Proposed rules include new rules, amendments to existing rules, and repeals of existing rules. A state agency shall give at least 30 days' notice of its intention to adopt a rule before it adopts the rule. A state agency shall give all interested persons a reasonable opportunity to submit data, views, or arguments, orally or in writing (Government Code, Chapter 2001).

Symbols in proposed rule text. Proposed new language is indicated by underlined text. [~~Square brackets and strikethrough~~] indicate existing rule text that is proposed for deletion. "(No change)" indicates that existing rule text at this level will not be amended.

TITLE 16. ECONOMIC REGULATION

PART 2. PUBLIC UTILITY COMMISSION OF TEXAS

CHAPTER 25. SUBSTANTIVE RULES APPLICABLE TO ELECTRIC SERVICE PROVIDERS

SUBCHAPTER S. WHOLESALE MARKETS

16 TAC §25.506

The Public Utility Commission of Texas (commission) proposes amendments to §25.506, relating to Publication of Resource and Load Information in the Electric Reliability Council of Texas Power Region. The amended rule will implement Public Utility Regulatory Act (PURA) §35.0022 as enacted by House Bill 1500, Section 8, during the 88th Texas Legislative Session (R.S.).

The amended rule will require owners and operators of generation resources and energy storage resources to provide ERCOT with information regarding each unplanned outage and derate, including the name of the resource experiencing the outage or derate, details on the duration of the outage or derate, details on the resource's return to normal operations, and the reason for the outage or derate. Additionally, the amended rule will require ERCOT to post the provided information in a publicly accessible location on its website within three business days of a resource's return to normal operations.

Growth Impact Statement

The agency provides the following governmental growth impact statement for the proposed rule, as required by Texas Government Code §2001.0221. The agency has determined that for each year of the first five years that the proposed rule is in effect, the following statements will apply:

(1) the proposed rule will not create a government program and will not eliminate a government program;

(2) implementation of the proposed rule will not require the creation of new employee positions and will not require the elimination of existing employee positions;

(3) implementation of the proposed rule will not require an increase and will not require a decrease in future legislative appropriations to the agency;

(4) the proposed rule will not require an increase and will not require a decrease in fees paid to the agency;

(5) the proposed rule will create a new regulation;

(6) the proposed rule will expand, limit an existing regulation;

(7) the proposed rule will change the number of individuals subject to the rule's applicability; and

(8) the proposed rule will not affect this state's economy.

Fiscal Impact on Small and Micro-Businesses and Rural Communities

There is no adverse economic effect anticipated for small businesses, micro-businesses, or rural communities as a result of implementing the proposed rule. Accordingly, no economic impact statement or regulatory flexibility analysis is required under Texas Government Code §2006.002(c).

Takings Impact Analysis

The commission has determined that the proposed rule will not be a taking of private property as defined in Chapter 2007 of the Texas Government Code.

Fiscal Impact on State and Local Government

Julie Gauldin, Power Markets Analyst, Market Analysis, has determined that for the first five-year period the proposed rule is in effect, there will be no fiscal implications for the state or for units of local government under Texas Government Code §2001.024(a)(4) as a result of enforcing or administering the section.

Public Benefits

Ms. Gauldin has determined that for each year of the first five years the proposed section is in effect the public benefit anticipated as a result of enforcing the section will be greater transparency into the reliability of generation resources and energy storage resources on the ERCOT system. There will be no probable economic cost to persons required to comply with the rule under Texas Government Code §2001.024(a)(5).

Local Employment Impact Statement

For each year of the first five years the proposed section is in effect, there should be no effect on a local economy; therefore, no local employment impact statement is required under Texas Government Code §2001.022.

Costs to Regulated Persons

Texas Government Code §2001.0045(b) does not apply to this rulemaking because the commission is expressly excluded under subsection §2001.0045(c)(7).

Public Hearing

Commission staff will conduct a public hearing on this rulemaking if requested in accordance with Texas Government Code §2001.029. The request for a public hearing must be received

by March 20, 2025. If a request for public hearing is received, commission staff will file in this project a notice of hearing.

Public Comments

Interested persons may file comments electronically through the interchange on the commission's website. Comments must be filed by March 20, 2025. Comments should be organized in a manner consistent with the organization of the proposed rule. The commission invites specific comments regarding the costs associated with, and benefits that will be gained by, implementation of the proposed rule. The commission will consider the costs and benefits in deciding whether to modify the proposed rule on adoption. All comments should refer to Project Number 57603.

The commission also requests comments on the following issue:

Under PURA §35.0022, the commission must require providers of electric generation service to report the reason for each "unplanned service interruption" to ERCOT. However, the statutory language leaves the commission with discretion to determine what constitutes an "unplanned service interruption" in this context.

In addition to unplanned outages, the proposed rule would require owners and operators of generation resources and energy storage resources to report the reason for each unplanned derate to ERCOT. By contrast, ERCOT Nodal Protocol §3.1.4.7 only requires generation resources and energy storage resources to report on unplanned derates that: (1) occur at an amount greater than 10 megawatts and 5% of their seasonal net maximum sustainable rating; and (2) last longer than 30 minutes.

The commission requests comments on whether all unplanned derates should be considered "unplanned service interruptions" for purposes of this rule.

Each set of comments should include a standalone executive summary as the last page of the filing. This executive summary must be clearly labeled with the submitting entity's name and should include a bulleted list covering each substantive recommendation made in the comments.

Statutory Authority

The amendment is proposed under Public Utility Regulatory Act (PURA) §14.001, which grants the commission the general power to regulate and supervise the business of each public utility within its jurisdiction and to do anything specifically designated or implied by this title that is necessary and convenient to the exercise of that power and jurisdiction; §14.002, which authorizes the commission to adopt and enforce rules reasonably required in the exercise of its powers and jurisdiction; and §35.0022, which directs the commission to require providers of electric generation service to report to ERCOT the reason for each unplanned service interruption.

Cross Reference to Statute: Public Utility Regulatory Act §§14.001; 14.002; and 35.0022.

§25.506. Publication of Resource and Load Information in the Electric Reliability Council of Texas Power Region.

(a) General Requirements. To increase the transparency of the ERCOT-administered markets, ERCOT must post the information required in this section at a publicly accessible location on its website. In no event will ERCOT disclose competitively sensitive consumption data. The information released must be made available to all market participants.

(b) [~~(1)~~] ERCOT will post the following information in aggregated form, for each settlement interval and for each area where available, two calendar days after the day for which the information is accumulated:

(1) [~~(A)~~] quantities and prices of offers for energy and each type of ancillary capacity service, in the form of supply curves;

(2) [~~(B)~~] self-arranged energy and ancillary capacity services, for each type of service;

(3) [~~(C)~~] actual resource output;

(4) [~~(D)~~] load and resource output for all entities that dynamically schedule their resources;

(5) [~~(E)~~] actual load; and

(6) [~~(F)~~] energy bid curves, cleared energy bids, and cleared load.

(c) [~~(2)~~] ERCOT will post the following information in entity-specific form, for each settlement interval, 60 calendar days after the day for which the information is accumulated, except where inapplicable or otherwise prescribed. Resource-specific offer information must be linked to the name of the resource (or identified as a virtual offer), the name of the entity submitting the information, and the name of the entity controlling the resource. If there are multiple offers for the resource, ERCOT must post the specified information for each offer for the resource, including the name of the entity submitting the offer and the name of the entity controlling the resource. ERCOT will use §25.502(d) of this title (relating to Pricing Safeguards in Markets Operated by the Electric Reliability Council of Texas) to determine the control of a resource and must include this information in its market operations data system.

(1) [~~(A)~~] Offer curves (prices and quantities) for each type of ancillary service and for energy in the real time market, except that, for the highest-priced offer selected or dispatched for each interval on an ERCOT-wide basis, ERCOT will post the offer price and the name of the entity submitting the offer three calendar days after the day for which the information is accumulated.

(2) [~~(B)~~] If the clearing prices for energy or any ancillary service exceeds a calculated value that is equal to 50 times a natural gas price index selected by ERCOT for each operating day, expressed in dollars per megawatt-hour (MWh) or dollars per megawatt (MW) per hour, during any interval, the portion of every market participant's price-quantity offer pairs for balancing energy service and each other ancillary service that is at or above a calculated value that is equal to 50 times a natural gas price index selected by ERCOT for each operating day, expressed in dollars per MWh [~~megawatt-hour (MWh)~~] or dollars per MW [~~megawatt~~] per hour, for that service and that interval must be posted seven calendar days after the day for which the offer is submitted.

(3) [~~(C)~~] Other resource-specific information, as well as self-arranged energy and ancillary capacity services, and actual resource output, for each type of service and for each resource at each settlement point.

(4) [~~(D)~~] The load and generation resource output, for each entity that dynamically schedules its resources.

(5) [~~(E)~~] For each hour, transmission flows, voltages, transformer flows, voltages and tap positions (i.e., State Estimator data). Notwithstanding the provisions of this paragraph [~~subparagraph~~] and the provisions of paragraphs (1) through (4) [~~subparagraphs (A) through (D)~~] of this subsection [~~paragraph~~], ERCOT must release relevant State Estimator data earlier than 60 days after the day for

which the information is accumulated if, in its sole discretion, it determines the release is necessary to provide a complete and timely explanation and analysis of unexpected market operations and results or system events, including but not limited to pricing anomalies, recurring transmission congestion, and system disturbances. ERCOT's release of data in this event must be limited to intervals associated with the unexpected market or system event as determined by ERCOT. The data released must be made available simultaneously to all market participants.

(d) Reporting on unplanned generation outages and derates.

(1) An owner or operator of a generation resource or energy storage resource must submit to ERCOT, in a manner determined by ERCOT, the following information related to each unplanned outage or unplanned derate of a generation resource or energy storage resource:

(A) the name of the resource;

(B) the date of the first day and the start time of the resource's unplanned outage or unplanned derate;

(C) the date of the last day and the end time of the resource's unplanned outage or unplanned derate;

(D) the date and time the resource returned to normal operations following the unplanned outage or derate;

(E) the reason for the resource's unplanned outage or unplanned derate; and

(F) any other information required under the ERCOT Nodal Protocols.

(2) Not later than the third business day after a generation resource or energy storage resource returns to normal operations following an unplanned outage or unplanned derate, ERCOT must post the information received under paragraph (1)(A), (B), (C), and (E) of this subsection, in resource-specific form, for each operating day.

(e) [~~(b)~~] Development and implementation. ERCOT must use a stakeholder process, in consultation with commission staff, to develop and implement rules that comply with this section. Nothing in this section prevents the commission from taking actions necessary to protect the public interest, including actions that are otherwise inconsistent with the other provisions in this section.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 13, 2025.

TRD-202500505
Adriana Gonzales
Rules Coordinator
Public Utility Commission of Texas
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 936-7322

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TITLE 19. EDUCATION

PART 1. TEXAS HIGHER EDUCATION COORDINATING BOARD

CHAPTER 22. STUDENT FINANCIAL AID PROGRAMS

SUBCHAPTER A. GENERAL PROVISIONS

19 TAC §§22.1, 22.2, 22.4, 22.7 - 22.11

The Texas Higher Education Coordinating Board (Coordinating Board) proposes amendments and new rules in Texas Administrative Code, Title 19, Part 1, Chapter 22, Subchapter A, §§22.1, 22.2, 22.4, and 22.7 - 22.11, concerning General Provisions. Specifically, the amendments and new sections will update terminology and definitions used throughout the chapter, restructure rules within the subchapter for greater clarity, and provide greater detail in how and to which programs the general provisions should be applied.

The Coordinating Board is authorized to adopt rules to effectuate the provisions of Texas Education Code (TEC), Chapter 61, including §61.051(a)(5) regarding the administration of financial aid programs.

Included throughout the subchapter are a number of nonsubstantive updates to rule language. References to the Coordinating Board as an agency, for example, previously written as "Board" or "Board staff," are revised to "Coordinating Board" to ensure the distinction is clear between the agency and its governing board. Similarly, the word "award" is changed to refer more precisely to a particular kind(s) of financial assistance.

Rule 22.1, Definitions, is amended by adding and removing several definitions, as well as amending definitions to more closely align with other defined terms. Several of the additions are commonly used terms throughout the chapter that have statutory definitions in TEC, §61.003. These terms have been consolidated into the General Provisions to ensure consistent usage and avoid citation issues that might arise from changes to TEC, §61.003. The term "forecast" was defined in multiple subchapters with slightly different definitions (though no practical difference); these definitions are consolidated in §22.1 with no change in function. Finally, to align more closely with changes to the federal financial aid process, the term "Student Aid Index" is added and will be used extensively throughout the chapter as a replacement for "Expected Family Contribution." Multiple definitions are removed as they are no longer needed or are being replaced with more precise terms.

Rule 22.2, Timely Distribution of Funds, is amended by adding provisions related to re-offering of funds and late disbursements of gift aid. New subsection (b) is the reconstituted §22.11(f), amended to clarify that it is applicable to all financial adjustments, not only grants. New subsection (c) is the reconstituted §22.11(g), amended to clarify that it applies to all gift aid. These adjustments do not represent a change in Coordinating Board practices or expectations.

Rule 22.4, Records Retention, is amended by eliminating subsection (a), which is simply an unnecessary directive to institutions to follow the rules within the section and making conforming formatting changes.

Rule 22.7, Financial Aid Uses, is added to specify the appropriate uses for state financial aid programs. This section is the reconstituted §22.11(c), amended slightly to make it more broadly applicable (to all financial aid, rather than simply grants or work-study). This does not represent a change in Coordinating Board practices or expectations.

Rule 22.8, Financial Aid Adjustments, is added to provide guidance to institutions in managing various financial aid adjustments. The bulk of the language is reconstituted from §22.11(d) and (e), with a few notable changes. First, provisions related to adjustments resulting from a student withdrawing from his/her institution are separated to offer more specific guidance in the case of gift aid versus loans. Subsection (b), related to over awards, frames the concept as a type of financial aid adjustment, rather than a separate concept as it has been previously. Finally, the new rule provides greater specificity regarding adjustments to financial aid resulting from a student becoming ineligible for particular financial aid programs after already receiving financial assistance from them. Subsection (d) provides general guidance in any other cases not addressed by the rest of the rule.

Rule 22.9, Institutional Responsibilities, is amended to align with the Coordinating Board's compliance monitoring role in TEC, §61.035, and the current practice between the Coordinating Board and the institutions as reflected in the program participation agreements, and furthermore to clarify the institutions' specific obligations with respect to allocated program funds.

Rule 22.10, Grade Point Average Calculations for Satisfactory Academic Progress, is amended to clarify that institutions have the discretion to include grades from prior institutions in determining whether a student's grade point average satisfies satisfactory academic progress requirements and may use the higher of the calculations.

Rule 22.11, Authority to Transfer Funds, is amended first by eliminating the specific program references in the title and narrowing the subject of the rule to focus only on the authority to transfer funds. Subsection (a) is eliminated entirely and not moved elsewhere in the chapter, as it merely restates statute. Subsection (b)(1), which implements a legislative rider, is retained with minor edits and the addition of the specific July 1 deadline. Subsection (b)(2) is eliminated as the allocations for the Texas College Work-Study Program and Work-Study Student Mentorship Programs have been combined. Subsections (c) - (g) are removed but the substance of these provisions has been relocated elsewhere in this subchapter, as described above.

Dr. Charles Contéro-Puls, Assistant Commissioner for Student Financial Aid Programs, has determined that for each of the first five years the sections are in effect there would be no fiscal implications for state or local governments as a result of enforcing or administering the rules. There are no estimated reductions in costs to the state and to local governments as a result of enforcing or administering the rule. There are no estimated losses or increases in revenue to the state or to local governments as a result of enforcing or administering the rule.

There is no impact on small businesses, micro businesses, and rural communities. There is no anticipated impact on local employment.

Dr. Charles Contéro-Puls, Assistant Commissioner for Student Financial Aid Programs, has also determined that for each year of the first five years the section is in effect, the public benefit anticipated as a result of administering the section will be improved rule clarity, consistency, and readability throughout the chapter impacted by the General Provisions. There are no anticipated economic costs to persons who are required to comply with the sections as proposed.

Government Growth Impact Statement

(1) the rules will not create or eliminate a government program;

(2) implementation of the rules will not require the creation or elimination of employee positions;

(3) implementation of the rules will not require an increase or decrease in future legislative appropriations to the agency;

(4) the rules will not require an increase or decrease in fees paid to the agency;

(5) the rules will not create a new rule;

(6) the rules will not limit an existing rule;

(7) the rules will not change the number of individuals subject to the rule; and

(8) the rules will not affect this state's economy.

Comments on the proposal may be submitted to Dr. Charles Contéro-Puls, Assistant Commissioner for Student Financial Aid Programs, P.O. Box 12788, Austin, Texas 78711-2788, or via email at SFAPPolicy@highered.texas.gov. Comments will be accepted for 30 days following publication of the proposal in the *Texas Register*.

The amendments and new sections are proposed under Texas Education Code, Section 61.051(a)(5), which provides the Coordinating Board with the authority to administer state financial aid programs.

The proposed amendments and new sections affect Texas Administrative Code, Title 19, Part 1, Chapter 22.

§22.1. Definitions.

The following words and terms, when used in chapter 22 [~~Chapter 22~~], shall have the following meanings, unless otherwise defined in a particular subchapter:

(1) Academic Year--The combination of semesters defined by a public or private institution of higher education to fulfill the federal "academic year" requirement as defined by 34 CFR 668.3.

(2) Attempted Semester Credit Hours--Every course in every semester for which a student has been registered as of the official Census Date, including but not limited to, repeated courses and courses the student drops and from which the student withdraws. For transfer students, transfer hours and hours for optional internship and cooperative education courses are included if they are accepted by the receiving institution towards the student's current program of study.

[~~(3) Awarded--Offered to a student.~~]

(3) [~~(4)~~] Board--The governing body of the agency known as the Texas Higher Education Coordinating Board.

(4) [~~(5)~~] Categorical Aid--Gift aid that the institution does not award to the student, but that the student brings to the school from a non-governmental third party.

(5) [~~(6)~~] Commissioner--The Texas Commissioner of Higher Education.

(6) [~~(7)~~] Coordinating Board--The agency known as the Texas Higher Education Coordinating Board, including agency [~~and its~~] staff.

(7) [~~(8)~~] Cost of Attendance/Total Cost of Attendance--An institution's estimate of the expenses incurred by a typical financial aid recipient in attending a particular institution of higher education. It includes direct educational costs (tuition and fees) as well as indirect costs (room and board, books and supplies, transportation, personal expenses, and other allowable costs for financial aid purposes).

(8) [~~(9)~~] Credit--College credit earned through the successful completion of a college career and technical education or academic course that fulfills specific requirements necessary to obtain an industry-recognized credential, certificate, associate degree, or other academic degree.

(9) [~~(10)~~] Degree or Certificate Program [~~certificate program~~] of Four Years [~~four years~~] or Less [~~less~~]--A baccalaureate degree, associate degree, or certificate program other than a program determined by the Coordinating Board to require four years or more to complete.

(10) [~~(11)~~] Degree or Certificate Program [~~certificate program~~] of More Than Four Years [~~more than four years~~]--A baccalaureate degree or certificate program determined by the Coordinating Board to require more than four years to complete.

(11) [~~(12)~~] Encumber--Program funds that have been officially requested by an institution through procedures developed by the Coordinating Board.

(12) [~~(13)~~] Equivalent of a Semester Credit Hour [~~semester credit hour~~]-- A unit of measurement for a continuing education course, determined as a ratio of one continuing education unit to ten [~~10~~] contact hours of instruction, which may be expressed as a decimal. For the purpose of conversion, 1.6 continuing education units of instruction equals one semester credit hour of instruction. In a continuing education course, not fewer than sixteen [~~16~~] contact hours are equivalent to one semester credit hour.

(13) [~~(14)~~] Expected Family Contribution (EFC)--A measure utilized to calculate a student's financial need as regulated and defined by the methodology used for federal student financial aid.

(14) [~~(15)~~] Financial Need--The Cost of Attendance at a particular institution of higher education or private or independent institution of higher education [~~public or private institution of higher education~~] less the Student Aid Index as those terms are defined in this section. [~~Expected Family Contribution. The Cost of Attendance and Expected Family Contribution are to be determined in accordance with Board guidelines.~~]

(15) Forecast--The FORECAST function in Microsoft Excel, or a comparable forecasting function.

(16) Full-Time--For undergraduate students, enrollment or expected enrollment for the equivalent of twelve or more semester credit hours per semester. For graduate students, enrollment or expected enrollment for the normal full-time course load of the student's program of study as defined by the institution.

(17) General Academic Teaching Institution--As defined in Texas Education Code, §61.003.

(18) [~~(17)~~] Gift Aid--Grants, scholarships, exemptions, waivers, and other financial aid provided to a student without a requirement to repay the funding or earn the funding through work.

(19) [~~(18)~~] Graduate Student [~~student~~]--A student who has been awarded a baccalaureate degree and is enrolled in coursework leading to a graduate or professional degree.

(20) [~~(19)~~] Half-Time--For undergraduates, enrollment or expected enrollment for the equivalent of at least six but fewer than nine semester credit hours per regular semester. For graduate students, enrollment or expected enrollment for the equivalent of 50 percent of the normal full-time course load of the student's program of study as defined by the institution.

(21) Institution of Higher Education--As defined by Texas Education Code, §61.003.

(22) Medical or Dental Unit--As defined by Texas Education Code, §61.003.

(23) [~~(20)~~] Period of Enrollment [~~enrollment~~]--The semester or semesters within the current state fiscal year (September 1 - August 31) for which the student was enrolled in an approved institution and met all eligibility requirements for financial assistance offered under this chapter [~~an award through this program~~].

(24) Private or Independent Institution of Higher Education--As defined by Texas Education Code, §61.003.

(25) [~~(21)~~] Program Officer--The individual named by each participating institution's chief executive officer to serve as agent for the Coordinating Board. The Program Officer has primary responsibility for all ministerial acts required by the program, including the determination of student eligibility, selection of recipients, maintenance of all records, and preparation and submission of reports reflecting program transactions. Unless otherwise indicated by the institution's chief executive officer, the director of student financial aid shall serve as Program Officer.

[~~(22) Residency Core Questions--A set of questions developed by the Coordinating Board to be used to determine a student's eligibility for classification as a resident of Texas, available for downloading from the Coordinating Board's website, and incorporated into the ApplyTexas application for admission.~~]

(26) Public Junior College--As defined by Texas Education Code, §61.003.

(27) Public State College--As defined by Texas Education Code, §61.003.

(28) Public Technical Institute-As defined by Texas Education Code, §61.003.

(29) [~~(23)~~] Resident of Texas--A resident of the State of Texas as determined in accordance with chapter 21, subchapter B, [~~Chapter 21, Subchapter B~~] of this title (relating to Determination of Resident Status). Nonresident students who are eligible to pay resident tuition rates are not residents of Texas.

(30) [~~(24)~~] Semester--A payment period, as defined by 34 CFR 668.4(a) or 34 CFR 668.4(b)(1).

(31) [~~(25)~~] Semester Credit Hour--A unit of measure of instruction, represented in intended learning outcomes and verified by evidence of student achievement, that reasonably approximates one hour of classroom instruction or direct faculty instruction and a minimum of two hours out of class student work for each week over a 15-week period in a semester system or the equivalent amount of work over a different amount of time. An institution is responsible for determining the appropriate number of semester credit hours awarded for its programs in accordance with Federal definitions, requirements of the institution's accreditor, and commonly accepted practices in higher education.

(32) Student Aid Index (SAI)--A student's Expected Family Contribution, as the term is defined in this section.

(33) [~~(26)~~] Three-Quarter-Time--For undergraduate students, enrollment or expected enrollment for the equivalent of at least nine but fewer than twelve [~~12~~] semester credit hours per semester. For graduate students, enrollment or expected enrollment for the equivalent of 75 percent of the normal full-time course load of the student's program of study as defined by the institution.

[~~(27) Timely Distribution of Funds--Activities completed by institutions of higher education related to the receipt and distribu-~~

tion of state financial aid funding from the Board and subsequent distribution to recipients or return to the Board.]

(34) [(28)] Undergraduate Student [student]--An individual who has not yet received a baccalaureate degree.

§22.2. Timely Distribution of Funds.

(a) All institutions participating in the financial aid programs outlined in chapter 22 [Chapter 22] shall follow the guidelines for the timely distribution of funds, as outlined in this section:

(1) Timely Disbursement. Institutions shall disburse state student financial aid funding to a student recipient's account or, in the case of work-study, through a paycheck, no later than three business days after receiving the funds. Undisbursed funds must be returned to the Coordinating Board no later than six business days after the receipt of funds. Gift aid and work-study funds for which a student is no longer eligible may be disbursed to a different eligible student for whom funds have not yet been requested in order to meet the timely disbursement requirement.

(2) Timely Determination of Ineligibility. For state student financial aid funding already disbursed to a student, except work study, institutions shall return funds to the Coordinating Board within forty-five [45] calendar days of a student becoming ineligible for the funding. Gift aid funds for which a student has been determined ineligible may be disbursed to a different eligible student for whom funds have not yet been requested in order to meet the timely determination of ineligibility requirement. In all cases, an institution must provide notification to the Coordinating Board regarding the change in student eligibility, as appropriate for the particular student financial aid program.

(3) Timely Cancellation. For state student financial aid funds already disbursed to a student, except work-study, institutions may return funds to the Coordinating Board within 120 calendar days of disbursement in situations where a student has notified the institution of his or her decision to cancel the financial aid. Gift aid funds for which a student has made the decision to cancel may be disbursed to a different eligible student for whom funds have not yet been requested in order to meet the timely cancellation requirement. In all cases, an institution must provide notification to the Coordinating Board regarding the student's decision to cancel financial aid, as appropriate for the particular student financial aid program.

(b) Re-offering of funds. Funds made available from financial aid adjustments, as detailed in §22.8 of this subchapter (relating to Financial Aid Adjustments) are subject to the requirements of timely determination of ineligibility in subsection (a)(2) of this section.

(c) Late Disbursements of Gift Aid.

(1) A student may receive a gift aid disbursement after the end of his/her period of enrollment if the student:

(A) Owes funds to the institution for the period of enrollment for which the grant is being made; or

(B) Received a student loan that is still outstanding for the period of enrollment.

(2) Funds that are disbursed after the end of the student's period of enrollment must be used to either pay the student's outstanding balance from his/her period of enrollment at the institution or to make a payment against an outstanding student loan received during that period of enrollment. Under no circumstances are funds to be released to the student.

(3) The institution shall retain documentation proving the late-disbursed funds were used to make a payment against an outstanding balance at the institution from the relevant period of enrollment and/or to make a payment against an outstanding loan taken out for the period of enrollment.

(4) Unless granted an extension by the Coordinating Board, late disbursements must be processed prior to the end of the state fiscal year for which the funds were allocated to the institution.

§22.4. Records Retention.

[(a) All institutions participating in the financial aid programs described in Chapter 22 shall follow the records retention guidelines outlined in subsection (a) and (b) of this section:]

(a) [(1)] An institution shall maintain its records and accounts of all transactions related to state and federal student financial aid in keeping with the institution's records retention schedule to ensure a full accounting for all funds received, disbursed, and expended by the institution.

(b) [(2)] Records and accounts shall be available for inspecting, monitoring, programmatic or financial auditing, or evaluation by the Coordinating Board, and by others authorized by law or regulation, for a period (whichever is later):

(1) [(A)] not less than seven (7) years after the date of the completion of the award period;[,]

(2) [(B)] the date of the receipt of the institution's final claim for payment of final expenditure report;[,] or

(3) [(C)] until a resolution of all billing questions in connection with the account has been resolved.

(c) [(3)] Records and accounts shall include, but are not limited to, general institutional and program specific record-keeping requirements in accordance with Federal Student Aid Title IV regulations (USOE, 34 CFR §668.24).

(d) [(b)] If an audit is announced, an institution shall retain its records until the audit has been completed or not less than seven (7) years after the expiration date of the Memorandum of Understanding for State Financial Aid Programs (MOU), Program Participation Agreement, or other operative written agreement between an institution and the Coordinating Board pertaining to financial aid, whichever is later.

(1) An institution shall make available to the auditing entity all documents and other information related to state financial aid programs.

(2) An institution and any subcontractors shall provide any information the auditing entity deems relevant to any monitoring, investigation, evaluation, or audit.

§22.7. Financial Aid Uses.

Neither an institution nor a student may use financial assistance offered through programs in this chapter for any purpose other than paying for any usual and customary cost of attendance incurred by the student related to enrollment at a participating institution of higher education for the academic year for which funding was offered.

§22.8. Financial Aid Adjustments.

(a) Withdrawal from Enrollment.

(1) Gift Aid. If a student officially withdraws from enrollment, then the institution shall reduce the student's gift aid by the same percentage by which the student's tuition has been reduced per the institution's general institutional refund policy.

(2) Loans. If a student officially withdraws from enrollment, the institution shall recalculate the student's cost of attendance to determine whether an adjustment to the student's state-funded loan aid is warranted.

(3) If the student withdraws or drops classes after the end of the institution's refund period, no refunds are due to the program(s) from which the student received financial assistance.

(b) Over Awards.

(1) An over award occurs when a student's total financial assistance (including the student's state-funded and additional financial assistance) exceeds his/her financial need.

(2) If an over award occurs, the institution shall resolve the over award by recalculating the student's amount of state-funded financial assistance in accordance with the institution's procedures, except the institution is not required to recalculate the student's financial aid if:

(A) the over award occurred after state-funded financial assistance has been disbursed because the student received additional financial assistance that was not factored into the institution's estimate of his/her financial need; and

(B) the student's total financial assistance exceeds his/her need by $300 or less.

(c) Ineligibility.

(1) If an institution determines that a student is ineligible for financial assistance from one or more programs in this chapter after receiving financial assistance from the program(s), the institution shall adjust the student's financial aid in accordance with the institution's procedures to either resolve the eligibility issue or remove the student from the program(s).

(2) An institution may distribute gift aid funds for which a student has been deemed ineligible to a different eligible student or return the funds to the Coordinating Board in accordance with §22.2(a)(2) of this subchapter (relating to Timely Distribution of Funds).

(d) If, for some reason not already specified in this section, the amount of a student's disbursement exceeds the amount the student is eligible to receive, the institution shall recalculate the student's financial aid accordingly.

§22.9. Institutional Responsibilities.

(a) Probation Notice. If the institution is placed on probation by its accrediting agency, the institution shall [~~it must~~] immediately notify the Coordinating Board [~~staff~~] and advise state financial aid recipients of this condition and maintain evidence to demonstrate that state financial aid program recipients were so informed.

(b) Disbursements to Students.

(1) Documentation. Each [~~The~~] institution shall [~~must~~] maintain records to prove the crediting of state financial aid program funds to the student's school account.

(2) Procedures in Case of Unauthorized [~~Illegal~~] Disbursements. If an institution receives an audit or compliance monitoring finding or otherwise determines [~~the Commissioner has reason for concern~~] that the [~~an~~] institution has disbursed state financial aid program funds for unauthorized purposes, whether over-allocated, misused, or misallocated, [~~Board staff will notify~~] the Program Officer shall notify the Coordinating Board within five business days [~~and offer an opportunity for a hearing pursuant to the procedures outlined in Chapter 1 of this title (relating to Agency Administration). Thereafter, if Board staff determine that funds have been improperly disbursed, the institution shall become primarily responsible for restoring the funds to the Board. No further disbursements of funds from the program in question shall be permitted to students at that institution until the funds have been repaid.~~].

(3) If the Commissioner determines that the institution has made an unauthorized disbursement, the Commissioner will notify the Program Officer of this determination in writing.

(4) The Commissioner may demand, in writing, that the institution return the funds to the Coordinating Board. The institution may comply with this demand and return the funds to the Coordinating Board within thirty calendar days of receipt, unless the Commissioner specifically permits a later deadline. If the institution elects not to comply with this demand, the Coordinating Board may utilize additional tools of recovery, as permitted by law, including any means of recovery authorized by Texas Education Code, §61.035.

(5) In addition, the Commissioner may subject the institution to compliance monitoring.

(6) The Coordinating Board shall not disburse further funds from the program in question to the institution until the funds have been repaid.

(c) Reporting Requirements/Deadlines. Each institution shall [~~All institutions must~~] submit such reports and information as the Coordinating Board may require in connection with the administration or evaluation of the state financial aid programs. These materials must be submitted within the time allotted by the Coordinating Board [~~THECB~~] for each such report or information request. The Program Officer shall ensure [~~officer agrees~~] that all reports and information provided to the Coordinating Board [~~shall reflect~~] properly reflect the facts and certify that those reports may be relied upon as being complete and accurate.

(d) Compliance Monitoring [~~Program Reviews~~]. If selected for such by the Coordinating Board [~~staff~~], a participating institution shall [~~institutions must~~] submit to [~~program~~] reviews of activities related to state financial aid programs.

§22.10. Grade Point Average Calculations for Satisfactory Academic Progress.

(a) Each institution shall calculate grade [~~Grade~~] point average [~~calculations shall be made~~] in accordance with institutional policies.

(b) Subject to any specific statutory requirements, in determining whether a financial aid [~~A grant~~] recipient has met the [~~whose GPA is below program~~] grade point average requirements for satisfactory academic progress for a given program, an [~~as of the end of an academic year may appeal his/her grade point average calculation if he/she has taken courses previously at one or more institutions. In the case of such an appeal, the current~~] institution may [~~(if presented with transcripts from the previous institutions), shall~~] calculate an overall grade point average based on classes and grade points from that institution only or based on [~~counting~~] all classes and grade points previously earned at one or more other institutions. If the resulting grade point average exceeds the program's academic progress requirement, an otherwise eligible student may receive an award in the following academic year.

(c) If a financial aid [~~grant~~] recipient's grade point average falls below the satisfactory academic progress [~~program~~] requirements and the student transfers to another institution, or has transferred from another institution, the receiving institution cannot make a subsequent offer [~~award~~] to the transfer student until the student provides official transcripts of previous coursework to the current institution's financial aid office and the institution re-calculates an overall grade-point average, including hours and grade points for courses taken at the previous and current institutions, that proves the student's overall grade point average now meets or exceeds the satisfactory academic progress [~~program~~] requirements.

§22.11. Authority to Transfer Funds [~~Provisions specific to the TEXAS Grant, TEOG, TEG, and Texas Work-Study Programs~~].

[(a) Funding. Funds offered through this program may not exceed the amount of appropriations, gifts, grants and other funds that are available for this use (§§56.303(c) and 56.403(c)) Texas Education Code).]

[(b) Authority to Transfer Funds.]

(a) [(1)] An institution [Institutions] participating in two or more [a combination] of the following programs: Toward EXcellence, Access and Success Grant, Texas Educational Opportunity Grant, Tuition Equalization Grant, and Texas College Work-Study Programs, in accordance with instructions from the Coordinating Board, may transfer current fiscal year funds up to the lesser of 25 percent or $60,000 between these programs. This threshold applies to the program from which the funds are transferred. [Requests for such transfers must be submitted by the institution by the annual deadline published by the agency.]

[(2) Institutions participating in both the Texas College Work-Study Program and the Work-Study Student Mentorship Program, in accordance with instructions from the Board, may transfer current fiscal year funds up to 25 percent between the two programs. This threshold applies to the program from which the funds are transferred. Such transfers must occur by July 1 of the current fiscal year.]

(b) An institution shall submit a request for transfer under subsection (a) of this section by the annual deadline published by the Coordinating Board, and the transfer must occur by July 1 of the current fiscal year.

[(c) Grant Uses. No state grant or work-study funding may be used for any purpose other than paying for any usual and customary cost of attendance incurred by the student related to enrollment at a participating institution of higher education for the academic year for which funding was offered.]

[(d) Over Awards. If, at a time after the grant has been disbursed by the institution to the student, the student receives assistance that was not taken into account in the institution's estimate of the student's financial need, so that the resulting sum of assistance exceeds the student's financial need, the institution is not required to adjust the grant under this program unless the sum of the excess resources is greater than $300.]

[(e) Grant adjustments. If a student officially withdraws from enrollment, the institution shall follow its general institutional refund policy in determining the amount by which the financial aid is to be reduced. If the student withdraws or drops classes after the end of the institution's refund period, no refunds are due to the program. If for some other reason the amount of a student's disbursement exceeds the amount the student is eligible to receive, the financial aid should be recalculated accordingly.]

[(f) Re-offering of funds. Funds made available from grant adjustments may be re-offered to other eligible students attending the institution. If funds cannot be re-offered, they should be returned to the Board in accordance with §22.2 of this subchapter (relating to Timely Distribution of Funds).]

[(g) Late Disbursements.]

[(1) A student may receive a disbursement after the end of his/her period of enrollment if the student:]

[(A) Owes funds to the institution for the period of enrollment for which the grant is being made; or]

[(B) Received a student loan that is still outstanding for the period of enrollment.]

[(2) Funds that are disbursed after the end of the student's period of enrollment must be used to either pay the student's outstanding balance from his/her period of enrollment at the institution or to make a payment against an outstanding student loan received during that period of enrollment. Under no circumstances are funds to be released to the student.]

[(3) Documentation must be retained by the institution, proving the late-disbursed funds were used to make a payment against an outstanding balance at the institution from the relevant period of enrollment and/or to make a payment against an outstanding loan taken out for the period of enrollment.]

[(4) Unless granted an extension by the staff of the Coordinating Board, late disbursements must be processed prior to the end of the state fiscal year for which the funds were allocated to the institution.]

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Nichole Bunker-Henderson
General Counsel
Texas Higher Education Coordinating Board
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For further information, please call: (512) 427-6365

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PART 2. TEXAS EDUCATION AGENCY

CHAPTER 67. STATE REVIEW AND APPROVAL OF INSTRUCTIONAL MATERIALS
SUBCHAPTER C. LOCAL OPERATIONS

19 TAC §67.69

The State Board of Education (SBOE) proposes new §67.69, concerning the local review of classroom instructional materials. The proposed new section would implement House Bill (HB) 1605, 88th Texas Legislature, Regular Session, 2023, by outlining the local process requirements for a parent to petition for a review of instructional materials.

BACKGROUND INFORMATION AND JUSTIFICATION: HB 1605, 88th Texas Legislature, Regular Session, 2023, significantly revised Texas Education Code (TEC), Chapter 31, including adding a provision for local classroom reviews of instructional materials.

HB 1605 established new TEC, §31.0252, Local Review of Classroom Instructional Materials, which requires that the Texas Education Agency (TEA) develop standards in consultation with stakeholders, including educators, by which a school district is authorized to conduct a review of instructional materials used by a classroom teacher in a foundation curriculum course under TEC, §28.002(a)(1), to determine the degree to which the material corresponds with the instructional materials adopted by the school district or campus and meets the level of rigor of the essential knowledge and skills adopted under TEC, §28.002, for the grade level in which it is being used.

TEC, §31.0252, also requires the agency to develop a rubric, approved by the SBOE, to determine if reviewed instructional material complies with the rigor requirements.

At the June 2023 SBOE meeting, the Committee of the Full Board held a work session to receive an overview presentation on HB 1605 from the commissioner of education and begin discussing preliminary decisions and next steps. The June 2023 SBOE HB 1605 Work Session Presentation shared during the work session is available on the TEA website at https://tea.texas.gov/about-tea/leadership/state-board-of-education/sboe-2023/sboe-2023-june/sboe-hb1605-working-session-slidedeck-062223.pdf.

At the November 2024 SBOE meeting, TEA staff presented to the Committee of the Full Board for discussion the local classroom review rubrics and considerations for the proposed rule.

Proposed new §67.69 would clarify the conditions under which a local review of classroom instructional materials would be conducted.

The SBOE approved the proposed new rule for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Todd Davis, associate commissioner for instructional strategy, has determined that for the first five years the proposal is in effect, there are no additional costs to state or local government, including school districts and open-enrollment charter schools, required to comply with the proposal.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: TEA staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would create a new regulation regarding the process for local reviews of classroom instructional materials conducted by school districts.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not expand, limit, or repeal an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Mr. Davis has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to define the requirements for a school district's process for parent petitions for instructional material review. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

STATUTORY AUTHORITY. The new rule is proposed under Texas Education Code (TEC), §26.0061, as added by House Bill (HB) 1605, 88th Texas Legislature, Regular Session, 2023, which requires the board of trustees of each school district to establish a process by which a parent may request an instructional material review under TEC, §31.0252, for a subject area in the grade level in which the student is enrolled and allows the State Board of Education (SBOE) to adopt rules to implement this section; TEC, §31.003(a), which permits the SBOE to adopt rules for the adoption, requisition, distribution, care, use, and disposal of instructional materials; and TEC, §31.0252, as added by HB 1605, 88th Texas Legislature, Regular Session, 2023, which requires the Texas Education Agency to develop a rubric, approved by the SBOE, to determine if reviewed instructional material complies with the rigor requirements described by TEC, §31.0252(a)(2).

CROSS REFERENCE TO STATUTE. The new rule implements Texas Education Code (TEC), §26.0061, as added by House Bill (HB) 1605, 88th Texas Legislature, Regular Session, 2023; TEC, §31.003(a); and TEC, §31.0252, as added by HB 1605, 88th Texas Legislature, Regular Session, 2023.

§67.69. Local Review of Classroom Instructional Materials.

(a) School districts and open-enrollment charter schools must establish a process by which a parent of a student may request an instructional material review under Texas Education Code, §31.0252, for a subject area in the grade level in which the student is enrolled. This process shall:

(1) establish minimum requirements for a parent's petition to the school district board of trustees for a local review of classroom instructional materials, including submission guidelines and timelines for the petition. The process must align to the statewide submission window of September 1 through the last instructional day for students. The process must require that the board consider such petitions at the regular board meeting that allows proper posting immediately following submission of the petition provided that it is submitted by the prescribed submission deadline;

(2) require parent petitions to include the student assignment, grade level, content area, campus name, and teacher name to complete the local review process; and

(3) establish an appeal process for parents if a petition for a local review is denied by the school district board of trustees, detailing steps for submitting an appeal, the criteria for reviewing the appeal, and the timelines for a final decision.

(b) A school district or open-enrollment charter school is requested to notify the State Board of Education member(s) representing the district or charter school, at the member's state email address as listed on the SBOE.Texas.gov website, within one week of a decision to approve a parent request for local classroom review and one week after receiving the final report.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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CHAPTER 74. CURRICULUM REQUIREMENTS

SUBCHAPTER B. GRADUATION REQUIREMENTS

19 TAC §74.12, §74.13

The State Board of Education (SBOE) proposes amendments to §74.12 and §74.13, concerning graduation requirements. The proposed amendments would reflect changes to a career and technical education (CTE) course title to align with recently adopted CTE Texas Essential Knowledge and Skills (TEKS) and update cross references.

BACKGROUND INFORMATION AND JUSTIFICATION: At the April 2024 SBOE meeting, the SBOE approved for second reading and final adoption TEKS for a set of CTE courses in agriculture; aviation maintenance; and science, technology, engineering, and mathematics (STEM) with an effective date of August 1, 2025. The proposed amendments would update the list of courses that can satisfy a science graduation requirement to reflect a CTE course that was retitled Physics for Engineering (formerly titled Principles of Technology) as a result of the 2024 CTE TEKS review.

The proposed amendments would also update cross references to certain subchapters that are being reorganized.

The SBOE approved the proposed amendments for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect, there are no additional costs to state or local government, including school districts and open-enrollment charter schools, required to comply with the proposal.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: Texas Education Agency (TEA) staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not create a new regulation; would not expand, limit, or repeal an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to clarify the rules by updating out-of-date language. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

STATUTORY AUTHORITY. The amendments are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.025(a), which requires the SBOE to determine by rule the curriculum requirements for the foundation high school program that are consistent with the required curriculum and requires the SBOE to designate specific courses that are required for the foundation high school program; TEC, §28.025(b-2)(2), which requires the SBOE to allow a student by rule to comply with the curriculum require-

ments for the third and fourth mathematics credits under TEC, §28.025(b-1)(2), or the third and fourth science credits under TEC, §28.025(b-1)(3), by successfully completing a career and technical education course designated by the SBOE as containing substantially similar and rigorous content; and TEC, §28.025(c-1), which requires the SBOE to adopt rules regarding earning an endorsement.

CROSS REFERENCE TO STATUTE. The amendments implement Texas Education Code, §7.102(c)(4) and §28.025(a), (b-2)(2), and (c-1).

§74.12. Foundation High School Program.

(a) (No change.)

(b) Core courses. A student must demonstrate proficiency in the following.

(1) - (2) (No change.)

(3) Science--three credits. One credit must consist of Biology or a comparable AP or IB biology course.

(A) One credit must be selected from the following laboratory-based courses:

(i) Integrated Physics and Chemistry;

(ii) Chemistry;

(iii) Physics;

(iv) Physics for Engineering [~~Principles of Technology~~]; and

(v) a comparable AP or IB chemistry or physics course that does not count toward another credit required for graduation.

(B) The additional credit may be selected from one full credit or a combination of two half credits from two different courses, subject to prerequisite requirements, from the following laboratory-based courses:

(i) - (xvii) (No change.)

(xviii) Physics for Engineering [~~Principles of Technology~~];

(xix) - (xxiv) (No change.)

(C) Credit may not be earned for both physics and Physics for Engineering [~~Principles of Technology~~] to satisfy science credit requirements.

(4) - (7) (No change.)

(c) - (d) (No change.)

§74.13. Endorsements.

(a) - (d) (No change.)

(e) To earn an endorsement a student must demonstrate proficiency in the following.

(1) - (5) (No change.)

(6) An additional credit in science that may be selected from one full credit or a combination of two half credits from two different courses, subject to prerequisite requirements, from the following courses:

(A) - (Q) (No change.)

(R) Physics for Engineering [~~Principles of Technology~~];

(S) - (X) (No change.)

(Y) credit may not be earned for both physics and Physics for Engineering [~~Principles of Technology~~] to satisfy science credit requirements.

(Z) (No change.)

(7) (No change.)

(f) A student may earn any of the following endorsements.

(1) Science, technology, engineering, and mathematics (STEM). Students who entered high school prior to the 2022-2023 school year may earn a STEM endorsement by completing the requirements specified in subsection (e) of this section, including Algebra II, chemistry, and physics or Physics for Engineering [~~Principles of Technology~~] and:

(A) a coherent sequence of courses for four or more credits in career and technical education (CTE) that consists of at least two courses in the same career cluster and at least one advanced CTE course. The courses may be selected from [~~Chapter 130 of this title (relating to Texas Essential Knowledge and Skills for Career and Technical Education),~~] Chapter 127 of this title (relating to Texas Essential Knowledge and Skills for Career Development and Career and Technical Education)[,] or CTE innovative courses. The final course in the sequence must be selected from Chapter 127, Subchapter O, of this title (relating to Science, Technology, Engineering, and Mathematics) as it existed prior to August 1, 2025, or Career Preparation I or II (Career Preparation General or Career Preparation for Programs of Study) and Project-Based Research (Career and Technical Education Project-Based Capstone) in Chapter 127, Subchapter B, of this title (relating to High School), if the course addresses a STEM-related field;

(B) - (E) (No change.)

(2) Business and industry. Students who entered high school prior to the 2022-2023 school year may earn a business and industry endorsement by completing the requirements specified in subsection (e) of this section and:

(A) a coherent sequence of courses for four or more credits in CTE that consists of at least two courses in the same career cluster and at least one advanced CTE course. The courses may be selected from [~~Chapter 130 of this title,~~] Chapter 127 of this title[,] or CTE innovative courses. The final course in the sequence must be selected from one of the following:

(i) Chapter 127, Subchapter C, of this title (related to Agriculture, Food, and Natural Resources);

(ii) Chapter 127, Subchapter D, of this title (relating to Architecture and Construction;

(iii) Chapter 127, Subchapter E, of this title (relating to Arts, Audio/Video Technology, and Communications);

~~*[(ii)* Chapter 130, Subchapter A, of this title (relating to Agriculture, Food, and Natural Resources);]~~

~~*[(iii)* Chapter 130, Subchapter B, of this title (relating to Architecture and Construction);]~~

~~*[(iv)* Chapter 130, Subchapter C, of this title (relating to Arts, Audio/Video Technology, and Communications);]~~

(iv) [~~(v)~~] Chapter 127, Subchapter F, of this title (relating to Business, Marketing, and Finance);

(v) Chapter 127, Subchapter H, of this title (relating to Energy);

[(vi) Chapter 130, Subchapter D, of this title (relating to Business Management and Administration);]

[(vii) Chapter 130, Subchapter F, of this title (relating to Finance);]

(vi) [(viii)] Chapter 127, Subchapter K [J], of this title (relating to Hospitality and Tourism);

(vii) Chapter 127, Subchapter M, of this title (relating to Information Technology);

(viii) Chapter 127, Subchapter O, of this title (relating to Manufacturing);

[(ix) Chapter 130, Subchapter K, of this title (relating to Information Technology);]

[(x) Chapter 130, Subchapter M, of this title (relating to Manufacturing);]

[(xi) Chapter 130, Subchapter N, of this title (relating to Marketing);]

(ix) [(xii)] Chapter 127, Subchapter P, of this title (relating to Transportation, Distribution, and Logistics); or

[(xiii) Chapter 130, Subchapter P, of this title (relating to Transportation, Distribution, and Logistics);]

[(xiv) Chapter 130, Subchapter Q, of this title (relating to Energy); or]

(x) [(xv)] Career Preparation I or II (Career Preparation General or Career Preparation for Programs of Study) and Project-Based Research (Career and Technical Education Project-Based Capstone) in Chapter 127, Subchapter B, of this title if the course addresses a career from a field listed in clauses (i)-(ix) [(i)-(xiv)] of this subparagraph;

(B) - (D) (No change.)

(3) Public services. Students who entered high school prior to the 2022-2023 school year may earn a public services endorsement by completing the requirements specified in subsection (e) of this section and:

(A) a coherent sequence of courses for four or more credits in CTE that consists of at least two courses in the same career cluster and at least one advanced CTE course. The courses may be selected from [Chapter 130 of this title,] Chapter 127 of this title[,] or CTE innovative courses. The final course in the sequence must be selected from one of the following:

(i) Chapter 127, Subchapter G, of this title (relating to Education and Training);

(ii) Chapter 127, Subchapter J [I], of this title (relating to Health Science);

(iii) Chapter 127 [130], Subchapter L [J], of this title (relating to Human Services);

(iv) Chapter 127, Subchapter N [M], of this title (relating to Law and Public Service); or

(v) Career Preparation I or II (Career Preparation General or Career Preparation for Programs of Study) and Project-Based Research (Career and Technical Education Project-Based Capstone) in Chapter 127, Subchapter B, of this title if the course addresses a field from a cluster listed in clauses (i)-(iv) [(i)-(v)] of this subparagraph;

(B) - (C) (No change.)

(4) - (5) (No change.)

(6) STEM. Students who entered high school in the 2022-2023 school year or later may earn a STEM endorsement by completing the requirements specified in subsection (e) of this section, including Algebra II, chemistry, and physics or Physics for Engineering [Principles of Technology] and:

(A) - (D) (No change.)

(7) - (8) (No change.)

(g) (No change.)

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Cristina De La Fuente-Valadez
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Texas Education Agency
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CHAPTER 111. TEXAS ESSENTIAL KNOWLEDGE AND SKILLS FOR MATHEMATICS

SUBCHAPTER B. MIDDLE SCHOOL

19 TAC §§111.29 - 111.31

The State Board of Education (SBOE) proposes new §§111.29 - 111.31, concerning middle school Texas Essential Knowledge and Skills (TEKS) for mathematics. The proposed new sections would add TEKS to support middle school advanced mathematics programs designed to enable students to enroll in Algebra I in Grade 8.

BACKGROUND INFORMATION AND JUSTIFICATION: The board received training from a standards writing advisor at the July 2014 meeting. The standards writing advisor provided additional training to Texas Education Agency (TEA) staff in October 2014 to support future facilitation of the TEKS review committees.

In 2017, the SBOE significantly revised the process for the review and revision of the TEKS. At the November 2018 meeting, the SBOE approved updates to the 2017 TEKS review and revision process to better clarify the process. The updated process was used for the review of the physical education, health education, and science TEKS.

At the January 2021 meeting, the board held a work session to discuss the timeline for the TEKS review and revision process and associated activities, including updates to State Board for Educator Certification teacher assignment rules and certification exams, adoption of instructional materials, and the completion of the Texas Resource Review. The board discussed potential adjustments to the TEKS and Instructional Materials Review and Adoption Schedule. At the April 2021 meeting, the SBOE approved revisions to the TEKS and Instructional Materials Review and Adoption Schedule.

At the April 2023 SBOE meeting, the board discussed and approved changes to the TEKS review process, including approving a process for selecting work group members.

At the April 2024 meeting, TEA staff shared an overview of upcoming interrelated needs for TEKS review and revision and instructional materials review and approval (IMRA) and identified two needs related to mathematics, including options for instructional materials for accelerated learning and establishing TEKS to support middle school advanced mathematics pathways. At the June 2024 meeting, the board approved moving forward with the establishment of TEKS for middle school advanced mathematics and inclusion of advanced mathematics in a future IMRA process.

Applications to serve on the middle school advanced mathematics TEKS work group were collected by TEA in July and August 2024. TEA provided SBOE members with the applications for approval to serve on the work group in late August.

At the September 2024 SBOE meeting, the board directed the work group to present two models for middle school advanced mathematics TEKS. One model was to be based on the importance of keeping the Grade 6 TEKS similar to the current TEKS and would combine the Grades 7 and 8 TEKS into Grade 7. The SBOE gave the work group leeway to analyze models from Barbers Hill Independent School District (ISD), Tomball ISD, and other school districts to develop recommendations for the second model. Additionally, the SBOE directed the work group to recommend one of the two models for the SBOE's further consideration. Work groups convened for two face-to-face meetings to develop recommendations for the proposed TEKS for middle school advanced mathematics in October.

A public hearing was conducted and a discussion item regarding TEKS for middle school advanced mathematics was presented to the Committee of the Full Board at the November 2024 SBOE meeting. At that time, the SBOE selected the second model as the plan for the middle school advanced mathematics programs. The work group met in December 2024 to finalize its recommendations for the second model.

The SBOE approved the proposed new rules for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect (2025-2029), there are no fiscal implications to the state. However, there was a cost to the state of approximately $35,000 to convene work group members who traveled to Austin to draft recommendations for the middle school advanced mathematics TEKS. In addition, there will be implications for TEA if the state develops professional development to help teachers and administrators understand the revised TEKS. Any professional development that is created would be based on whether TEA received an appropriation for professional development in the next biennium.

There may be fiscal implications for school districts and charter schools to implement the proposed new TEKS, which may include the need for professional development and revisions to district-developed databases, curriculum, and scope and sequence documents. Since curriculum and instruction decisions are made at the local district level, it is difficult to estimate the fiscal impact on any given district.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: TEA staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would expand an existing regulation by adding new TEKS for middle school advanced mathematics.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not expand, limit, or repeal an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to provide TEKS to support middle school advanced mathematics programs designed to enable students to enroll in Algebra I in Grade 8. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all stu-

dents should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments; and TEC, §28.029, which requires school districts and open-enrollment charter schools to develop an advanced mathematics program for middle school students that is designed to enable those students to enroll in Algebra I in Grade 8.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §§7.102(c)(4), 28.002(a) and (c), and 28.029.

§111.29. Grade 6, Middle School Advanced Mathematics, Adopted 2025.

(a) Implementation. The provisions of this section may be implemented by school districts beginning with the 2025-2026 school year.

(b) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) To increase the number of students who complete advanced mathematics courses in high school, the middle school advanced mathematics courses are designed to enable students to complete Algebra I by the end of Grade 8.

(4) The primary focal areas in Grade 6, Middle School Advanced Mathematics are numeracy; proportionality; expressions, equations, and relationships; and data science. Students use concepts, algorithms, and properties of rational numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships, including number, geometry and measurement, and statistics. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students begin to develop a foundational understanding of functions. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. The use of technology, including graphing tools, is essential in middle school advanced mathematics courses to master algebra readiness skills by bridging conceptual understanding and procedural fluency.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Numeracy--foundations of rational numbers. The student applies mathematical process standards to represent and use rational numbers in a variety of forms. The student is expected to:

(A) classify sets and subsets using a visual representation such as a Venn diagram or a hierarchy to describe relationships between sets of rational numbers;

(B) identify a number, its opposite, and its absolute value;

(C) represent benchmark fractions and percents such as 1%, 10%, 25%, 33 1/3%, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers as proportional relationships;

(D) generate equivalent forms of fractions, decimals, and percents using real-world problems as proportional relationships, including problems that involve money;

(E) use equivalent fractions, decimals, and percents to show equal parts of the same whole as proportional relationships;

(F) locate, compare, and order integers and rational numbers using a number line;

(G) order a set of rational numbers arising from mathematical and real-world contexts; and

(H) use coordinate geometry to identify locations on a plane, including graphing points in all four quadrants using ordered pairs of rational numbers.

(3) Numeracy--operations with rational numbers. The student applies mathematical process standards to represent addition, subtraction, multiplication, and division while solving problems and justifying solutions. The student is expected to:

(A) recognize that dividing by a rational number and multiplying by its reciprocal result in equivalent values;

(B) determine, with and without computation, whether a quantity is increased or decreased when multiplied by a fraction, including values greater than or less than one;

(C) extend representations for division to include fraction notation such as a/b represents the same number as $a \div b$ where $b \neq 0$;

(D) represent integer operations with concrete models and connect the actions with the models to standardized algorithms;

(E) add, subtract, multiply, and divide integers fluently;

(F) add, subtract, multiply, and divide rational numbers;

(G) generate equivalent numerical expressions using order of operations, including whole number exponents and prime factorization;

(H) balance a check register that includes deposits, withdrawals, and transfers; and

(I) create and organize a financial assets and liabilities record and construct a net worth statement.

(4) Numeracy--applications of percents. The student applies mathematical process standards to solve problems involving percents as proportional relationships. The student is expected to:

(A) solve real-world problems to find the whole given a part and the percent, to find the part given the whole and the percent, and to find the percent given the part and the whole, including the use of concrete and pictorial models; and

(B) calculate the sales tax for a given purchase and calculate income tax for earned wages.

(5) Proportionality--foundations of ratios and rates. The student applies mathematical process standards to develop an understanding of proportional relationships in problem situations. The student is expected to:

(A) give examples of ratios as multiplicative comparisons of two quantities describing the same attribute;

(B) give examples of rates as the comparison by division of two quantities having different attributes, including rates as quotients;

(C) represent ratios and percents with concrete models, fractions, and decimals; and

(D) represent mathematical and real-world problems involving ratios and rates using scale factors, tables, graphs, and proportions.

(6) Proportionality--applications of ratios and rates. The student applies mathematical process standards to solve problems involving proportional relationships. The student is expected to:

(A) apply qualitative and quantitative reasoning to solve prediction and comparison of real-world problems involving ratios and rates;

(B) calculate unit rates from rates in mathematical and real-world problems; and

(C) convert within and between measurement systems, including the use of proportions and the use of unit rates.

(7) One-variable expressions, equations, and relationships--foundations of one-variable relationships. The student applies mathematical process standards to develop concepts of expressions and equations. The student is expected to:

(A) distinguish between expressions and equations verbally, numerically, and algebraically;

(B) determine if two expressions are equivalent using concrete models, pictorial models, and algebraic representations; and

(C) generate equivalent expressions using the properties of operations: inverse, identity, commutative, associative, and distributive properties.

(8) One-variable expressions, equations, and relationships--applications of one-variable relationships. The student applies mathematical process standards to use equations and inequalities to represent situations and solve problems. The student is expected to:

(A) write one-variable, one- and two-step equations and inequalities to represent constraints or conditions within problems;

(B) write corresponding real-world problems given one-variable, one- and two-step equations or inequalities;

(C) represent solutions for one-variable, one- and two-step equations and inequalities on number lines;

(D) model and solve one-variable, one-step equations and inequalities that represent problems, including geometric concepts;

(E) model and solve one-variable, two-step equations and inequalities; and

(F) determine if the given value(s) make(s) one-variable, one- and two-step equations and inequalities true.

(9) Two-variable equations and relationships--foundations of linear relationships. The student applies mathematical process standards to use multiple representations to describe algebraic relationships. The student is expected to:

(A) identify independent and dependent quantities from tables and graphs;

(B) write an equation that represents the relationship between independent and dependent quantities from a table;

(C) represent a given situation using verbal descriptions, tables, graphs, and equations in the form $y = kx$ or $y = x + b$; and

(D) compare two rules verbally, numerically, graphically, and symbolically in the form of $y = ax$ or $y = x + a$ in order to differentiate between additive and multiplicative relationships.

(10) Two-variable equations and relationships--applications of proportional relationships. The student applies mathematical process standards to represent and solve problems involving proportional relationships. The student is expected to represent constant rates

of change in mathematical and real-world problems given pictorial, tabular, verbal, numeric, graphical, and algebraic representations, including $d = rt$.

(11) Geometric expressions, equations, and relationships--foundations of geometric concepts equations. The student applies mathematical process standards to use geometry to represent relationships. The student is expected to:

(A) model area formulas for parallelograms, trapezoids, and triangles by decomposing and rearranging parts of these shapes; and

(B) write equations that represent problems related to the area of rectangles, parallelograms, trapezoids, and triangles and volume of right rectangular prisms where dimensions are positive rational numbers.

(12) Geometric expressions, equations, and relationships--applications of geometric concepts. The student applies mathematical process standards to use geometry to represent relationships and solve problems. The student is expected to:

(A) extend previous knowledge of triangles and their properties to include the sum of angles of a triangle, the relationship between the lengths of sides and measures of angles in a triangle, and determining when three lengths form a triangle;

(B) determine solutions for problems involving the area of rectangles, parallelograms, trapezoids, and triangles where dimensions are positive rational numbers;

(C) solve problems involving the volume of right rectangular prisms and triangular prisms; and

(D) write and solve equations using geometry concepts, including the sum of the angles in a triangle, and angle relationships.

(13) Data science--foundations of measurement and data. The student applies mathematical process standards to represent and analyze data. The student is expected to:

(A) distinguish between situations that yield data with and without variability; and

(B) represent numeric data graphically, including dot plots, stem-and-leaf plots, histograms, and box plots.

(14) Data science--applications of measurement and data. The student applies mathematical process standards to use numerical or graphical representations to analyze and solve problems. The student is expected to:

(A) use the graphical representation of numeric data to describe the center, spread, and shape of the data distribution;

(B) summarize numeric data with numerical summaries, including the mean and median (measures of center) and the range and interquartile range (IQR) (measures of spread), and use these summaries to describe the center, spread, and shape of the data distribution;

(C) interpret numeric data summarized in dot plots, stem-and-leaf plots, histograms, and box plots;

(D) solve problems using data represented in bar graphs, dot plots, and circle graphs, including part-to-whole and part-to-part comparisons and equivalents;

(E) compare two groups of numeric data using comparative dot plots or box plots by comparing their shapes, centers, and spreads; and

(F) summarize categorical data with numerical and graphical summaries, including the mode, the percent of values in each category (relative frequency table), and the percent bar graph, and use these summaries to describe the data distribution.

(15) Personal financial literacy--money management. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:

(A) compare the features and costs of a checking account and a debit card offered by different local financial institutions;

(B) identify and explain the advantages and disadvantages of different payment methods, including distinguishing between debit cards and credit cards;

(C) explain why it is important to establish a positive credit history;

(D) describe the information in a credit report and how long it is retained;

(E) describe the value of credit reports to borrowers and to lenders;

(F) explain various methods to pay for college, including through savings, grants, scholarships, student loans, and work-study; and

(G) compare the annual salary of several occupations requiring various levels of post-secondary education or vocational training and calculate the effects of the different annual salaries on lifetime income.

§111.30. Grade 7, Middle School Advanced Mathematics, Adopted 2025.

(a) Implementation. The provisions of this section may be implemented by school districts beginning with the 2025-2026 school year.

(b) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on computational thinking, mathematical fluency, and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, algorithms, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, computer programs, and language. Students will use mathe-

matical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) To increase the number of students who complete advanced mathematics courses in high school, the middle school advanced mathematics courses are designed to enable students to complete Algebra I by the end of Grade 8.

(4) The primary focal areas in Grade 7, Middle School Advanced Mathematics are numeracy; proportionality; expressions, equations, and relationships; and data science. Students use concepts, algorithms, and properties of real numbers to explore mathematical relationships and to describe increasingly complex situations. Students use concepts of proportionality to explore, develop, and communicate mathematical relationships, including number, geometry and measurement, and statistics and probability. Students use algebraic thinking to describe how a change in one quantity in a relationship results in a change in the other. Students connect verbal, numeric, graphic, and symbolic representations of relationships, including equations and inequalities. Students continue to develop a foundational understanding of functions. Students use geometric properties and relationships, as well as spatial reasoning, to model and analyze situations and solve problems. Students communicate information about geometric figures or situations by quantifying attributes, generalize procedures from measurement experiences, and use the procedures to solve problems. Students use appropriate statistics, representations of data, and reasoning to draw conclusions, evaluate arguments, and make recommendations. The use of technology, including graphing tools, is essential in middle school advanced mathematics courses to master algebra readiness skills by bridging conceptual understanding and procedural fluency.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Numeracy--foundations of real numbers. The student applies mathematical process standards to represent and use real numbers in a variety of forms. The student is expected to:

(A) extend previous knowledge of sets and subsets using a visual representation to describe relationships between sets of real numbers;

(B) approximate the value of an irrational number, including π and square roots of numbers less than 225, and locate that rational number approximation on a number line;

(C) convert between standard decimal notation and scientific notation; and

(D) order a set of real numbers arising from mathematical and real-world contexts.

(3) Numeracy--operations with rational numbers. The student applies mathematical process standards to add, subtract, multiply, and divide while solving problems and justifying solutions. The student is expected to:

(A) add, subtract, multiply, and divide rational numbers fluently; and

(B) apply and extend previous understandings of operations to solve problems using addition, subtraction, multiplication, and division of rational numbers.

(4) Numeracy--applications of percents. The student applies mathematical process standards to represent and solve problems involving percents as proportional relationships. The student is expected to:

(A) solve problems involving ratios, rates, and percents, including multi-step problems involving percent increase and percent decrease, and financial literacy problems;

(B) calculate and compare simple interest and compound interest earnings;

(C) analyze and compare monetary incentives, including sales, rebates, and coupons;

(D) solve real-world problems comparing how interest rate and loan length affect the cost of credit;

(E) calculate the total cost of repaying a loan, including credit cards and easy access loans, under various rates of interest and over different periods using an online calculator;

(F) explain how small amounts of money invested regularly, including money saved for college and retirement, grow over time; and

(G) estimate the cost of a two-year and four-year college education, including family contribution, and devise a periodic savings plan for accumulating the money needed to contribute to the total cost of attendance for at least the first year of college.

(5) Proportionality--geometric ratios. The student applies mathematical process standards to use geometry to describe or solve problems involving proportional relationships such as dilations. The student is expected to:

(A) describe π as the ratio of the circumference of a circle to its diameter;

(B) generalize the critical attributes of similarity, including ratios within and between similar shapes;

(C) solve mathematical and real-world problems involving similar shape and scale drawings;

(D) compare and contrast the attributes of a shape and its dilation(s) on a coordinate plane; and

(E) use an algebraic representation to explain the effect of a given positive rational scale factor applied to two-dimensional figures on a coordinate plane with the origin as the center of dilation.

(6) Proportionality--probability. The student applies mathematical process standards to use probability and statistics to describe or solve problems involving proportional relationships. The student is expected to:

(A) represent sample spaces for simple and compound events using lists and tree diagrams;

(B) select and use different simulations to represent simple and compound events with and without technology;

(C) make predictions and determine solutions using experimental data for simple and compound events;

(D) make predictions and determine solutions using theoretical probability for simple and compound events;

(E) find the probabilities of a simple event and its complement and describe the relationship between the two;

(F) solve problems using qualitative and quantitative predictions and comparisons from simple experiments; and

(G) determine experimental and theoretical probabilities related to simple and compound events using data and sample spaces.

(7) One-variable expressions, equations, and relationships--applications of one-variable relationships. The student applies mathematical process standards to use one-variable equations or inequalities in problem situations. The student is expected to:

(A) represent solutions for one-variable, two-step inequalities on number lines;

(B) model and solve one-variable, two-step inequalities;

(C) write one-variable equations or inequalities with variables on both sides that represent problems using rational number coefficients and constants;

(D) write a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides of the equal sign using rational number coefficients and constants; and

(E) model and solve one-variable equations with variables on both sides of the equal sign that represent mathematical and real-world problems using rational number coefficients and constants.

(8) Two-variable equations and relationships--foundations of linear relationships. The student applies mathematical process standards to use proportional and non-proportional relationships to develop foundational concepts of functions. The student is expected to:

(A) determine the constant of proportionality ($k = y/x$) within mathematical and real-world problems;

(B) distinguish between proportional and non-proportional situations using tables, graphs, and equations in the form $y = kx$ or $y = mx + b$, where $b \neq 0$; and

(C) identify examples of proportional and non-proportional functions that arise from mathematical and real-world problems.

(9) Two-variable equations and relationships--applications of linear relationships. The student applies mathematical process standards to represent linear relationships using multiple representations. The student is expected to represent linear proportional and non-proportional relationships using verbal descriptions, tables, graphs, and equations that simplify to the form $y = mx + b$.

(10) Geometric expressions, equations, and relationships--foundations of geometric concepts. The student applies mathematical process standards to develop geometric relationships and solve problems. The student is expected to:

(A) use models to determine the approximate formulas for the circumference and area of a circle and connect the models to the actual formulas;

(B) solve problems involving the lateral and total surface area of a rectangular prism, rectangular pyramid, triangular prism, and triangular pyramid by determining the area of the shape's net;

(C) describe the volume formula $V = Bh$ of a cylinder in terms of its base area and its height;

(D) model the relationship between the volume of a rectangular prism and a rectangular pyramid having both congruent bases and heights and connect that relationship to the formulas;

(E) explain verbally and symbolically the relationship between the volume of a triangular prism and a triangular pyramid having both congruent bases and heights and connect that relationship to the formulas;

(F) model the relationship between the volume of a cylinder and a cone having both congruent bases and heights and connect that relationship to the formulas;

(G) use models and diagrams to explain the Pythagorean theorem; and

(H) use informal arguments to establish facts about the angle sum and exterior angle of triangles, the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

(11) Geometric expressions, equations, and relationships--applications of geometric concepts. The student applies mathematical process standards to solve geometric problems. The student is expected to:

(A) determine the circumference and area of circles;

(B) determine the area of composite figures containing combinations of rectangles, squares, parallelograms, trapezoids, triangles, semicircles, and quarter circles;

(C) use previous knowledge of surface area to make connections to the formulas for lateral and total surface area and determine solutions for problems involving rectangular prisms, triangular prisms, and cylinders;

(D) solve problems involving the volume of rectangular pyramids and triangular pyramids;

(E) solve problems involving the volume of cylinders, cones, and spheres;

(F) use the Pythagorean theorem and its converse to solve problems; and

(G) determine the distance between two points on a coordinate plane using the Pythagorean theorem.

(12) Geometric expressions, equations, and relationships--transformations. The student applies mathematical process standards to develop transformational geometry concepts. The student is expected to:

(A) generalize the properties of orientation and congruence of rotations, reflections, translations, and dilations of two-dimensional shapes on a coordinate plane;

(B) differentiate between transformations that preserve congruence and those that do not;

(C) explain the effect of translations, reflections over the *x*- or *y*-axis, and rotations limited to 90°, 180°, 270°, and 360° as applied to two-dimensional shapes on a coordinate plane using an algebraic representation; and

(D) model the effect on linear and area measurements of dilated two-dimensional shapes.

(13) Data science--applications of measurement and data. The student applies mathematical process standards to use statistical representations and procedures to analyze and describe data. The student is expected to:

(A) use data from a random sample to make inferences about a population;

(B) compare two populations based on data in random samples from these populations, including informal comparative inferences about differences between the two populations;

(C) simulate generating random samples of the same size from a population with known characteristics to develop the notion of a random sample being representative of the population from which it was selected; and

(D) determine the mean absolute deviation and use this quantity as a measure of the average distance data are from the mean using a data set of no more than 10 data points.

(14) Personal financial literacy--money management. The student applies mathematical process standards to develop an economic way of thinking and problem solving useful in one's life as a knowledgeable consumer and investor. The student is expected to:

(A) identify the components of a personal budget, including income; planned savings for college, retirement, and emergencies; taxes; and fixed and variable expenses, and calculate what percentage each category comprises of the total budget;

(B) use a family budget estimator to determine the minimum household budget and average hourly wage needed for a family to meet its basic needs in the student's city or another large city nearby; and

(C) analyze situations to determine if they represent financially responsible decisions and identify the benefits of financial responsibility and the costs of financial irresponsibility.

§111.31. Grade 8, Middle School Advanced Mathematics, Algebra (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section may be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. Students shall be awarded one credit that satisfies the Algebra I requirement for high school graduation. This course is recommended for students in Grade 8. Prerequisite: Middle School Advanced Mathematics, Grade 7 or Mathematics, Grade 8.

(c) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, number sense, and generalization and abstraction to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) To increase the number of students who complete advanced mathematics courses in high school, the middle school advanced mathematics courses are designed to enable students to complete Algebra I by the end of Grade 8.

(4) In Grade 8, Middle School Advanced Mathematics, Algebra, students will build on the knowledge and skills for mathematics in Middle School Advanced Mathematics, Grades 6 and 7, which provide a foundation in linear relationships, number and operations, and proportionality. Students will study linear, quadratic, and exponential functions and their related transformations, equations, and associated solutions. Students will connect functions and their associated solutions in both mathematical and real-world situations. Students will use technology to collect and explore data and analyze statistical relationships. In addition, students will study polynomials of degree one and two, radical expressions, sequences, and laws of exponents. Students will generate and solve linear systems with two equations and two variables and will create new functions through transformations. The use of technology, including graphing tools, is essential in Middle School Advanced Mathematics, Algebra to bridge conceptual understanding and procedural fluency.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:

(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities;

(B) write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points;

(C) write linear equations in two variables given a table of values, a graph, and a verbal description;

(D) write and solve equations involving direct variation;

(E) write the equation of a line that contains a given point and is parallel to a given line;

(F) write the equation of a line that contains a given point and is perpendicular to a given line;

(G) write an equation of a line that is parallel or perpendicular to the *x*- or *y*- axis and determine whether the slope of the line is zero or undefined;

(H) write linear inequalities in two variables given a table of values, a graph, and a verbal description; and

(I) write systems of two linear equations given a table of values, a graph, and a verbal description.

(3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. The student is expected to:

(A) use similar right triangles to develop an understanding that slope, *m*, given as the rate comparing the change in *y*-values to the change in *x*-values, $(y2 - y1)/(x2 - x1)$, is the same for any two points $(x1, y1)$ and $(x2, y2)$ on the same line;

(B) graph proportional relationships, interpreting the unit rate as the slope of the line that models the relationship;

(C) determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$;

(D) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems;

(E) use data from a table or graph to determine the rate of change or slope and *y*-intercept in mathematical and real-world problems;

(F) graph linear functions on the coordinate plane and identify key features, including *x*-intercept, *y*-intercept, zeros, and slope, in mathematical and real-world problems;

(G) graph the solution set of linear inequalities in two variables on the coordinate plane;

(H) determine the effects on the graph of the parent function $f(x) = x$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, and $f(bx)$ for specific values of *a*, *b*, *c*, and *d*;

(I) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist;

(J) estimate graphically the solutions to systems of two linear equations with two variables in real-world problems; and

(K) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane.

(4) Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. The student is expected to:

(A) construct a scatterplot and describe the observed data to address questions of association such as linear, non-linear, and no association between bivariate data;

(B) contrast bivariate sets of data that suggest a linear relationship with bivariate sets of data that do not suggest a linear relationship from a graphical representation;

(C) use a trend line that approximates the linear relationship between bivariate sets of data to make predictions;

(D) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association;

(E) compare and contrast association and causation in real-world problems; and

(F) write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(5) Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The student is expected to:

(A) solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides;

(B) solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides; and

(C) solve systems of two linear equations with two variables for mathematical and real-world problems.

(6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:

(A) determine the domain and range of quadratic functions and represent the domain and range using inequalities;

(B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$); and

(C) write quadratic functions when given real solutions and graphs of their related equations.

(7) Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. The student is expected to:

(A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry;

(B) describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions; and

(C) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, and $f(bx)$ for specific values of a, b, c, and d.

(8) Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula; and

(B) write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) determine the domain and range of exponential functions of the form $f(x) = ab^x$ and represent the domain and range using inequalities;

(B) interpret the meaning of the values of a and b in exponential functions of the form $f(x) = ab^x$ in real-world problems;

(C) write exponential functions in the form $f(x) = ab^x$ (where b is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay;

(D) graph exponential functions that model growth and decay and identify key features, including y-intercept and asymptote, in mathematical and real-world problems; and

(E) write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.

(10) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. The student is expected to:

(A) add and subtract polynomials of degree one and degree two;

(B) multiply polynomials of degree one and degree two;

(C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend;

(D) rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property;

(E) factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two; and

(F) decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial.

(11) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. The student is expected to:

(A) simplify numerical radical expressions involving square roots; and

(B) simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents.

(12) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:

(A) identify functions using sets of ordered pairs and mappings;

(B) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function;

(C) evaluate functions, expressed in function notation, given one or more elements in their domains;

(D) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes;

(E) write a formula for the n^{th} term of arithmetic and geometric sequences, given the value of several of their terms; and

(F) solve mathematic and scientific formulas, and other literal equations, for a specified variable.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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CHAPTER 127. TEXAS ESSENTIAL KNOWLEDGE AND SKILLS FOR CAREER DEVELOPMENT AND CAREER AND TECHNICAL EDUCATION

(Editor's note: In accordance with Texas Government Code, §2002.014, which permits the omission of material which is "cumbersome, expensive, or otherwise inexpedient," the Figure: 19 TAC Chapter 127 - Preamble is not included in the print version of the Texas Register. The figure is available in the on-line version of the February 28, 2025, issue of the Texas Register.)

The State Board of Education (SBOE) proposes the repeal of §§127.277, 127.278, 127.314, 127.316 - 127.321, 127.323 - 127.326, 127.403, 127.410, 127.413 - 127.415, 127.417 - 127.433, 127.469 - 127.472, 127.474 - 127.480, 127.482, 127.625 - 127.632, 127.634 - 127.648, 127.652, 127.745 - 127.750, 127.754, 127.758 - 127.760, 127.766 - 127.768, 127.771 - 127.776, and 127.778 - 127.796, concerning Texas Essential Knowledge and Skills (TEKS) for career development and career and technical education (CTE). The proposed repeals would move some existing courses within 19 TAC Chapter 127 in order to avoid confusion and make the TEKS easier to locate.

BACKGROUND INFORMATION AND JUSTIFICATION: In accordance with statutory requirements that the SBOE identify by rule the essential knowledge and skills of each subject in the required curriculum, the SBOE follows a board-approved cycle to review and revise the essential knowledge and skills for each subject.

The TEKS for courses associated with 14 CTE career clusters are codified by subchapter in 19 TAC Chapters 127 and 130. In December 2020, the SBOE began initial steps to prepare for the review and revision of CTE courses in programs of study for the education and training; health science; and science, technology, engineering, and mathematics career clusters. Two additional courses eligible to satisfy a graduation requirement in science were also part of the review. The board approved for second reading and final adoption new TEKS for these courses in November 2021 and January, April, and June 2022.

At the November 2023 SBOE meeting, the board approved new CTE TEKS in Chapter 127 for courses in career preparation and entrepreneurship, which became effective February 13, 2024, and were implemented beginning in the 2024-2025 school year. At the April 2024 meeting, the board approved new CTE TEKS in Chapter 127 for courses in agribusiness, animal science, plant science, and aviation maintenance and for two CTE courses that can satisfy a graduation requirement in science that will be implemented beginning in the 2025-2026 school year.

Due to the current structure of Chapter 130, there are not enough sections to add new CTE courses under consideration in their assigned subchapters. To accommodate the addition of new and future courses, the board began the process of moving the CTE TEKS from Chapter 130 to Chapter 127 in order to keep all the TEKS together in administrative rule and avoid confusion.

In a separate rule action, all remaining courses in Chapter 130 are being repealed to move them to Chapter 127. As a result, current subchapters in Chapter 127 need to be reorganized and assigned new subchapters within the same chapter. The related implementation sections would be repealed and not re-proposed. Instead, implementation information would be added to each individual course. Additionally, each new course would include the level for the course in a CTE program of study, if applicable, and language would be added to encourage students to participate in extended learning experiences like organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

The following figure provides a crosswalk between the current TEKS in Chapter 127 and the new location of those TEKS in Chapter 127. The proposed new sections can be found in the Proposed Rules section of this issue of the *Texas Register*.

Figure: 19 TAC Chapter 127 - Preamble

The SBOE approved the proposed repeals for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect, there are no additional costs to state or local government, including school districts and open-enrollment charter schools, required to comply with the proposal.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: Texas Education Agency (TEA) staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would repeal existing regulations by transferring some existing CTE TEKS within Chapter 127 to new locations in Chapter 127.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not create a new regulation; would not expand or limit an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to improve access to and organization of the CTE TEKS and avoid confusion regarding the revised TEKS. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

SUBCHAPTER F. BUSINESS, MARKETING, AND FINANCE

19 TAC §127.277, §127.278

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.277. Practicum in Entrepreneurship (Two Credits), Adopted 2023.

§127.278. Extended Practicum in Entrepreneurship (One Credit), Adopted 2023.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER G. EDUCATION AND TRAINING

19 TAC §§127.314, 127.316 - 127.321, 127.323 - 127.326

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.314. Extended Practicum in Education and Training (One Credit), Adopted 2015.

§127.316. Principles of Education and Training (One Credit), Adopted 2021.

§127.317. Child Development (One Credit), Adopted 2021.

§127.318. Child Guidance (Two Credits), Adopted 2021.

§127.319. Child Development Associate Foundations (One Credit), Adopted 2021.

§127.320. Practicum in Early Learning (Two Credits), Adopted 2021.

§127.321. Extended Practicum in Early Learning (One Credit), Adopted 2021.

§127.323. Human Growth and Development (One Credit), Adopted 2021.

§127.324. Communication and Technology in Education (One Credit), Adopted 2021.

§127.325. Instructional Practices (Two Credits), Adopted 2021.

§127.326. Practicum in Education and Training (Two Credits), Adopted 2021.

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SUBCHAPTER I. HEALTH SCIENCE

19 TAC §§127.403, 127.410, 127.413 - 127.415, 127.417 - 127.433

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.403. Principles of Health Science (One Credit), Adopted 2015.

§127.410. Mathematics for Medical Professionals (One Credit), Adopted 2015.

§127.413. Health Science Clinical (One Credit), Adopted 2015.

§127.414. Practicum in Health Science (Two Credits), Adopted 2015.

§127.415. Extended Practicum in Health Science (One Credit), Adopted 2015.

§127.417. Medical Terminology (One Credit), Adopted 2021.

§127.418. Health Informatics (One Credit), Adopted 2021.

§127.419. Healthcare Administration and Management (One Credit), Adopted 2021.

§127.420. World Health and Emerging Technologies (One Credit), Adopted 2021.

§127.421. Medical Billing and Coding (One Credit), Adopted 2021.

§127.422. Health Science Theory (One Credit), Adopted 2021.

§127.423. Anatomy and Physiology (One Credit), Adopted 2021.

§127.424. Pathophysiology (One Credit), Adopted 2021.

§127.425. Pharmacy I (One Credit), Adopted 2021.

§127.426. Pharmacy II (Two Credits), Adopted 2021.

§127.427. Medical Assistant (One Credit), Adopted 2021.

§127.428. Pharmacology (One Credit), Adopted 2021.

§127.429. Respiratory Therapy I (One Credit), Adopted 2021.

§127.430. Respiratory Therapy II (One Credit), Adopted 2021.

§127.431. Leadership and Management in Nursing (One Credit), Adopted 2021.

§127.432. Practicum in Nursing (Two Credits), Adopted 2021.

§127.433. Medical Microbiology (One Credit), Adopted 2021.

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SUBCHAPTER J. HOSPITALITY AND TOURISM

19 TAC §§127.469 - 127.472, 127.474 - 127.480, 127.482

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.469. Principles of Hospitality and Tourism (One Credit), Adopted 2015.

§127.470. Introduction to Culinary Arts (One Credit), Adopted 2015.

§127.471. Culinary Arts (Two Credits), Adopted 2015.

§127.472. Advanced Culinary Arts (Two Credits), Adopted 2015.

§127.474. Practicum in Culinary Arts (Two Credits), Adopted 2015.

§127.475. Travel and Tourism Management (One Credit), Adopted 2015.

§127.476. Hotel Management (One Credit), Adopted 2015.

§127.477. Hospitality Services (Two Credits), Adopted 2015.

§127.478. Practicum in Hospitality Services (Two Credits), Adopted 2015.

§127.479. Extended Practicum in Culinary Arts (One Credit), Adopted 2015.

§127.480. Extended Practicum in Hospitality Services (One Credit), Adopted 2015.

§127.482. Food Science (One Credit), Adopted 2021.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER M. LAW AND PUBLIC SERVICE

19 TAC §§127.625 - 127.632, 127.634 - 127.648, 127.652

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all

students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.625. Implementation of Texas Essential Knowledge and Skills for Law, Public Safety, Corrections, and Security, Adopted 2015.

§127.626. Principles of Law, Public Safety, Corrections, and Security (One Credit), Adopted 2015.

§127.627. Correctional Services (One Credit), Adopted 2015.

§127.628. Firefighter I (Two Credits), Adopted 2015.

§127.629. Firefighter II (Three Credits), Adopted 2015.

§127.630. Law Enforcement I (One Credit), Adopted 2015.

§127.631. Law Enforcement II (One Credit), Adopted 2015.

§127.632. Criminal Investigation (One Credit), Adopted 2015.

§127.634. Court Systems and Practices (One Credit), Adopted 2015.

§127.635. Federal Law Enforcement and Protective Services (One Credit), Adopted 2015.

§127.636. Practicum in Law, Public Safety, Corrections, and Security (Two Credits), Adopted 2015.

§127.637. Extended Practicum in Law, Public Safety, Corrections, and Security (One Credit), Adopted 2015.

§127.638. Implementation of Texas Essential Knowledge and Skills for Government and Public Administration, Adopted 2015.

§127.639. Principles of Government and Public Administration (One Credit), Adopted 2015.

§127.640. Political Science I (One Credit), Adopted 2015.

§127.641. Political Science II (One Credit), Adopted 2015.

§127.642. Foreign Service and Diplomacy (One Credit), Adopted 2015.

§127.643. Planning and Governance (One Credit), Adopted 2015.

§127.644. National Security (One Credit), Adopted 2015.

§127.645. Public Management and Administration (One Credit), Adopted 2015.

§127.646. Revenue, Taxation, and Regulation (One Credit), Adopted 2015.

§127.647. Practicum in Local, State, and Federal Government (Two Credits), Adopted 2015.

§127.648. Extended Practicum in Local, State, and Federal Government (One Credit), Adopted 2015.

§127.652. Forensic Science (One Credit), Adopted 2021.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER O. SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS

19 TAC §§127.745 - 127.750, 127.754, 127.758 - 127.760, 127.766 - 127.768, 127.771 - 127.776, 127.778 - 127.796

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.745. Principles of Technology (One Credit), Adopted 2015.

§127.746. AC/DC Electronics (One Credit), Adopted 2015.

§127.747. Solid State Electronics (One Credit), Adopted 2015.

§127.748. Digital Electronics (One Credit), Adopted 2015.

§127.749. Robotics I (One Credit), Adopted 2015.

§127.750. Robotics II (One Credit), Adopted 2015.

§127.754. Engineering Mathematics (One Credit), Adopted 2015.

§127.758. Scientific Research and Design (One Credit), Adopted 2015.

§127.759. Practicum in Science, Technology, Engineering, and Mathematics (Two Credits), Adopted 2015.

§127.760. Extended Practicum in Science, Technology, Engineering, and Mathematics (One Credit), Adopted 2015.

§127.766. Discrete Mathematics for Computer Science (One Credit), Beginning with School Year 2012-2013.

§127.767. Game Programming and Design (One Credit).

§127.768. Mobile Application Development (One Credit).

§127.771. Advanced Placement (AP) Computer Science A (Two Credits).

§127.772. Advanced Placement (AP) Computer Science Principles (One Credit).

§127.773. International Baccalaureate (IB) Computer Science Standard Level (Two Credits)

§127.774. International Baccalaureate (IB) Computer Science Higher Level (Two Credits).

§127.775. International Baccalaureate (IB) Information Technology in a Global Society Standard Level (Two Credits).

§127.776. International Baccalaureate (IB) Information Technology in a Global Society Higher Level (Two Credits).

§127.778. Principles of Bioscience (One Credit), Adopted 2021.

§127.779. Biotechnology I (One Credit), Adopted 2021.

§127.780. Biotechnology II (One Credit), Adopted 2021.

§127.781. Principles of Applied Engineering (One Credit), Adopted 2021.

§127.782. Engineering Science (One Credit), Adopted 2021.

§127.783. Engineering Design and Presentation I (One Credit), Adopted 2022.

§127.784. Engineering Design and Presentation II (Two Credits), Adopted 2022.

§127.785. Engineering Design and Problem Solving (One Credit), Adopted 2021.

§127.786. Introduction to Computer-Aided Design and Drafting (One Credit), Adopted 2021.

§127.787. Intermediate Computer-Aided Design and Drafting (One Credit), Adopted 2021.

§127.788. Fundamentals of Computer Science (One Credit), Adopted 2022.

§127.789. Computer Science I (One Credit), Adopted 2022.

§127.790. Computer Science II (One Credit), Adopted 2022.

§127.791. Computer Science III (One Credit), Adopted 2022.

§127.792. Foundations of Cybersecurity (One Credit), Adopted 2022.

§127.793. Digital Forensics (One Credit), Adopted 2022.

§127.794. Cybersecurity Capstone (One Credit), Adopted 2022.

§127.795. Physics For Engineering (One Credit), Adopted 2024.

§127.796. Scientific Research and Design (One Credit), Adopted 2024.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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CHAPTER 127. TEXAS ESSENTIAL KNOWLEDGE AND SKILLS FOR CAREER DEVELOPMENT AND CAREER AND TECHNICAL EDUCATION

(Editor's note: In accordance with Texas Government Code, §2002.014, which permits the omission of material which is "cumbersome, expensive, or otherwise inexpedient," the figure in the preamble is not included in the print version of the Texas Register. The figure is available in the on-line version of the February 28, 2025, issue of the Texas Register.)

The State Board of Education (SBOE) proposes new §§127.18, 127.31 - 127.44, 127.85, 127.94 - 127.114, 127.145 - 127.154, 127.160 - 127.193, 127.224 - 127.235, 127.241 - 127.260, 127.264 - 127.266, 127.268, 127.294 - 127.300, 127.309 - 127.315, 127.343 - 127.346, 127.351 - 127.357, 127.391 - 127.401, 127.461, 127.462, 127.474 - 127.493, 127.553 - 127.555, 127.561 - 127.568, 127.600 - 127.603, 127.611 - 127.622, 127.665, 127.666, 127.671 - 127.688, 127.720 - 127.727, 127.735 - 127.738, 127.746 - 127.751, 127.758 - 127.769, 127.800 - 127.803, 127.810 - 127.823, 127.865, 127.866, 127.871 - 127.886, and 127.921 - 127.924, concerning Texas Essential Knowledge and Skills (TEKS) for career development and career and technical education (CTE). The proposed new sections would add existing CTE TEKS from 19 TAC Chapters 127 and 130 that are proposed for repeal to ensure that all CTE TEKS are in the same chapter in administrative rule and easier to locate.

BACKGROUND INFORMATION AND JUSTIFICATION: In accordance with statutory requirements that the SBOE identify by rule the essential knowledge and skills of each subject in the required curriculum, the SBOE follows a board-approved cycle to review and revise the essential knowledge and skills for each subject.

The TEKS for courses associated with 14 CTE career clusters are codified by subchapter in 19 TAC Chapters 127 and 130. In December 2020, the SBOE began initial steps to prepare for the review and revision of CTE courses in programs of study for the education and training; health science; and science, technology, engineering, and mathematics career clusters. Two additional courses eligible to satisfy a graduation requirement in science were also part of the review. The board approved for second reading and final adoption new TEKS for these courses in November 2021 and January, April, and June 2022.

At the November 2023 SBOE meeting, the board approved new CTE TEKS in Chapter 127 for courses in career preparation and entrepreneurship, which became effective February 13, 2024, and were implemented beginning in the 2024-2025 school year. At the April 2024 meeting, the board approved new CTE TEKS in Chapter 127 for courses in agribusiness, animal science, plant science, and aviation maintenance and for two CTE courses that can satisfy a graduation requirement in science that will be implemented beginning in the 2025-2026 school year.

Due to the current structure of Chapter 130, there are not enough sections to add new CTE courses under consideration in their assigned subchapters. To accommodate the addition of new and future courses, the board began the process of moving the CTE TEKS from Chapter 130 to Chapter 127 in order to keep all the TEKS together in administrative rule and avoid confusion.

In separate rule actions, all remaining courses in Chapter 130 are being repealed to move them to Chapter 127, and some existing courses in Chapter 127 are being repealed to reorganize them and assign new subchapters within the same chapter. The proposed repeals can be found in the Proposed Rules section of this issue of the *Texas Register*.

The proposed new sections reflect existing courses from Chapters 127 and 130. The related implementation sections would be repealed and not re-proposed. Instead, implementation information would be added to each individual course. Additionally, each new course would include the level for the course in a CTE program of study, if applicable, and language would be added to encourage students to participate in extended learning experiences like organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

The following figure provides a crosswalk between the current TEKS in Chapters 127 and 130 and the new location of those TEKS in Chapter 127.

Figure: 19 TAC Chapter 127 - Preamble

The SBOE approved the proposed new sections for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect, there are no additional costs to

state or local government, including school districts and open-enrollment charter schools, required to comply with the proposal.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: Texas Education Agency (TEA) staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would create new regulations by transferring existing CTE TEKS from Chapters 127 and 130 to new locations in Chapter 127.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not expand, limit, or repeal an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to improve access to and organization of the CTE TEKS and avoid confusion regarding the revised TEKS. There is no anticipated economic cost to persons who are required to comply with the proposal There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

SUBCHAPTER B. HIGH SCHOOL

19 TAC §127.18

STATUTORY AUTHORITY. The new section is proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new section implements Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.18. Scientific Research and Design (One Credit), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Biology, and one credit of the following: Applied Physics and Engineering, Chemistry, Integrated Physics and Chemistry (IPC), or Physics. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course. Students may take this course with different course content for a maximum of three credits.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Scientific Research and Design allows districts and schools flexibility to develop local curriculum to supplement a program of study or coherent sequence. The course has the components of any rigorous scientific or career and technical education (CTE) program of study, including problem identification, investigation design, data collection, data analysis, formulation, and presentation of conclusions. These components are integrated with the CTE emphasis of helping students gain entry-level employment in high-skill, high-wage jobs and/or continue their education.

(4) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific hypotheses and theories. Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have

been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide tools for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations, other organizations that foster leadership and career development in the profession such as student chapters of related professional associations, or practical, hands-on activities or experiences through which a learner interacts with industry professionals in a workplace, which may be an in-person, virtual, or simulated setting. Learners prepare for employment or advancement along a career pathway by completing purposeful tasks that develop academic, technical, and employability skills.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe and demonstrate how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) describe and demonstrate how to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as measurement and data collection tools, software, sensors, probes, microscopes, cameras, and glassware;

(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;

(F) organize quantitative and qualitative data using notebooks, journals, graphs, charts, tables, spreadsheets, and drawings and models;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors to investigate science, technology, engineering, and mathematics careers.

(6) The student develops a proposal that centers around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) establish a rationale and preliminary set of ideas for a research question or questions using organizational tools, collaboration, or research;

(B) perform a literature review and evaluate several examples related to the project;

(C) refine a research question by interacting with professionals in the field of study and document the conversations;

(D) distinguish between descriptive, comparative, or experimental research design methodologies;

(E) develop a research question or questions that are testable and measurable;

(F) justify in writing the significance and feasibility of the project;

(G) generate a materials list and propose a cost analysis; and

(H) use the citation style appropriate to the field of study throughout the documentation.

(7) The student formulates hypotheses to guide experimentation and data collection independently or in a team that centers around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) perform background research on the selected investigative problem;

(B) examine hypotheses generated to guide a research process by evaluating the merits and feasibility of the hypotheses; and

(C) identify the control, independent variable, and dependent variables within the research and justify the purpose of each.

(8) The student develops, implements, and collects data for their investigative designs that centers around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) write the procedure of the experimental design, including a schematic of the lab, materials, set up, ethical considerations, and safety protocols;

(B) conduct the experiment with the independent and dependent variables;

(C) acquire data using appropriate equipment and technology; and

(D) record observations as they occur within an investigation, including qualitative and quantitative observations such as journals, photographic evidence, logs, tables, and charts.

(9) The student organizes and evaluates qualitative and quantitative data obtained through experimentation that centers around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) manipulate data by constructing charts, data tables, or graphs using technology to organize information collected in an experiment;

(B) identify sources of random error and systematic error and differentiate between both types of error;

(C) report error of a set of measured data in various formats such as standard deviation and percent error; and

(D) analyze data using statistical methods to recognize patterns, trends, and proportional relationships.

(10) The student knows how to synthesize valid conclusions from qualitative and quantitative data that centers around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) justify conclusions that are supported by research data;

(B) consider and summarize alternative explanations for observations and results; and

(C) identify limitations within the research process and provide recommendations for additional research.

(11) The student communicates clearly and concisely to an audience of professionals conclusions that center around a scientific or engineering topic or problem within a specific program of study or area of interest. The student is expected to:

(A) develop a plan of action on how to present to a target audience;

(B) review artifacts used in the communication of the presentation for errors, grammar, professional standards, and citations;

(C) develop a professional collection or portfolio of work that includes artifacts such as a journal, proposal, written procedures, methodology, iterations, interviews and check ins with professionals, changes within the experiment, and photographic evidence;

(D) practice a professional presentation with peers and educators using a rubric to measure content, skill, and performance;

(E) incorporate feedback provided by a review panel to document for future improvements or changes; and

(F) communicate data analysis and experimental results of original findings of a research project clearly to an audience of professionals.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER C. AGRICULTURE, FOOD, AND NATURAL RESOURCES

19 TAC §§127.31 - 127.44, 127.85

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.31. Mathematical Applications in Agriculture, Food, and Natural Resources (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Algebra I. Recommended prerequisite: one credit from the courses in the Agriculture, Food, and Natural Resources Career Cluster. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) In Mathematical Applications in Agriculture, Food, and Natural Resources, students will apply knowledge and skills related to mathematics, including algebra, geometry, and data analysis in the context of agriculture, food, and natural resources. To prepare for careers in agriculture, food, and natural resources, students must acquire technical knowledge in the discipline as well as apply academic skills in mathematics. To prepare for success, students need opportunities to reinforce, apply, and transfer their knowledge and skills related to mathematics in a variety of contexts.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities;

(B) demonstrate competencies related to resources, information, interpersonal skills, and systems of operation;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, and legal responsibilities;

(E) demonstrate characteristics of good citizenship such as stewardship, advocacy, and community leadership; and

(F) research career topics using technology such as the Internet.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(4) The student performs mathematical calculations used in agriculture, food, and natural resources. The student is expected to:

(A) add, subtract, multiply, and divide whole numbers, fractions, and decimals in calculations related to agriculture, food, and natural resources;

(B) apply mathematical skills such as measurement, conversion, and data analysis needed for agriculture, food, and natural resources;

(C) find solutions to problems related to agriculture, food, and natural resources by calculating percentages and averages;

(D) convert between English and metric units;

(E) use scientific calculations to determine weight, volume, and linear measurements;

(F) solve word problems using ratios and dimensional analysis; and

(G) interpret data using tables, charts, and graphs.

(5) The student demonstrates mathematics knowledge and skills required to solve problems related to the agriculture, food, and natural resources industries. The student is expected to:

(A) demonstrate use of relational expressions such as equal to, not equal, greater than, and less than in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;

(B) apply statistical and data analysis to solve problems related to agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;

(C) analyze mathematical problem statements for missing or irrelevant data essential to agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;

(D) construct and analyze charts, tables, and graphs from functions and data generated in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems;

(E) analyze data using measures of central tendency when interpreting operational documents in agriculture, food, and natural resources industries such as agribusiness; animal; environmental service; food products and processing; natural resources; plant; and power, structural, and technical systems; and

(F) use mathematical operations and knowledge of relationships to solve problems such as the calculation of gallons of water from inches of rain, acres of ground water, liquid and gaseous volumes, and conversion of units; calculation of caloric value, parts per million of restricted ingredients, conversion of measurements, and U.S. Department of Agriculture (USDA) grades; estimation of wildlife populations and pulpwood yields; and calculation of mapping data inherent to systems of agriculture or agribusiness.

(6) The student demonstrates mathematical knowledge and skills required to solve problems related to agribusiness systems and related career opportunities. The student is expected to:

(A) use mathematical operations and knowledge of relationships to solve daily problems related to record keeping such as profit/loss statements, income statements, capital asset inventories, insurance, risk management, lease agreements, employee payroll and benefits, and investments and loan, real estate contract, or tax documentation in agribusiness systems;

(B) demonstrate knowledge of algebraic applications and linear and exponential functions related to concepts such as simple interest, compound interest, maturity value, tax rates, depreciation, production analysis, market trends, investments, and price determination in agribusiness systems;

(C) use statistical and data analysis, including counts, percentages, central tendency, and prediction, to evaluate agribusiness systems data such as demographic, production, consumption, weather, and market data; and

(D) report statistical data related to concepts such as pricing, market trends, commodity prices, exports and imports, supply and demand, and production yields numerically or graphically.

(7) The student demonstrates mathematical knowledge and skills required to solve problems related to animal systems and related career opportunities. The student is expected to:

(A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of purchasing, marketing, and production costs; housing requirements; conversion of units; average daily gain; topical and injectable medication dosages; USDA grades; feeding schedules; volumes; stocking rates; and breeding and gestation cycles related to animal systems;

(B) demonstrate knowledge of algebraic applications related to animal system calculations such as ration formulation using the Pearson Square, percent homozygosity, heritability, USDA grades, gene frequency, cost per unit of nutrient, and weaning weight ratio;

(C) use geometric principles to solve problems such as the use of right triangles for perpendicular cross fencing and the calculation of square footage for housing requirements; acreage for normal and irregular shaped pastures; feed bin volume based upon shape such as cylinder, cone, cube, or pyramid; and housing volume for ventilation related to animal systems; and

(D) use statistical and data analysis to evaluate animal systems data reported numerically or graphically such as birth weight, weaning weight, days to market weight, expected progeny differences, feed efficiencies, birth type, litter size, presence or absence of genetic abnormality, milk production, sow productivity index, and veterinary costs or records.

(8) The student demonstrates mathematical knowledge and skills required to solve problems related to environmental service systems and related career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications to create solutions to problems such as the calculation of acre feet of water, water volume in ponds, water well volume, water pressure friction loss, flow rate, total head pressure, pump efficiency, soil solids volume, and soil degree of saturation related to environmental service systems;

(B) use geometric principles to solve problems such as calculating acreage for normal and irregular shaped pastures and slope of land, planning runoff drainage structures, and applying differential leveling techniques related to environmental service systems; and

(C) use statistical and data analysis to evaluate environmental service systems data reported numerically or graphically such as rainfall, soil classifications, groundwater levels, recycling activities, and pollution rates.

(9) The student demonstrates mathematical knowledge and skills required to solve problems related to food products and processing systems and related career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications to solve problems such as the calculation of exponential growth of bacteria, contribution margin in processing, percentage of weight loss in packaged food, percentage of water absorption in packaged food, and microbe analysis following pasteurization related to food products and processing systems;

(B) use geometric principles to solve problems such as the calculation of packaging requirements, construction of food storage structures and containers, liquid transfer materials, and vessels design and volume related to food products and processing systems; and

(C) use statistical and data analysis to evaluate food products and processing systems data reported numerically or graphically such as governmental regulations, hazard analysis, critical control points data, taste tests, quality assurance data, and industry packing practices.

(10) The student demonstrates mathematical knowledge and skills required to solve problems related to natural resource systems and related career opportunities. The student is expected to:

(A) demonstrate knowledge of algebraic applications to solve problems such as the calculation of mean harvest area, calibration of pesticides, and the Doyle Log Rule related to natural resource systems;

(B) use geometric principles to solve problems such as planning and construction of structures related to wildlife and fisheries management, determination of lumber volume in given tree stock, and calculation of tank volume for chemical application related to natural resource systems; and

(C) use statistical and data analysis to evaluate natural resource systems data reported numerically or graphically such as Geographic Information Systems and Global Positioning Systems data, weather-related data, and data related to wildlife and habitat.

(11) The student demonstrates mathematical knowledge and skills required to solve problems related to plant systems and related career opportunities. The student is expected to:

(A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of crop yields, crop loss, grain drying requirements, grain weight shrinkage, germination rates, greenhouse heating, and cooling and fertilizer application rates related to plant systems;

(B) demonstrate knowledge of algebraic applications to solve problems such as the calculation of grain handling efficiency, harvesting capacity, crop rotation, seeding rates, fertilizer nutrient requirements, and greenhouse ventilation related to plant systems;

(C) use geometric principles for the analysis of problems such as planning grain storage structures and calculating volume of grain storage vessels, grain handling volume, greenhouse capacity, and regular and irregular shaped planting bed size related to plant systems; and

(D) use statistical and data analysis to evaluate plant systems data such as crop yields, Global Information Systems data, plant growth data, and climate data.

(12) The student demonstrates mathematical knowledge and skills required to solve problems related to power, structural, and technical systems and related career opportunities. The student is expected to:

(A) use mathematical operations and knowledge of relationships to solve problems such as the calculation of gear ratio, fuel efficiency, construction costs, project layout, energy costs, unit conversions, and bid preparation and labor-related calculations related to power, structural, and technical systems;

(B) demonstrate knowledge of algebraic applications such as the calculation of strength of magnetism, chain or belt tension, horsepower, Ohm's Law, hydraulic multiplication of force, stresses using Mohr's Circle, and tensile strength related to power, structural, and technical systems;

(C) use geometric principles for the evaluation of problems such as rafter length, land measurement, differential leveling, concrete volume, heating, ventilating, and air conditioning requirements and creation of structural drawings related to power, structural, and technical systems;

(D) use statistical and data analysis to evaluate power, structural, and technical systems data such as construction cost data; equipment maintenance; heating, ventilation, and air conditioning efficiencies; engine performance; and labor costs; and

(E) use geometric principles to develop and implement a plan for construction of a project such as a trailer, an agricultural structure, a storage facility, or a fence.

§127.32. Energy and Natural Resource Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: a minimum of one credit from the courses in the Agriculture, Food, and Natural Resources Career Cluster. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Energy and Natural Resource Technology examines the interrelatedness of environmental issues and production agriculture. Students will evaluate the environmental benefits provided by sustainable resources and green technologies. Instruction is designed to allow for the application of science and technology to measure environmental impacts resulting from production agriculture through field and laboratory experiences. To prepare for careers in environmental service systems, students must attain academic skills and knowledge, acquire advanced technical knowledge and skills related to environmental service systems and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the field of energy and natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in energy and natural resources;

(C) demonstrate knowledge of personal and occupational safety, environmental regulations, and first-aid policy in the workplace; and

(D) analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student uses instructional time to conduct field and laboratory investigations using safe, environmentally appropriate, and ethical practices in a supervised agriculture experience. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations in a supervised agriculture experience; and

(B) use accepted procedures for the use and conservation of resources and for the safe handling of materials.

(4) The student discusses the importance and scope of natural resources. The student is expected to:

(A) identify various types of natural resources;

(B) discuss renewable and non-renewable energy resources and their impact on the environment;

(C) analyze the impacts of natural resources and their effects on the agricultural economy; and

(D) map the geographic and demographic uses of natural resources.

(5) The student identifies water use and management in agricultural settings. The student is expected to:

(A) identify the distribution and properties of water in the hydrologic cycle;

(B) identify agricultural uses of water such as recycling;

(C) discuss how agricultural uses may impact water resources;

(D) define point source and non-point source pollution;

(E) identify sources of point source and non-point source pollution associated with agriculture;

(F) evaluate how the different agricultural water uses may impact water availability; and

(G) research water use legislation.

(6) The student describes air quality associated with agricultural production. The student is expected to:

(A) describe the components of the atmosphere and the atmospheric cycle;

(B) define air pollution;

(C) analyze air quality legislation;

(D) identify sources and effects of air pollution from agricultural production;

(E) discuss different emission management strategies; and

(F) identify common air pollution controls used in agricultural production.

(7) The student examines soil erosion as related to agricultural production. The student is expected to:

(A) identify agricultural production practices that can contribute to soil erosion;

(B) analyze effects of soil erosion;

(C) discuss the legal aspects of soil erosion; and

(D) identify soil erosion control methods and programs.

(8) The student explains the effects of natural resource use. The student is expected to:

(A) identify the progression of use of natural resources leading to environmental degradation;

(B) explain the impact of human population dynamics on the environment;

(C) discuss the abuse of natural resources; and

(D) communicate the environmental consequences of natural resource use such as the impact on living organisms.

§127.33. Advanced Energy and Natural Resource Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended prerequisites: a minimum of one credit from the courses in the Agriculture, Food, and Natural Resources Career Cluster and Energy and Natural Resource Technology. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Advanced Energy and Natural Resource Technology is designed to explore the interdependency of the public and natural resource systems related to energy production. In addition, renewable, sustainable, and environmentally friendly practices will be explored. To prepare for careers in the field of energy and natural resource systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to energy and natural resources and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the field of energy and natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in energy and natural resources;

(C) demonstrate knowledge of personal and occupational safety, environmental regulations, and first aid policy in the workplace; and

(D) analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student uses instructional time to conduct field and laboratory investigations using safe, environmentally appropriate, and ethical practices in a supervised agriculture experience. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations in a supervised agriculture experience; and

(B) apply accepted procedures for the use and conservation of resources and for the safe handling of materials.

(4) The student determines and evaluates the importance and scope of energy and natural resources. The student is expected to:

(A) identify various types of natural resources;

(B) identify renewable, non-renewable, and sustainable energy resources and determine their availability;

(C) evaluate the impacts of energy production on natural resources and the agricultural economy; and

(D) analyze the geographic and demographic uses of natural resources.

(5) The student analyzes ethical issues related to natural resource management and energy production. The student is expected to:

(A) compile examples of different lease agreements used for leasing minerals and natural resources;

(B) interpret legal documents related to natural resource management and energy production; and

(C) compare and contrast public and industry interest in natural resource management.

(6) The student understands the role of natural resource management and energy production policies at the local, state, and national levels. The student is expected to:

(A) identify policy affecting the use of natural resources;

(B) identify policy affecting energy production;

(C) research controls that protect Earth's natural resources;

(D) identify state and federal agencies that have natural resource management and energy production responsibilities; and

(E) define the roles of government, society, and property owners in the development of natural resource management and energy production policy.

(7) The student recognizes the purpose of land use planning for natural resource management and energy production. The student is expected to:

(A) discuss advantages and disadvantages of land use planning for natural resource management and energy production; and

(B) compare and contrast land use policy trends within the state.

(8) The student identifies water use and wastewater management. The student is expected to:

(A) identify municipal, industrial, and agricultural uses of water;

(B) explore and develop water recycling opportunities;

(C) evaluate sources of point and non-point source pollution associated with municipal, industrial, and agricultural uses;

(D) describe effective management practices commonly used to abate point and non-point sources of pollution;

(E) analyze how water use impacts water availability;

(F) research water use legislation;

(G) discuss water quality policy and how it affects the decisions made in agricultural production; and

(H) discuss the interaction of energy production and water resources.

(9) The student describes air quality associated with natural resource management and energy production. The student is expected to:

(A) research air quality legislation;

(B) identify sources and effects of air pollution;

(C) discuss different emission management strategies; and

(D) identify air pollution controls used in energy production.

(10) The student examines soil erosion as related to natural resource management and energy production. The student is expected to:

(A) examine the effects of natural resource management and energy production on soil erosion;

(B) analyze the components and functions of soils;

(C) appraise soil and water conservation programs; and

(D) compare soil erosion control methods.

(11) The student analyzes the identification, handling, storing, and disposing of waste and hazardous materials. The student is expected to:

(A) classify types of waste and hazardous materials;

(B) research legislation related to waste and hazardous materials;

(C) select appropriate entities responsible for waste and hazardous material management; and

(D) describe safe handling, storing, and disposal of waste materials such as composting and recycling.

(12) The student learns the processes for producing energy and green products from agricultural, biomass, fossil fuel, wind, solar, and geothermal sources. The student is expected to:

(A) identify agricultural and silvicultural crops and bio-products suitable for renewable production;

(B) discuss production processes for agricultural- and silvicultural-based bio-products;

(C) describe the fundamentals for non-renewable resource recovery;

(D) analyze the effects of non-renewable resource recovery methods and the environmental considerations associated with each method such as environmentally friendly alternatives;

(E) analyze the advantages and disadvantages of wind-generated energy;

(F) identify public policy considerations associated with transmission line construction to transport wind-generated energy;

(G) locate areas in the state that have geothermal energy production potential;

(H) explain the benefits of geothermal energy;

(I) identify solar energy systems and describe the function of each; and

(J) identify the environmental considerations associated with biofuels.

§127.34. Food Technology and Safety (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Food Technology and Safety examines the food technology industry as it relates to food production, handling, and safety. To prepare for careers in value-added and food processing systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to value-added and food processing and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and locate career opportunities that appeal to personal career goals;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in food processing;

(C) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, and legal responsibilities;

(E) demonstrate characteristics of good citizenship such as stewardship, advocacy, and community leadership; and

(F) research career topics using technology such as the Internet.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student explains the impact of food science systems. The student is expected to:

(A) explain the significance of food science systems;

(B) define trends in food production, world population, and supply and demand for food products;

(C) research trends in animal and food science research; and

(D) evaluate the relationship between biotechnology and the food science industry.

(4) The student analyzes the nutritive value of food constituents. The student is expected to:

(A) define the terms used in food technology;

(B) compare and contrast the nutritive value of food groups; and

(C) apply data and measurements to solve a problem related to food processing.

(5) The student identifies procedures and regulations for sanitation and safety in the food industry. The student is expected to:

(A) identify food industry inspection standards, including hazard analysis and critical control points;

(B) describe procedures for insect and rodent control;

(C) identify appropriate chemicals used in the food industry;

(D) assess conditions with regard to safety and health; and

(E) identify specific regulation for organic animal products, grains, and produce.

(6) The student identifies safety and governmental regulations involved in the processing and labeling of foods. The student is expected to:

(A) research regulations dealing with preserving red meat, poultry, and fish;

(B) describe packaging, labeling, and storage requirements for red meat, poultry, and fish;

(C) explain the impact of temperature in food preservation;

(D) compare and contrast packaging requirements; and

(E) evaluate cultural practices and exotic species in food harvesting and processing.

(7) The student demonstrates an understanding of the trends and issues important to careers in the food science industry by comparing and contrasting issues affecting the food science industry, including biotechnology, employment, safety, environmental, and animal welfare issues. The student is expected to:

(A) select solutions for different environmental issues;

(B) identify issues affecting food science;

(C) research history and policies related to food science issues;

(D) analyze and defend solutions for different environmental issues; and

(E) apply economic principles such as supply, demand, and profit to food science systems.

(8) The student describes the processing, packaging, quality analysis, and marketing of red meats and their by-products. The student is expected to:

(A) describe preparing livestock carcasses for market;

(B) describe the U.S. Department of Agriculture's inspection and grading procedures;

(C) identify wholesale and retail cuts;

(D) evaluate and grade beef, pork, lamb, and goat carcasses and wholesale cuts; and

(E) identify methods of fabricating and marketing processed meats.

(9) The student describes the processing, packaging, quality analysis, and marketing of eggs, poultry, and fish and their by-products. The student is expected to:

(A) describe processing techniques;

(B) demonstrate poultry and retail cuts evaluation;

(C) identify grades and classes of eggs, poultry, fish, and seafood;

(D) fabricate specialty and value-added products;

(E) demonstrate an understanding of quality and portion control procedures; and

(F) describe marketing procedures for eggs, poultry, fish, and seafood.

(10) The student describes the processing, packaging, quality analysis, and marketing of fruits, nuts, and vegetables and their by-products. The student is expected to:

(A) identify, classify, and grade fruits, nuts, and vegetables;

(B) demonstrate trimming, washing, waxing, peeling, blanching, and other marketing techniques;

(C) research critical issues in transporting, receiving, and storing fruits, nuts, and vegetables; and

(D) discuss preserving, packaging, and storing fruits, nuts, and vegetables.

(11) The student describes the processing, packaging, quality analysis, and marketing of milk and dairy products for distribution. The student is expected to:

(A) describe methods of preparing milk for processing;

(B) evaluate methods of processing milk and dairy products;

(C) identify dairy products, including cultured milk products and frozen dairy desserts; and

(D) process, classify, and grade cheese.

§127.35. Food Processing (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Food Technology and Safety. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Food Processing focuses on the food processing industry with special emphasis on the handling, processing, and marketing of food products. To prepare for careers in food products and processing systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to natural resources and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the food processing industry, including the value-added products industry;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in the food processing industry, including the value-added products industry;

(C) demonstrate knowledge of personal and occupational safety practices in the workplace;

(D) identify employers' expectations, including appropriate work habits, ethical conduct, and legal responsibilities;

(E) demonstrate characteristics of good citizenship such as stewardship, advocacy, and community leadership; and

(F) research career topics using technology such as the Internet.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student knows the relationship of the food processing industry to the free enterprise system. The student is expected to:

(A) explain the importance of the food processing industry in the free enterprise system; and

(B) explain trends in the consumption of food products.

(4) The student understands consumer satisfaction issues. The student is expected to:

(A) practice equipment maintenance and sanitation procedures;

(B) explain the factors that affect food palatability;

(C) fabricate red meat, poultry, game, and fish into wholesale and retail cuts; and

(D) demonstrate work ethics, customer relations skills, and management competencies consistent with industry standards.

(5) The student understands quality control issues in food processing. The student is expected to:

(A) practice procedures relating to the safe manufacture of foods through hygienic food handling and processing;

(B) develop and maintain sanitation schedules;

(C) describe hazard analysis and critical control point implementation issues;

(D) research food safety laws; and

(E) describe solutions for different environmental issues.

(6) The student identifies marketing considerations for food processing. The student is expected to:

(A) practice methods of merchandising red meat, poultry, game, fish, and their by-products;

(B) identify, select, and grade meat;

(C) develop food preservation programs using appropriate food preservation methods;

(D) explain the impact of temperature in food preservation;

(E) compare and contrast preservation packaging such as film, plastic, and cans;

(F) describe harvest and inspection techniques to process food products and analyze food product options; and

(G) identify specific criteria for organic food processing and marketing.

§127.36. Wildlife, Fisheries, and Ecology Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Wildlife, Fisheries, and Ecology Management examines the management of game and non-game wildlife species, fish, and aquacrops and their ecological needs as related to current agricultural practices. To prepare for careers in natural resource systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to natural resources, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the field of natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in natural resources;

(C) demonstrate knowledge of personal and occupational safety and health, environmental regulations, and first-aid policy in the workplace; and

(D) analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student analyzes the importance of wildlife, with an emphasis on use and management. The student is expected to:

(A) analyze the importance of wildlife, fisheries, and ecology management;

(B) discuss the history of wildlife, fisheries, and ecology management;

(C) discuss policies, laws, and the administration of wildlife, fisheries, and ecology management; and

(D) analyze the economic impact of public recreation.

(4) The student knows the scientific basis of and applies concepts related to wildlife management. The student is expected to:

(A) analyze the basic ecological concepts of game management;

(B) identify game, non-game, upland, and migratory game birds, waterfowl, furbearers, freshwater and saltwater fish, predators, and protected endangered species;

(C) describe and assess the management of wildlife populations;

(D) identify diseases and parasites impacting wildlife species;

(E) discuss the appropriate method of reporting disease and parasite outbreaks;

(F) identify plants impacting aquaculture and wildlife management practices; and

(G) discuss habitat and food plot management to benefit aquaculture and wildlife species.

(5) The student knows the interrelationship between various aspects of wildlife and outdoor public use management. The student is expected to:

(A) discuss the importance and role of the Wildlife Management Areas of Texas in the management of private and public lands;

(B) identify laws and regulations regarding the use of wildlife resources;

(C) apply laws and regulations regarding recreation safety such as angler, archer, boater, and hunter safety;

(D) compare and contrast public and private land use;

(E) identify appropriate safety certification requirements;

(F) recognize precautions to use when interfacing with the public concerning regulations and law enforcement;

(G) describe security issues for closed and restricted areas;

(H) recognize potential threat situations for the public of dangers on public and private lands;

(I) recognize the role of law enforcement; and

(J) summarize wildlife and fish harvest techniques and procedures.

(6) The student examines natural cycles and ecological concepts. The student is expected to:

(A) explain the hydrologic, nitrogen, carbon, and nutrient cycles;

(B) evaluate the impact of natural cycles on succession;

(C) analyze the effects of natural cycles on population dynamics;

(D) distinguish between primary and secondary producers;

(E) compare and contrast predator-prey relationships;

(F) evaluate the effects of pollution sources; and

(G) evaluate riparian zones.

(7) The student applies cartographic skills to natural resource activities. The student is expected to:

(A) compare and contrast types of maps;

(B) interpret map features and legends;

(C) compare map scale to actual distance;

(D) evaluate elevation and terrain features from topographic maps;

(E) use land survey and coordinate systems; and

(F) locate position and interpret images using a geospatial interface.

(8) The student evaluates planning data by monitoring natural resource status. The student is expected to:

(A) identify resource inventory and population studies;

(B) devise sample plots and points;

(C) identify and locate resources;

(D) interpret data concerning resource availability and health;

(E) organize databases of resource data; and

(F) create a technical report.

(9) The student analyzes various natural resource enhancement techniques using scientific knowledge. The student is expected to:

(A) develop a riparian zone enhancement technique plan;

(B) evaluate wildlife habitat enhancement plans; and

(C) evaluate public use and recreation area enhancement plans.

(10) The student demonstrates concepts related to optimum production. The student is expected to:

(A) discuss the importance and progress of aquaculture as an emerging industry;

(B) describe nutritional requirements of aquaculture production;

(C) identify requirements for optimum growth of species-specific aqua crops/aquaculture products; and

(D) identify appropriate treatments for diseases and parasites impacting wildlife species and aquaculture.

§127.37. Forestry and Woodland Ecosystems (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Forestry and Woodland Ecosystems examines current management practices for forestry and woodlands. Special emphasis is given to management as it relates to ecological requirements and how these practices impact the environment. To prepare for careers in natural resource systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to natural resources, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer knowledge and skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the field of forestry and woodland ecosystems;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in forestry and woodland ecosystems;

(C) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and

(D) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student describes the principles of forestry and woodland ecosystems. The student is expected to:

(A) describe the historical and economic significance of forestry;

(B) illustrate tree anatomy and morphology;

(C) differentiate between species of trees;

(D) classify forest and woodland soils;

(E) describe silviculture;

(F) compare and contrast forest and woodland ecosystems;

(G) describe photosynthesis and respiration as they relate to forest and woodland species;

(H) describe watershed management as it relates to forest and woodland ecosystems;

(I) describe sexual and asexual reproduction in forest and woodland species;

(J) define succession; and

(K) compare natural and managed forests and woodlands.

(4) The student demonstrates forestry biometrics skills. The student is expected to:

(A) calculate tree volume;

(B) estimate timber growth and yield;

(C) evaluate forest and woodland quality by cruising timber stands; and

(D) scale logs to calculate their quality and volume.

(5) The student demonstrates knowledge of forestry management skills. The student is expected to:

(A) identify forestry management techniques;

(B) discuss multiple-use possibilities for forest and woodlands areas; and

(C) develop a control plan for destructive agents such as fire, insects, and disease.

(6) The student identifies softwood and hardwood forest management and use practices. The student is expected to:

(A) identify principles of forestry economics;

(B) research sources of forestry management assistance;

(C) identify harvesting practices and equipment;

(D) describe merchandising practices; and

(E) evaluate research in forestry and wood technology.

(7) The student describes the role of wood technology in forest product development. The student is expected to:

(A) compare timber manufacturing processes and products; and

(B) discuss research and development issues in forestry and wood technology.

(8) The student applies cartographic skills to natural resource activities. The student is expected to:

(A) compare and contrast types of maps;

(B) interpret map features and legends;

(C) compare map scale to actual distance;

(D) evaluate elevation and terrain features from topographic maps;

(E) use land survey and coordinate systems; and

(F) locate position and interpret images using a geospatial interface.

§127.38. Range Ecology and Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Range Ecology and Management is designed to develop students' understanding of rangeland ecosystems and sustainable forage production. To prepare for careers in environmental and natural resource systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to environmental and natural resources, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the field of environmental and natural resources;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation in environmental and natural resources;

(C) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and

(D) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student develops an understanding of the rangeland ecosystem. The student is expected to:

(A) describe ecology, photosynthesis, energy flow, and climax vegetation;

(B) describe the impact of rangeland on the water cycle and water quality; and

(C) determine capabilities and limitations of rangelands.

(4) The student develops an understanding of rangeland as a dynamic, living, and changeable system. The student is expected to:

(A) explain the relationship of rangeland to the environment;

(B) discuss the interrelationships among water, alternative use, carrying capacity, and population;

(C) identify and classify native, non-native, and invasive plants and animals in the rangeland ecosystem;

(D) explore the use of rangeland plants as alternative energy sources;

(E) develop an understanding of the role of rangeland in water recharge and conservation; and

(F) recognize the importance of successful rangeland ecology practices.

(5) The student analyzes the biotic and abiotic components of a rangeland. The student is expected to:

(A) discuss components of rangeland with an emphasis on soil;

(B) determine components of rangeland with an emphasis on topography; and

(C) classify range sites by soil properties;

(6) The student develops an understanding of the dynamic process of a renewable rangeland resource. The student is expected to:

(A) determine range condition based on plant populations;

(B) compare and contrast rangeland condition trends; and

(C) formulate methods to improve range conditions.

(7) The student identifies methods of maintaining and improving rangeland for livestock management. The student is expected to:

(A) identify plants beneficial to livestock;

(B) identify plant species harmful to livestock;

(C) analyze how livestock use range plants; and

(D) discuss livestock grazing management.

(8) The student identifies methods of maintaining and improving rangeland for wildlife management. The student is expected to:

(A) identify plants beneficial to wildlife;

(B) identify plants species harmful to wildlife;

(C) analyze how wildlife species use range plants; and

(D) discuss wildlife grazing management.

(9) The student develops an understanding of rangeland management as it relates to global concerns. The student is expected to:

(A) examine how rangeland characteristics affect aquifers;

(B) analyze how rangeland characteristics affect the environment;

(C) analyze how rangeland management affects the environment; and

(D) evaluate the impact of energy production systems on rangelands.

§127.39. Landscape Design and Management (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Landscape Design and Management is designed to develop an understanding of landscape design and management techniques and practices. To prepare for careers in horticultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticultural systems and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of landscape design and management;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in landscape design and management;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the industry;

(E) identify employers' expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship such as advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student identifies environmental, aesthetic, and financial benefits of landscaped sites. The student is expected to:

(A) assess soil characteristics and environmental conditions;

(B) assess site for local conditions such as property lines, easement restrictions, and location of public utilities;

(C) complete a site analysis checklist;

(D) produce a site sketch using graphic design equipment or software;

(E) identify plants used in designing landscapes;

(F) identify structures and hardscape materials used in designing landscapes;

(G) create landscape designs demonstrating the application of design elements and principles; and

(H) analyze different landscape design styles and identify the different aesthetic and environmental factors of each style.

(4) The student performs landscape business procedures. The student is expected to:

(A) demonstrate skills for interviewing potential clients;

(B) develop landscape ideas from a checklist;

(C) prepare cost estimates and schedules for landscaping services, including materials, labor, and business costs; and

(D) analyze service contracts.

(5) The student analyzes the cost and maintenance of tools and equipment used in the landscape industry. The student is expected to:

(A) identify, store, and maintain landscaping hand tools and power equipment;

(B) analyze costs associated with purchasing and maintaining landscaping hand tools and power equipment;

(C) assess different landscape irrigation systems for efficiency, application, and environmental impact;

(D) identify common irrigation system components and materials; and

(E) examine local and state regulations affecting irrigation systems.

(6) The student performs landscape installation services. The student is expected to:

(A) prepare landscape sites for installation; and

(B) install landscape plants and structures using proper installation techniques.

(7) The student performs landscape maintenance services. The student is expected to:

(A) identify and demonstrate proper pruning techniques for different plant materials;

(B) recognize methods for renovating existing landscapes;

(C) analyze nutritional needs of plants;

(D) develop fertilization plans that address plant needs and environmental concerns;

(E) examine Integrated Pest Management in assessing an insect, pathogen, or weed problem;

(F) use pesticide application techniques and equipment properly;

(G) explain pesticide labeling and safety data sheets; and

(H) demonstrate lawn management techniques.

§127.40. Turf Grass Management (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Turf Grass Management is designed to develop an understanding of turf grass management techniques and practices. To prepare for careers in horticultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticultural systems and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of turf grass management;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in turf grass management;

(C) examine licensing, certification, and legal requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the industry;

(E) identify employers' expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship such as advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student identifies the environmental, aesthetic, and financial benefits of turf grass in residential, commercial, and athletic settings. The student is expected to:

(A) assess sites for environmental factors that impact turf grass establishment and management such as soil type, soil pH, and elevation differences;

(B) develop a site assessment checklist; and

(C) develop a site preparation plan.

(4) The student identifies and implements common cultural and physiological requirements for cool and warm season turf grass establishment. The student is expected to:

(A) identify turf grass varieties and cultivars that fulfill site requirements;

(B) identify pests and pathogens of turf grasses;

(C) identify common weeds found in turf grasses;

(D) determine the importance of site grading for water movement;

(E) determine the importance of soil compaction on turf grass establishment;

(F) reduce impact of compaction using aeration methods;

(G) compare establishment procedures such as seeding, sodding, sprigging, and hydromulching; and

(H) explain the importance of turf grass installation timing.

(5) The student identifies and implements common cultural and physiological requirements for cool and warm season turf grass maintenance. The student is expected to:

(A) explain and demonstrate mowing heights;

(B) explain the principle of mowing frequency;

(C) compare residential, commercial, and athletic turf maintenance needs;

(D) determine turf grass irrigation requirements;

(E) analyze and address thatch accumulation in turf grass;

(F) analyze nutritional needs of turf grass;

(G) develop fertilization plans that address turf grass needs and environmental concerns;

(H) examine Integrated Pest Management in assessing an insect, pathogen, or weed problem;

(I) use turf grass pesticide application techniques and equipment properly; and

(J) explain turf grass pesticide labeling and safety data sheets.

(6) The student performs turf grass management business procedures. The student is expected to:

(A) assess the needs of prospective clients;

(B) analyze material, labor, and business costs related to turf grass sites;

(C) develop and analyze service contracts and maintenance schedules;

(D) prepare a cost estimate for establishing a turf grass site, including materials and labor; and

(E) prepare a cost estimate for maintaining a turf grass site, including materials and labor.

(7) The student manages turf grass maintenance equipment. The student is expected to:

(A) identify, store, and maintain turf grass hand tools and power equipment;

(B) analyze the costs associated with turf grass hand tools and power equipment; and

(C) analyze components of turf grass irrigation systems.

§127.41. Agricultural Mechanics and Metal Technologies (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Agricultural Mechanics and Metal Technologies is designed to develop an understanding of agricultural mechanics as it relates to safety and skills in tool operation, electrical wiring, plumbing, carpentry, fencing, concrete, and metal working techniques. To prepare for careers in agricultural power, structural, and technical systems, students must attain academic skills and knowledge; acquire technical knowledge and skills related to power, structural, and technical agricultural systems and the industry; and develop knowledge and skills regarding career opportunities, entry requirements, industry certifications, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of power, structural, and technical agricultural systems;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation of power, structural, and technical agricultural systems;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health, safety, and first-aid practices in the industry;

(E) identify employer expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student follows operating instructions for tools and equipment to perform a given task. The student is expected to:

(A) select, use, maintain, and store appropriate hand tools to perform a given task;

(B) select, use, maintain, and store appropriate power equipment such as tools powered by electric, pneumatic, and internal combustion engines; and

(C) select and use measuring and marking devices.

(4) The student identifies and performs electric wiring skills. The student is expected to:

(A) identify principles of electricity and wiring terminology;

(B) install electric wiring components and fixtures to comply with governmental regulations and applicable codes; and

(C) maintain electric motors.

(5) The student performs plumbing skills. The student is expected to:

(A) identify and use plumbing tools; and

(B) identify plumbing fixtures.

(6) The student performs concrete construction skills. The student is expected to:

(A) project cost estimates for materials; and

(B) form and pour concrete slabs.

(7) The student performs carpentry skills. The student is expected to:

(A) identify materials used in agricultural construction;

(B) identify elements of a cost estimate and prepare a bid package for a planned project;

(C) demonstrate basic carpentry skills; and

(D) paint and protect a project with coatings.

(8) The student identifies fencing methods. The student is expected to:

(A) select fencing materials; and

(B) plan and install fences.

(9) The student performs appropriate cold and hot metal techniques. The student is expected to:

(A) identify types of metal;

(B) cut, file, shape, and drill metal;

(C) select and operate oxy-fuel welding and cutting equipment to meet standards;

(D) select and operate electric-arc welding equipment to meet standards; and

(E) perform specialty welding and cutting techniques to meet standards.

(10) The student applies processes relating to assembly of equipment in agricultural systems operations. The student is expected to:

(A) select, use, and maintain appropriate tools, equipment, and facilities; and

(B) identify and determine properties, types, and uses of metal.

(11) The student plans and performs cost-effective construction techniques. The student is expected to:

(A) analyze site, equipment, and permit requirements;

(B) operate computer-aided drafting design software;

(C) develop, read, and interpret designs and sketches;

(D) estimate material needs and costs;

(E) measure, mark, and cut material; and

(F) perform specialized nonmetallic fabrication techniques.

§127.42. Agricultural Structures Design and Fabrication (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Agricultural Mechanics and Metal Technologies. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) In Agricultural Structures Design and Fabrication, students will explore career opportunities, entry requirements, and industry expectations. To prepare for careers in mechanized agriculture and technical systems, students must attain knowledge and skills related to agricultural structures design and fabrication. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their academic knowledge and technical skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of mechanized agriculture;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation of mechanized agriculture;

(C) research licensing, certification, and credentialing requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(E) identify employer expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student demonstrates principles of facilities design and fabrication related to agricultural structures. The student is expected to:

(A) develop building plans;

(B) select site and locate agricultural building placement;

(C) estimate materials and costs needed for construction with an emphasis on renewable and eco-friendly materials;

(D) select appropriate environmental control systems with a special emphasis on green technology; and

(E) use computer-aided design software as appropriate.

(4) The student explores the different types of power systems used in agricultural structures. The student is expected to:

(A) define the terms and principles of electricity;

(B) estimate electrical needs and loads;

(C) plan installations using local codes and National Electric Code guidelines;

(D) demonstrate the use of various meters;

(E) select circuit wiring materials and supplies;

(F) demonstrate electrical systems repair; and

(G) explore alternative power systems, including solar, wind, and biomass.

(5) The student constructs agricultural structures using appropriate technology. The student is expected to:

(A) demonstrate appropriate use of surveying equipment;

(B) demonstrate and apply Geographic Information System (GIS) and Global Positioning System (GPS) principles;

(C) reinforce, place, finish, and cure concrete;

(D) plan, establish, and maintain water-management systems;

(E) identify non-traditional structural building techniques, including industry trends that are eco-friendly;

(F) discuss the use of masonry and drywall construction;

(G) install doors, windows, and roofing materials; and

(H) install plumbing equipment and fixtures to comply with governmental regulations and applicable codes.

(6) The student demonstrates metal construction techniques related to agricultural design and fabrication of structures. The student is expected to:

(A) explain the operations of safe oxy-fuel cutting; and

(B) demonstrate safe electrical welding.

§127.43. Agricultural Equipment Design and Fabrication (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Agricultural Mechanics and Metal Technologies. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) In Agricultural Equipment Design and Fabrication, students will acquire knowledge and skills related to the design and fabrication of agricultural equipment. To prepare for careers in mechanized agriculture and technical systems, students must attain knowledge and skills related to agricultural equipment design and fabrication. To pre-

pare for success, students reinforce, apply, and transfer their academic knowledge and technical skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of mechanized agriculture;

(B) apply competencies related to resources, information, interpersonal skills, and systems of operation of mechanized agriculture;

(C) research licensing, certification, and credentialing requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(E) identify employer expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student demonstrates principles of design and fabrication related to agricultural machinery and equipment. The student is expected to:

(A) develop project construction plans;

(B) select appropriate construction and finish materials for different types of agricultural equipment;

(C) estimate materials and costs needed for construction with an emphasis on renewable and eco-friendly materials;

(D) construct one or more agricultural equipment projects using measuring and mechanical skills;

(E) integrate a logical order of operations into the construction of an agricultural equipment project; and

(F) use computer-aided design software.

(4) The student plans, constructs, and maintains fences, corrals, and other agricultural enclosures. The student is expected to:

(A) select site and locate enclosures;

(B) estimate materials and building costs; and

(C) define appropriate construction methods that are friendly to the environment.

(5) The student demonstrates construction techniques related to design and fabrication of agricultural equipment. The student is expected to:

(A) operate oxy-fuel and plasma cutting equipment safely;

(B) proficiently demonstrate safe electrical welding; and

(C) use hand and power tools safely in the construction and repair of agricultural equipment.

(6) The student demonstrates knowledge of laws and regulations related to the construction, design and fabrication of agricultural equipment. The student is expected to:

(A) incorporate industry standards developed by entities such as American National Standards Institute (ANSI), American Society of Agricultural Engineers (ASAE), or Occupational Safety and Health Administration (OSHA) into the construction of agricultural equipment; and

(B) design and build equipment in compliance with state and federal laws enforced by agencies such as the U.S. Department of Transportation (DOT).

§127.44. Agricultural Power Systems (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Agricultural Power Systems is designed to develop an understanding of power and control systems as related to energy sources, small and large power systems, and agricultural machinery. To prepare for careers in agricultural power, structural, and technical systems, students must attain academic skills and knowledge; acquire technical knowledge and skills related to power, structural, and technical agricultural systems and the workplace; and develop knowledge and skills regarding career opportunities, entry requirements, industry certifications, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and technical skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations

and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the field of power, structural, and technical systems;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, and critical thinking in power, structural, and technical systems;

(C) examine licensing, certification, and credentialing requirements to maintain compliance with industry requirements;

(D) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(E) identify employers' expectations and appropriate work habits; and

(F) demonstrate characteristics of good citizenship, including advocacy, stewardship, and community leadership.

(2) The student develops a supervised agriculture experience program. The student is expected to:

(A) plan, propose, conduct, document, and evaluate a supervised agriculture experience program as an experiential learning activity;

(B) apply proper record-keeping skills as they relate to the supervised agriculture experience;

(C) participate in youth leadership opportunities to create a well-rounded experience program; and

(D) produce and participate in a local program of activities using a strategic planning process.

(3) The student connects power generation to differing energy sources. The student is expected to:

(A) examine benefits and detriments of petroleum and alternative energy sources;

(B) compare environmental impacts of varying energy sources;

(C) compare efficiency and characteristics of different energy sources; and

(D) investigate the efficiency of power generation systems that use various energy sources.

(4) The student selects the appropriate tool to perform a given task related to agricultural power systems. The student is expected to:

(A) select and identify standard tools, equipment, and safety procedures common to power and control applications;

(B) follow operating instructions of specialized tools and equipment such as micrometers, digital multimeters, and dynamometers;

(C) set up and adjust tools and equipment such as dynamometers, flow meters, torque wrenches, lathes, and mills;

(D) maintain and store tools and equipment common to power and control applications; and

(E) inventory tools and equipment in a service or maintenance facility.

(5) The student selects, operates, and maintains small engines. The student is expected to:

(A) describe principles of operation of internal combustion engines;

(B) disassemble and reassemble small engines;

(C) select, maintain, and troubleshoot small engines; and

(D) research small engine industry certifications.

(6) The student selects, operates, and maintains agricultural machines and equipment. The student is expected to:

(A) identify and select agricultural equipment for appropriate tasks such as the selection of tillage equipment to obtain a desired result;

(B) identify and maintain component materials such as bearings, hydraulic cylinders, seals, chains, and drives on varying types of machines and equipment;

(C) ensure the presence and function of safety devices such as guards and shields and hardware on machinery and equipment;

(D) calibrate metering, monitoring, and sensing equipment on various equipment such as tillage, harvest, transport, and haying equipment; and

(E) perform pre-operation inspection and appropriate start-up procedures, identify causes of equipment malfunctions and failures, perform scheduled preventive maintenance, and safely operate equipment.

(7) The student selects, operates, and maintains tractors and agricultural power systems. The student is expected to:

(A) select tractors based upon application and power requirements and describe or perform safe operation of tractors in various applications;

(B) maintain intake and exhaust system components, including shrouds, screens, filters, piping, after-coolers, air induction systems, manifolds, exhaust scrubbers, and mufflers;

(C) select lubricants and apply appropriate lubrication as required by maintenance schedules;

(D) identify and maintain various fuel systems, power trains, and hydraulic systems used on farm tractors;

(E) explain charging, starting, operating, and igniting direct current electrical systems;

(F) maintain steering and braking systems;

(G) maintain tires and tracks and describe the role of ballasting and traction in farm tractors; and

(H) explain the operation of and maintain liquid- and air-cooling systems in tractors.

(8) The student monitors and controls electrical systems as related to agricultural machines and equipment. The student is expected to:

(A) collect data and troubleshoot electrical systems using various meters and test equipment such as digital multimeters;

(B) employ appropriate techniques for applying devices, controls, and grounding in electrical systems;

(C) apply local and national codes and regulations relevant in electrical systems;

(D) select and apply electric controls such as motor controls, switches, circuit breakers, timers, sensors, and relays; and

(E) interpret data generated by electrical monitoring systems.

(9) The student implements control systems related to agricultural machines and equipment. The student is expected to:

(A) analyze schematic drawings for electrical control systems;

(B) describe uses of various electrical control system components;

(C) install control system components such as motor controls, switches, circuit breakers, timers, sensors, and relays and properly use appropriate tools, procedures, and safety practices; and

(D) identify system performance problems and apply troubleshooting techniques using monitoring or troubleshooting devices.

(10) The student describes hydraulic controls and applications as related to agricultural machines and equipment. The student is expected to:

(A) describe the operation of open and closed center hydraulic systems;

(B) explain the purpose and function of hydraulic controls such as valves, motors, pumps, cylinders, manifolds, and meters; and

(C) create basic hydraulic circuits using a variety of hydraulic controls.

(11) The student describes additional control systems as related to agricultural machines and equipment. The student is expected to:

(A) explain the application of pneumatic systems and controls; and

(B) explain the application of water or other fluid control systems to agricultural machines and equipment and their components.

§127.85. Agricultural Laboratory and Field Experience (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12 as a corequisite course for students participating in a coherent sequence of career and technical education courses in the Agriculture, Food, and Natural Resources or Energy career clusters. This course provides an enhancement opportunity for students to develop the additional skills necessary to pursue industry certification.

(1) Recommended prerequisite: a minimum of one credit from a course in the Agriculture, Food, and Natural Resources or Energy career clusters.

(2) Corequisite: this course must be taken concurrently with a corequisite course from the Agriculture, Food, and Natural Resources or Energy career clusters and may not be taken as a stand-alone course. The following courses are permitted as corequisites:

(A) Agribusiness Management and Marketing;

(B) Livestock Production;

(C) Veterinary Medical Applications;

(D) Food Technology and Safety;

(E) Food Processing;

(F) Wildlife, Fisheries, and Ecology Management;

(G) Forestry and Woodland Ecosystems;

(H) Range Ecology and Management;

(I) Floral Design;

(J) Horticultural Science;

(K) Greenhouse Operation and Production;

(L) Agricultural Mechanics and Metal Technologies;

(M) Agricultural Structures Design and Fabrication;

(N) Agricultural Equipment Design and Fabrication;

(O) Agricultural Power Systems;

(P) Oil and Gas Production I;

(Q) Oil and Gas Production II;

(R) Energy and Natural Resource Technology; and

(S) Advanced Energy and Natural Resource Technology.

(3) Districts are encouraged to offer this lab in a consecutive block with the corequisite course to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

(3) Agricultural Laboratory and Field Experience is designed to provide students a laboratory and/or field experience opportunity. To prepare for careers in agriculture, food, and natural resources, students must acquire knowledge and skills that meet entry requirements and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer academic knowledge and technical skills in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) investigate career development and entrepreneurship opportunities in agriculture, food, and natural resources;

(B) apply competencies related to resources, information, and interpersonal skills;

(C) practice personal and occupational health and safety practices in the workplace;

(D) examine employer expectations and exhibit appropriate work habits;

(E) develop good characteristics of citizenship, including advocacy, stewardship, and community leadership; and

(F) pursue appropriate licensing, certification, and credentialing requirements.

(2) The student uses technology to research a project. The student is expected to:

(A) effectively use search engines, databases, and other digital electronic tools to locate information;

(B) evaluate quality, accuracy, completeness, reliability, and currency of information from any source;

(C) prepare, organize, present, and apply independent research; and

(D) accept constructive criticism and revise personal views when warranted by valid evidence.

(3) The student develops an elevated aptitude for the essential knowledge and skills listed for the corequisite course. The student is expected to:

(A) demonstrate deeper understanding of the corequisite course;

(B) develop mastery of hands-on skills at an industry-accepted standard; and

(C) exhibit progress toward achieving industry-recognized documentation of specific expertise in an agriculture, food, and natural resources field or skill.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
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For further information, please call: (512) 475-1497

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SUBCHAPTER D. ARCHITECTURE AND CONSTRUCTION

19 TAC §§127.94 - 127.114, 127.145 - 127.154

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.94. Principles of Architecture (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Principles of Architecture provides an overview to the various fields of architecture, interior design, and construction management. Achieving proficiency in decision making and problem solving is an essential skill for career planning and lifelong learning. Students use self-knowledge, education, and career information to set and achieve realistic career and educational goals. Job-specific training can be provided through training modules that identify career goals in trade and industry areas. Classroom studies include topics such as safety, work ethics, communication, information technology applications, systems, health, environment, leadership, teamwork, ethical and legal responsibility, employability, and career development and include skills such as problem solving, critical thinking, and reading technical drawings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and preparation requirements, for careers in the architecture and construction cluster;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) identify employers' expectations and appropriate work habits;

(D) apply the competencies related to resources, information, systems, and technology in appropriate settings and situations; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student performs mathematical operations to complete tasks such as measuring and estimating materials and supplies. The student is expected to:

(A) determine areas and volumes of various structures and estimate materials and supplies using appropriate geometric formulas and calculations;

(B) determine percentages and decimals and use percentages and decimals to perform measurement tasks using appropriate formulas and calculations;

(C) determine ratios, fractions, and proportions using appropriate formulas and calculations;

(D) perform measurement tasks using ratios, fractions, and proportions; and

(E) estimate materials and supplies using dimensions, spaces, and structures calculations.

(3) The student uses physics skills to work with materials and load applications. The student is expected to:

(A) apply basic concepts of static and loads to planning; and

(B) identify the physical properties present when using common construction materials in order to use the materials safely, effectively, and efficiently.

(4) The student manages chemical materials safely. The student is expected to:

(A) recognize the issues present when mixing compatible and incompatible substances to maintain workplace and jobsite safety;

(B) differentiate between incompatible and compatible substances;

(C) describe the chemical process that occurs when using common construction materials to maintain workplace and jobsite safety; and

(D) apply chemical processes in relation to environmental conditions.

(5) The student reads, comprehends, and communicates effectively in the workplace, using proper grammar and workplace terminology when using printed, written, and electronic media. The student is expected to:

(A) use technological applications to transmit reports;

(B) develop written communications such as estimates, work orders, and memos;

(C) read and follow technical instructions and manuals;

(D) compose an accurate and organized diary or log of work; and

(E) write reports and documents such as estimates, permits, memos, and technical reports.

(6) The student listens attentively and speaks clearly to convey information correctly. The student is expected to:

(A) confirm understanding of verbal and visual instructions; and

(B) ask relevant questions concerning details of instructions.

(7) The student listens to and speaks clearly with a variety of individuals to enhance communications skills. The student is expected to:

(A) provide verbal instructions; and

(B) listen attentively to spoken messages to respond to information.

(8) The student exhibits public relations skills to address a variety of situations such as increasing internal and external customer and client satisfaction. The student is expected to:

(A) communicate effectively to develop positive customer and client relationships;

(B) develop and maintain customer relations;

(C) define customer and client satisfaction; and

(D) evaluate customer and client satisfaction.

(9) The student identifies the relationship between available resources and requirements of a project to accomplish realistic planning. The student is expected to:

(A) initiate a project, including identifying resources and materials and time-management, labor-management, job-management, and job-site obligations in order to effectively plan;

(B) plan a project, including estimating correct amounts of required resources and materials and identifying risks;

(C) evaluate the feasibility of alternative suggestions;

(D) execute, monitor, and control a project using available resources and materials effectively; and

(E) close a project, including identifying lessons learned and evaluating waste of resources and materials.

(10) The student evaluates and adjusts plans and schedules to respond to unexpected events and conditions. The student is expected to:

(A) incorporate potential job disruptions into planning timelines;

(B) identify potential events and conditions that disrupt the completion of a job;

(C) solve situational problems involved with unexpected events and conditions;

(D) adjust plans and schedules to meet project needs;

(E) modify existing plans and schedules to reflect an unexpected change;

(F) identify and assess critical situations as they arise to resolve issues with the best solution; and

(G) present a project update to track changes necessitated by unexpected events and conditions.

(11) The student synthesizes and reports conditions to keep the organization appraised of progress and potential problems. The student is expected to:

(A) provide a project update for stakeholders; and

(B) present a verbal or written status report on a project.

(12) The student uses technological applications specific to architecture and construction to access, manage, integrate, and create information. The student is expected to:

(A) manage personal and professional schedules and contact information;

(B) manage daily, weekly, and monthly schedules using an application; and

(C) create memos and notes.

(13) The student uses electronic devices to communicate. The student is expected to:

(A) access an electronic system using login and password functions;

(B) access electronic messages received;

(C) create electronic messages in accordance with established business standards such as grammar, word usage, spelling, sentence structure, clarity, and etiquette;

(D) practice appropriate electronic message etiquette;

(E) send electronic messages;

(F) use electronic devices to share files and documents;

(G) access electronic devices for attachments;

(H) attach documents to electronic messages; and

(I) save electronic messages and attachments.

(14) The student uses writing and publishing applications. The student is expected to:

(A) prepare simple documents and other business communications;

(B) retrieve existing documents;

(C) create documents such as letters, memos, and reports using existing forms and templates;

(D) safeguard documents using name and save functions;

(E) format text using basic formatting functions; and

(F) employ word processing utility tools such as spell check, grammar check, and thesaurus.

(15) The student uses spreadsheet applications. The student is expected to:

(A) create, retrieve, edit, save, and print spreadsheets;

(B) perform calculations and analysis on data;

(C) group worksheets;

(D) create charts and graphs from a spreadsheet;

(E) perform calculations using simple formulas; and

(F) input and process data using spreadsheet functions.

(16) The student uses database applications. The student is expected to:

(A) manipulate data elements;

(B) enter data using a form;

(C) locate and replace data using search and replace functions; and

(D) process data using database functions such as structure, format, attributes, and relationships.

(17) The student uses collaborative applications. The student is expected to:

(A) facilitate group work through management of shared schedules and contact information;

(B) manage daily, weekly, and monthly schedules using an application; and

(C) maintain a shared database of contact information.

(18) The student complies with governmental regulations and applicable codes to establish a legal and safe environment. The student is expected to:

(A) identify occupation-specific governmental regulations and national, state, and local building codes to establish appropriate regulations and codes;

(B) comply with governmental regulations and building codes;

(C) read and discuss information on Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and other safety regulations; and

(D) read and discuss Safety Data Sheet (SDS) information to manage and dispose of hazardous materials.

(19) The student examines all aspects of the built environment and systems to complete project planning. The student is expected to:

(A) align and incorporate the built environment and its systems to complete the project;

(B) label all systems on a set of construction documents;

(C) discuss the interrelationship of the systems in the built environment; and

(D) use a sequential method such as the critical path method so that work progresses efficiently.

(20) The student applies industry standards and practices to ensure quality work. The student is expected to:

(A) identify current industry standards and practices in order to incorporate quality into projects;

(B) document how quality improves profitability;

(C) report on issues that affect quality;

(D) use industry standards and practices to enhance appreciation for quality workmanship; and

(E) perform work that meets or exceeds the quality standards of the industry.

(21) The student observes rules and regulations to comply with personal and occupational health and safety standards. The student is expected to:

(A) follow appropriate safety standards to ensure a safe environment;

(B) practice safety rules and regulations;

(C) identify safety precautions and hazards to ensure a safe environment; and

(D) use appropriate safety practices and equipment, including personal protective equipment.

(22) The student works as an individual and as a team member to accomplish assignments. The student is expected to:

(A) use human relations skills to work cooperatively with coworkers representing different cultures, genders, and backgrounds;

(B) track team goals to contribute constructively and positively to the team;

(C) match team members to appropriate activities;

(D) manage skills to effectively accomplish assignments;

(E) effectively use conflict-resolution skills with coworkers to maintain a smooth workflow; and

(F) use mentoring skills to inspire and motivate others to achieve and enhance performance.

(23) The student exhibits personal accountability, integrity, and responsibility to enhance confidence among coworkers. The student is expected to:

(A) apply the professional and ethical standards of the industry to personal conduct;

(B) practice professional and ethical standards;

(C) maintain personal integrity;

(D) promote personal and professional integrity in coworkers; and

(E) recognize integrity in others.

(24) The student reads regulations and contracts to ensure ethical and safety elements are observed. The student is expected to:

(A) study regulations and codes to identify those applicable to the local area;

(B) locate and implement regulations and codes applicable to tasks and projects;

(C) comply with local, state, and federal agencies and model code-setting organizations;

(D) recognize the definition of specialized words or phrases to fully understand documents and contracts;

(E) use industry jargon or terminology appropriately;

(F) use industry acronyms correctly;

(G) use words with multiple meanings correctly in context; and

(H) use ethical and legal standards to avoid conflicts of interest.

(25) The student recognizes a positive work ethic to comply with employment requirements. The student is expected to:

(A) exhibit behaviors showing reliability and dependability;

(B) recognize appropriate dress for the work environment; and

(C) recognize the required employment forms and documentation such as I-9, work visa, W-4, and licensures to meet employment requirements.

(26) The student recognizes requirements for career advancement to plan for continuing education and training. The student is expected to:

(A) identify opportunities for career advancement to formulate career goals;

(B) identify a career ladder;

(C) develop a career advancement plan;

(D) review progress of a career advancement plan;

(E) maintain positive interpersonal skills to enhance advancement potential;

(F) explore education and training opportunities to acquire skills necessary for career advancement;

(G) list postsecondary educational paths associated with the architecture and construction trades, including college, apprenticeship, and specialty trade schools;

(H) explore costs associated with postsecondary education;

(I) participate in professional development opportunities such as professional organizations and associations, trade shows, and seminars;

(J) read professional journals, magazines, manufacturers' catalogs, industry publications, and Internet sites to keep current on industry trends; and

(K) identify declining and emerging occupations, practices, and procedures.

(27) The student examines the organization and structure of various segments of the industry to prepare for career advancement. The student is expected to:

(A) recognize segments of the construction industry and show the relationships to specialty areas;

(B) obtain necessary knowledge and skills to enhance employability;

(C) research local and regional labor markets and job growth information to project potential for advancement;

(D) identify sources of career information;

(E) identify job opportunities for the trade;

(F) identify organizations that offer career and job placement;

(G) analyze potential growth of identified careers;

(H) apply labor market and job growth information to career goals;

(I) examine licensing, certification, and credentialing requirements at the national, state, and local levels to achieve compliance;

(J) align licensing, certification, and credentialing requirements to career goals in order to plan for career advancement;

(K) use technologies and resources to research licensing, certification, and credentialing;

(L) evaluate and select suitable sources of licensing, certification, and credentialing;

(M) identify licenses, certifications, and credentials applicable to career goals; and

(N) document sources and agencies for licensing and certification and credentialing information, including contact information.

(28) The student initiates and maintains a career portfolio to document knowledge, skills, and abilities. The student is expected to:

(A) select education, work history, and skills to create a personal resume;

(B) develop a resume using word processing technology;

(C) contact professional references to acquire recommendations;

(D) obtain appropriate letters of recommendation; and

(E) document and maintain a record of work experiences, licenses, certifications, credentials, and education and training to build a portfolio.

(29) The student reads technical drawings and documents to plan a project. The student is expected to:

(A) interpret blueprints and drawings to assist with project planning;

(B) recognize elements and symbols of blueprints and drawings;

(C) relate information on blueprints to actual locations on the print;

(D) recognize different classifications of drawings; and

(E) interpret and use drawing dimensions.

(30) The student uses and maintains appropriate tools, machines, and equipment to accomplish project goals. The student is expected to:

(A) select tools, machinery, and equipment to match requirements of the project;

(B) safely operate tools, machinery, and equipment;

(C) maintain and care for tools, machines, and equipment;

(D) use tools, machines, and equipment productively and efficiently in alignment with industry standards;

(E) identify sources of information concerning state-of-the-art tools, equipment, materials, technologies, and methodologies;

(F) read current periodicals, industry publications, and manufacturers' catalogs; and

(G) explore state-of-the-art tools, equipment, materials, technologies, and methodologies.

§127.95. Principles of Construction (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Principles of Construction is intended to provide an introduction and lay a solid foundation for those students entering the construction or craft skilled areas. The course provides a strong knowledge of construction safety, construction mathematics, and common hand and power tools. For safety and liability considerations, limiting course enrollment to 15 students is recommended. This course also provides communication and occupation skills to assist the student in obtaining and maintaining employment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) define effective relationship skills;

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse;

(H) explain the Occupational Safety and Health Administration (OSHA) General Duty Clause; and

(I) explain OSHA 1926 CFR Subpart C.

(2) The student understands that safe working standards are imperative in the classroom and in the field. The student is expected to:

(A) explain the idea of a safety culture;

(B) explain the importance of a safety culture in the construction crafts;

(C) explain the role of the OSHA in job-site safety;

(D) explain fall protection, ladder safety, stair safety, and scaffold safety procedures;

(E) demonstrate the use and care of appropriate personal protective equipment, including safety goggles and glasses, hard hats, gloves, safety harnesses, and safety shoes;

(F) define safe work procedures around electrical hazards; and

(G) explain the importance of Safety Data Sheets (SDS).

(3) The student understands the importance of recognizing potential hazards and preventing accidents in the classroom and in the field. The student is expected to:

(A) identify causes of accidents;

(B) identify impacts of accident costs;

(C) define hazard recognition;

(D) identify struck-by hazards;

(E) identify caught-in-between hazards;

(F) identify other construction hazards on the jobsite, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires; and

(G) explain the importance of hazard communication (HazCom).

(4) The student understands basic construction mathematics. The student is expected to:

(A) add, subtract, multiply, and divide whole numbers with and without a calculator;

(B) add, subtract, multiply, and divide fractions;

(C) add, subtract, multiply, and divide decimals with and without a calculator;

(D) convert decimals to percentages and percentages to decimals; and

(E) convert fractions to decimals and decimals to fractions.

(5) The student demonstrates basic measuring practices. The student is expected to:

(A) use a standard ruler, a metric ruler, a measuring tape, and an architectural/engineering scale to measure;

(B) explain what the metric system is and how it is important in the construction trade;

(C) recognize and use metric units of length, weight, volume, and temperature; and

(D) recognize some of the basic shapes used in the construction industry and apply basic geometric principles to measure them.

(6) The student acquires knowledge about care and identification of hand tools. The student is expected to:

(A) recognize and identify the basic hand tools and their purposes for the construction trades;

(B) inspect basic hand tools visually to determine if they are safe for use; and

(C) use the basic construction hand tools safely and properly.

(7) The student acquires knowledge about care and identification of powered hand tools. The student is expected to:

(A) identify powered hand tools commonly used in the construction trades;

(B) practice safe and proper application of powered hand tools commonly used in the construction trades; and

(C) explain how to properly maintain and clean powered hand tools commonly used in construction trades.

(8) The student develops the basics of construction drawing. The student is expected to:

(A) interpret and use drawing dimensions;

(B) recognize and identify basic construction terms;

(C) recognize and identify basic drawing components;

(D) recognize and identify commonly used drawing symbols;

(E) relate information on construction drawings to actual locations on the print; and

(F) recognize different classifications of construction drawings.

(9) The student interprets and presents information used in workplace situations. The student is expected to:

(A) interpret information and instructions presented in written form;

(B) interpret information and instructions presented in verbal form;

(C) communicate effectively using verbal and writing skills; and

(D) communicate effectively on the job using electronic communication devices.

(10) The student identifies ergonomic tools and procedures as well as safe material handling standards. The student is expected to:

(A) define a load;

(B) establish a pre-task plan prior to moving a load;

(C) apply proper material-handling techniques;

(D) choose appropriate material-handling equipment for the task; and

(E) recognize hazards and follow safety procedures required for material handling.

§127.96. Building Maintenance Technology I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prereq-

uisite: Principles of Architecture or Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Building Maintenance Technology I, students will gain knowledge and skills needed to enter the field of building maintenance as a building maintenance technician or supervisor or secure a foundation for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in plumbing; electrical; and heating, ventilation, and air conditioning (HVAC) systems. Additionally, students will learn methods for repair and installation of drywall, roof, and insulation systems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas and messages to others in a clear, concise, and effective manner, including explaining or conveying written information in a professional comprehensive manner;

(B) compile data using numbers in various formats to solve job-appropriate problems;

(C) demonstrate how to choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(D) demonstrate punctuality, dependability, reliability, and responsibility consistently in reporting for duty and performing assigned tasks as directed; and

(E) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations.

(2) The student demonstrates knowledge of basic worksite safety regulations and safety guidelines such as in electrical work and carpentry. The student is expected to:

(A) demonstrate safe working procedures during building maintenance and repair;

(B) explain the purpose of the Occupational Safety and Health Administration (OSHA) and how to promote safety on a worksite;

(C) identify worksite hazards and how to avoid or minimize them on a worksite;

(D) explain safety obligations of workers, supervisors, and managers to ensure a safe worksite;

(E) discuss the causes, effects, impacts, and costs of accidents;

(F) define safe work procedures for working with hazardous chemicals;

(G) define proper use of personal protective equipment; and

(H) identify potential construction hazards, including hazardous material exposures, welding, cutting hazards, and confined spaces.

(3) The student interprets various types of working drawings as they pertain to commercial construction and becomes familiar with all aspects of commercial construction documents, including architectural, engineering, and shop drawings. The student is expected to:

(A) describe the types of drawings usually included in a set of plans and list the information found on each type;

(B) identify the different types of lines used on blueprint drawings;

(C) identify selected electrical, mechanical, and plumbing symbols commonly used on plans;

(D) identify selected architectural symbols commonly used to present materials on plans;

(E) identify selected abbreviations commonly used on plans;

(F) read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings;

(G) describe the purpose of written specifications;

(H) identify and describe the parts of a specification; and

(I) demonstrate how to perform a quantity takeoff for materials.

(4) The student demonstrates how to use hand tools that are commonly used in the worksite such as hammers, saws, levels, pullers, and clamps. The student is expected to:

(A) explain and demonstrate the specific applications and uses of hand tools; and

(B) identify the important safety and maintenance requirements for hand tools.

(5) The student demonstrates how to use power tools that are commonly used in the worksite such as drills, grinders, saws, and sanders. The student is expect to:

(A) explain and demonstrate appropriately the specific applications and uses of power tools; and

(B) identify the important safety and maintenance requirements for power tools.

(6) The student demonstrates how to use the latest technologies such as computer numeric control (CNC) machinery and plasma machinery. The student is expected to:

(A) identify the important safety issues of the latest technologies; and

(B) identify the important maintenance issues of the latest technologies.

(7) The student selects and installs various types of insulation in walls, floors, and attics and becomes familiar with the uses and installation practices for vapor barriers and waterproofing materials. The student is expected to:

(A) demonstrate how to properly remove, replace, and install various types of insulation, including batt, rigid, and blown materials; and

(B) demonstrate how to use and install various vapor barriers and waterproofing materials.

(8) The student installs various exterior siding materials, including wood, metal, vinyl, and cement board siding. The student is expected to:

(A) demonstrate the proper methods to install exterior finish materials, including wood, metal, vinyl, and cement board siding;

(B) identify various fasteners used to install siding, including nails, screws, and adhesives;

(C) describe the types and applications of stucco and masonry veneer finishes; and

(D) install three types of siding commonly used in the local area.

(9) The student gains knowledge of the types and grades of framing materials and the process for installation of metal framing for interior walls, exterior nonbearing walls, and partitions. The student is expected to:

(A) identify and use a system to install a frame wall or partition;

(B) identify the fastening methods used for frame systems; and

(C) identify methods used to secure steel frame systems to supporting structures.

(10) The student knows various types of gypsum drywall and their uses and the fastening devices and methods used to install them. The student is expected to:

(A) identify the different types of drywall and their uses;

(B) select the type and thickness of drywall required for specific installations;

(C) explain the fastener schedules for different types of drywall installations;

(D) perform single-layer and multi-layer drywall installations using different types of fastening systems, including nails, drywall screws, and adhesives;

(E) install gypsum drywall on steel studs; and

(F) estimate material quantities for a drywall installation.

(11) The student knows the materials, tools, and methods used to finish and patch gypsum drywall. The student is expected to:

(A) describe the differences among the six levels of finish established by industry standards and distinguish a finish level by observation;

(B) identify the hand tools used in drywall finishing and demonstrate the ability to use these tools;

(C) identify the automatic tools used in drywall finishing;

(D) identify the materials used in drywall finishing and describe the purpose and use of each type of material, including compounds, joint reinforcing tapes, trim materials, and textures and coatings;

(E) finish drywall using hand tools;

(F) recognize various types of problems that occur in drywall finishes;

(G) identify the causes and correct method for solving each type of problem that occurs in drywall finishes; and

(H) patch damaged drywall.

(12) The student installs metal doors and related hardware in steel-framed, wood-framed, and masonry walls. The student is expected to:

(A) identify various types of door jambs and frames and demonstrate the installation procedures for placing selected door jambs and frames in different types of interior partitions;

(B) identify types of interior doors;

(C) identify different types of interior door hardware and demonstrate the installation procedures for selected types;

(D) list and identify specific items included on a typical door schedule; and

(E) demonstrate the procedures for placing and hanging a selected door.

(13) The student gains knowledge of the materials, layouts, and installations of various types of suspended ceilings used in commercial construction as well as ceiling tiles, drywall suspension systems, and pan-type ceilings. The student is expected to:

(A) establish a level line;

(B) explain the common terms related to sound waves and acoustical ceiling materials;

(C) identify the different types of suspended ceilings;

(D) interpret plans related to ceiling layout for a suspended ceiling;

(E) sketch the ceiling layout for a suspended ceiling; and

(F) install selected suspended ceilings.

(14) The student knows the various types of trim used in finish work and the proper methods for selecting, cutting, and fastening trim. The student is expected to:

(A) identify the different types of standard moldings and describe their uses;

(B) make square and miter cuts using a miter box or power miter saw;

(C) make coped joint cuts using a coping saw; and

(D) select and use fasteners to install trim, including door trim, window trim, base trim, and ceiling trim.

(15) The student selects and installs base and wall cabinets and countertops. The student is expected to:

(A) describe the classes and sizes of typical base and wall cabinets;

(B) identify cabinet components and hardware and describe their purposes;

(C) lay out factory-made cabinets, countertops, and backsplashes; and

(D) install plastic laminate on a countertop core.

(16) The student selects and installs various types of floor coverings, including carpet, vinyl tile, ceramic tile, and wood flooring systems. The student is expected to:

(A) describe the methods used to install ceramic tile, carpet, and vinyl tile;

(B) make repairs to ceramic tile, carpet, and vinyl tile; and

(C) use and maintain the tools used for the installation and repair of floor systems, including wet saw, trowels, and carpet knives.

§127.97. Building Maintenance Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Building Maintenance Technology I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Building Maintenance Technology II, students will continue to gain advanced knowledge and skills needed to enter the workforce as a building maintenance technician or supervisor and construction project manager or secure a foundation for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in safety, Occupational Safety and Health Administration (OSHA) standards, and safety devices in electrical circuits; maintenance of electrical and heating, ventilation, and air conditioning (HVAC) systems; and concepts of historic preservation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas and messages to others in a clear, concise, and effective manner, including explaining and justifying actions convincingly and effectively conveying written information and messages in a socially acceptable manner that is easily understandable;

(B) compile data using numbers in various formats to solve job-appropriate problems;

(C) demonstrate an ability to be trustworthy and honest, to choose the ethical course of action, and to comply with all applicable rules, laws, and regulations;

(D) demonstrate consistency, punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed; and

(E) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations.

(2) The student demonstrates knowledge of basic worksite safety regulations and safety guidelines. The student is expected to:

(A) demonstrate safe working procedures during building maintenance and repair;

(B) explain the purpose of the OSHA and how to promote on-site safety;

(C) identify electrical hazards and how to avoid or minimize them;

(D) explain obligations of workers, supervisors, and managers to ensure a safe work environment;

(E) discuss the causes, effects, and costs of accidents; and

(F) define safe work procedures regarding personal protective equipment, hazardous chemicals, and potential construction hazards, including hazardous material exposures, welding, cutting hazards, and confined spaces.

(3) The student knows how to interpret blueprint drawings, various symbols, schematics, one-line diagrams, and wiring diagrams. The student is expected to:

(A) explain the basic layout of a blueprint drawing;

(B) identify the common symbols used on commercial construction drawings; and

(C) read equipment schedules found on blueprint drawings.

(4) The student knows how to handle fuses and circuit breakers. The student is expected to:

(A) explain the necessity of overcurrent protection devices in electrical circuits;

(B) define the terms associated with fuses and circuit breakers;

(C) describe the operation of a circuit breaker;

(D) describe the operation of single-element and time-delay fuses;

(E) explain how ground fault circuit interrupters can save lives; and

(F) describe troubleshooting and maintenance techniques for overcurrent devices.

(5) The student installs various types of lamps and fixtures. The student is expected to:

(A) recognize the different types of lamps and explain the advantages and disadvantages of different types such as incandescent, halogen, fluorescent, and high-intensity discharge;

(B) select and install lamps into lighting fixtures; and

(C) install various lighting fixtures such as surface mounted, recessed, suspended, and track-mounted.

(6) The student knows various methods to properly select, inspect, use, and maintain common electrical test equipment. The student is expected to:

(A) explain the operation of and describe various test equipment such as ammeter, voltmeter, volt-ohm-multimeter, and continuity tester;

(B) explain how to read test equipment and convert from one scale to another;

(C) explain the importance of proper meter polarity;

(D) define frequency and explain the use of a frequency meter; and

(E) explain the differences between digital and analog meters.

(7) The student installs and maintains electrical devices and demonstrates wiring techniques common to residential and industrial facilities. The student is expected to:

(A) describe how to determine electrical service requirements for residential and industrial facilities;

(B) select the proper wiring methods for various residential and industrial facilities;

(C) explain the role of the National Electrical Code;

(D) compute branch circuit loads and explain their installation requirements;

(E) explain the types of equipment grounding conductors such as ground fault circuit interrupter (GFCI), light fixtures, receptors, and switches and their purposes;

(F) distinguish between the sizes of outlet boxes and their various wiring methods;

(G) describe the rules for installing electric space heating and HVAC systems equipment; and

(H) describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.

(8) The student is introduced to the basic principles of HVAC systems. The student is expected to:

(A) explain the principles of HVAC systems;

(B) describe what the Clean Air Act means to the HVAC systems industry; and

(C) identify the types of schedules and drawings used in the HVAC systems and refrigeration industries.

(9) The student installs, selects, prepares, joins, and supports copper and plastic pipes and fittings. The student is expected to:

(A) describe the precautions that must be taken when installing refrigerant piping;

(B) select the right tubing for a project;

(C) cut and bend copper tubing;

(D) determine the kinds of hangers and supports needed for refrigeration piping;

(E) describe the requirements for pressure-testing an installed system;

(F) identify types of plastic pipe and describe their uses; and

(G) cut and join lengths of plastic pipe.

(10) The student operates, tests, and adjusts conventional and electronic thermostats as well as the common electrical, electronic, and pneumatic circuits used to control HVAC systems. The student is expected to:

(A) describe how conventional and electronic thermostats operate;

(B) describe how pneumatic and electronic circuits are used to control mechanical systems;

(C) analyze circuit diagrams for electronic and microprocessor-based controls; and

(D) troubleshoot systems using various controls.

(11) The student knows the concepts of historic preservation and local and national resources to maintain and renovate historic structures and landscapes. The student is expected to:

(A) research the U.S. Department of Interior's methods and guides for historic preservation;

(B) describe the rules and regulations for historic preservation as prescribed by the Texas Historical Commission; and

(C) describe the historic preservation building codes for a local area.

§127.98. Construction Management I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisites: Algebra I, Geometry, and Principles of Architecture or Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Construction Management I, students will gain knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management I includes the knowledge of design techniques and tools related to the management of architectural and engineering projects.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations

and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and career preparation requirements, in the field of construction management;

(B) demonstrate an understanding of group participation and leadership related to career preparation;

(C) identify employers' expectations, including appropriate work habits;

(D) apply the competencies related to resource technology in appropriate settings; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student applies academic skills to the requirements of construction management. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(B) complete work orders and related paperwork;

(C) estimate jobs, schedules, and industry standards related to legal restrictions;

(D) read and interpret appropriate architectural symbols, schematics, blueprints, work drawings, manuals, and bulletins; and

(E) apply descriptive geometry related to auxiliary views, revolutions, intersections, and piping drawings.

(3) The student gains knowledge about building materials used in the construction industry, including lumber, sheet materials, engineered wood products, structural concrete, structural steel, fasteners, and adhesives used in construction settings. The student is expected to:

(A) identify various types of construction materials and methods;

(B) describe the uses of various types of hardwoods and softwoods;

(C) identify the grades and markings of wood building materials;

(D) describe the proper method of storing and handling building materials;

(E) describe the uses of various types of engineered lumber;

(F) calculate quantities of lumber and wood products using industry-standard methods; and

(G) describe the fasteners, anchors, and adhesives used in construction work.

(4) The student describes how a systems model can be used to describe construction activities, including mechanical, fluid, electrical, and thermal systems. The student is expected to:

(A) apply the universal systems model to construction activities;

(B) identify the inputs, processes, outputs, and feedback associated with construction systems;

(C) describe the subsystems used in construction; and

(D) describe how technological systems interact to achieve common goals.

(5) The student selects and uses the proper construction technology to meet practical objectives. The student is expected to:

(A) distinguish between architectural and civil construction systems;

(B) apply construction technology to individual or community problems;

(C) describe the factors that affect the purchase and use of constructed items; and

(D) identify and describe the roles of construction.

(6) The student designs an item for construction using appropriate design processes and techniques. The student is expected to:

(A) describe the design processes and techniques used in construction;

(B) develop or improve a building or structure that meets specified needs; and

(C) identify areas where quality, reliability, and safety can be designed into a building or structure.

(7) The student investigates emerging and innovative construction technologies. The student is expected to:

(A) report on emerging and innovative construction technologies; and

(B) conduct research and experimentation in construction technology.

(8) The student describes quality and how it is measured in construction. The student is expected to:

(A) describe different quality control applications in construction; and

(B) apply continuous quality improvement techniques to the construction of a building or structure.

(9) The student builds buildings or structures using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) describe the chemical, mechanical, and physical properties of construction materials;

(B) describe the processes used in construction; and

(C) construct buildings or structures using a variety of tools, equipment, and machines.

(10) The student works safely with construction tools, equipment, machines, and materials. The student is expected to:

(A) master relevant safety tests;

(B) follow safety manuals, instructions, and requirements;

(C) identify and classify hazardous materials and wastes; and

(D) dispose of hazardous materials and wastes appropriately.

(11) The student describes the importance of maintenance in construction. The student is expected to:

(A) maintain tools and materials correctly;

(B) perform manufacturers' maintenance procedures on selected tools, equipment, and machines; and

(C) describe the results of negligent or improper maintenance.

(12) The student manages a construction project. The student is expected to:

(A) develop a plan for completing a construction project; and

(B) participate in the organization and operation of a real or simulated construction project using project management processes, including initiating, planning, executing, monitoring and controlling, and closing a project.

(13) The student applies the appropriate codes, laws, standards, or regulations related to construction technology. The student is expected to:

(A) explain the importance of codes, laws, standards, or regulations related to construction technology;

(B) identify areas where codes, laws, standards, or regulations related to construction technology may be required; and

(C) comply with appropriate codes, laws, standards, or regulations.

(14) The student describes the intended and unintended effects of technological solutions. The student is expected to:

(A) apply an assessment strategy to determine the risks and benefits of technological developments in construction;

(B) describe how technology has affected individuals, societies, cultures, economies, and environments;

(C) discuss the international effects of construction technology; and

(D) describe the issues related to regional and community planning.

(15) The student identifies the factors that influence the evolution of construction technology. The student is expected to:

(A) describe how changes in construction technology affect business and industry; and

(B) describe how the evolution of construction technology has been influenced by past events.

(16) The student solves problems, thinks critically, and makes decisions related to construction technology. The student is expected to:

(A) develop or improve a building or structure by following a problem-solving strategy; and

(B) apply critical-thinking strategies to analyze and evaluate proposed technological solutions.

(17) The student identifies the factors that influence the cost of goods and services in construction projects. The student is expected to:

(A) develop a budget for a construction project; and

(B) determine the most effective strategies to minimize costs.

(18) The student knows the concepts and skills that form the technical knowledge of building carpentry. The student is expected to:

(A) identify the uses of carpentry hardware and fasteners; and

(B) demonstrate knowledge of fire ratings of construction materials.

(19) The student knows the function and application of the tools, equipment, technologies, and materials used in construction carpentry. The student is expected to:

(A) use hand tools, power tools, and equipment commonly employed in carpentry in a safe manner;

(B) handle and dispose of environmentally hazardous materials used in carpentry in the proper manner;

(C) use the different types of scaffolding employed in building carpentry in a safe manner; and

(D) demonstrate knowledge of new and emerging technologies that may affect construction carpentry.

(20) The student applies the concepts and skills of the construction industry to simulated or actual work situations. The student is expected to:

(A) square, measure, and cut materials to specified dimensions;

(B) handle different types of loads;

(C) use framing techniques for walls, floors, ceilings, rafters, structural timbers, stairs, trusses, and fireproof metal-studs;

(D) demonstrate the proper principles of drywall application; and

(E) install doors, windows, interior and exterior wall covering, and trim.

(21) The student knows the proper and safe use of hand and power tools. The student is expected to:

(A) identify the hand tools commonly used by carpenters and describe their uses;

(B) use hand tools safely;

(C) state the general safety rules for operating all power tools, regardless of type;

(D) identify the portable power tools commonly used by carpenters and describe their uses; and

(E) use portable power tools safely.

(22) The student learns how to interpret architectural and engineering working drawings and specifications. The student will become familiar with the symbols and nomenclature specific to the construction industry. The student is expected to:

(A) describe the types of drawings usually included in a set of plans;

(B) identify the different types of lines used on construction drawings;

(C) identify selected architectural symbols commonly used to represent materials on plans;

(D) identify selected electrical, mechanical, and plumbing symbols commonly used on plans;

(E) identify selected abbreviations commonly used on plans;

(F) read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings;

(G) state the purpose of written specifications; and

(H) demonstrate or describe how to perform a quantity takeoff for materials.

(23) The student gains knowledge about the basics of wood framing, including layout and construction of wood-framed floor systems using common and engineered lumber. The student is expected to:

(A) identify the different types of framing systems;

(B) interpret drawings with specifications to determine floor system requirements;

(C) identify framing and support members as it refers to flooring;

(D) name the methods used to fasten sills to the foundation;

(E) given specific floor load and span data, select the proper girder and beam size from a list of available girders and beams;

(F) list and recognize different types of bridging;

(G) list and recognize different types of flooring materials;

(H) explain the purposes of subflooring and underlayment;

(I) select the appropriate fasteners to be used in various floor-framing systems;

(J) estimate the amount of material needed to frame a floor assembly; and

(K) demonstrate the ability to lay out and construct a floor assembly, including installing bridging; installing joists for a cantilever-floor; installing a subfloor using butt-joint plywood or oriented strand board panels; and installing a single floor system using tongue-and-groove plywood or oriented strand board panels.

(24) The student understands how to lay out and frame walls and ceilings, rough-in door and window openings, construct corners and partition tee-bracing walls and ceilings, and apply sheathing. The student is expected to:

(A) identify the components of a wall and ceiling layout;

(B) describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and fire stops;

(C) describe the correct procedure for assembling and erecting an exterior wall;

(D) identify the common materials and methods for installing sheathing on walls;

(E) describe or demonstrate how to lay out, assemble, erect, and brace exterior walls for a frame building;

(F) describe wall-framing techniques used in masonry construction;

(G) explain the use of metal studs in wall framing;

(H) explain how to cut and install ceiling joists on a wood frame building; and

(I) estimate the materials required for frame walls and ceilings.

(25) The student investigates various types of framed roofs. The student is expected to:

(A) demonstrate an understanding of the terms associated with roof framing;

(B) identify the roof-framing members used in gable and hip roofs;

(C) identify the methods used to calculate the length of a rafter;

(D) identify the various types of trusses used in roof framing;

(E) use a framing square, speed square, and calculator in laying out a roof;

(F) identify various types of sheathing used in roof construction;

(G) frame or describe how to frame a gable roof with vent openings;

(H) erect, or describe how to erect, a gable roof using trusses;

(I) frame, or describe how to frame, a roof opening; and

(J) estimate the materials used for framing and sheathing a roof.

(26) The student describes various types of windows, skylights, and exterior doors. The student is expected to:

(A) identify various types of fixed, sliding, and swinging windows;

(B) identify the parts of a window installation;

(C) state the requirements for proper window installation;

(D) explain how to install a pre-hung window;

(E) identify the common types of exterior doors and explain how they are constructed;

(F) identify the parts of a door installation;

(G) identify types of thresholds used with exterior doors;

(H) install, or explain the procedure to install, a pre-hung exterior door;

(I) identify the various types of locksets used on exterior doors and explain how the locksets are installed;

(J) install a lockset; and

(K) identify and explain the use and installation of various other door and window hardware, including security hinges, keepers, deadbolts, and peep holes.

(27) The student describes various types of stairs and the common building code requirements related to stairs. The student is expected to:

(A) identify the various types of stairs;

(B) identify the various parts of stairs;

(C) identify the materials used in the construction of stairs;

(D) interpret construction drawings of stairs; and

(E) calculate the total rise, number and size of risers, and the number and size of treads required for a given stairway.

(28) The student describes basic product marketing processes and techniques used in construction. The student is expected to prepare a marketing plan for an idea, product, or service.

(29) The student investigates career opportunities, requirements, and expectations in construction technology. The student is expected to:

(A) describe an area of interest in construction and investigate its entry-level requirements and advancement opportunity requirements and its growth potential; and

(B) identify the careers available in construction technology.

(30) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) describe the use of teamwork to solve problems;

(C) distinguish between the roles of team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' expectations and appropriate work habits;

(F) define discrimination, harassment, and inequality; and

(G) describe the use of time-management techniques to develop and maintain work schedules and meet deadlines.

§127.99. Construction Management II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Construction Management I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Construction Management II, students will gain knowledge and skills needed to enter the workforce as apprentice carpenters or building maintenance supervisors' assistants or to build a foundation toward a postsecondary degree in architecture, construction science, drafting, or engineering. Construction Management II includes knowledge of the design, techniques, and tools related to the management of architectural and engineering projects.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply construction technology to individual or local problems;

(B) identify the appropriate resources needed to solve problems; and

(C) describe the factors that affect the purchase and use of buildings.

(2) The student designs or modifies a structure using designated design processes and techniques. The student is expected to:

(A) develop or improve a building design that meets a specified need; and

(B) develop and communicate ideas using specified design processes.

(3) The student investigates emerging construction technologies. The student is expected to:

(A) report on emerging construction technologies; and

(B) conduct research in construction technology to determine its effectiveness.

(4) The student describes quality and how it is measured in construction. The student is expected to:

(A) construct items that meet a specified level of quality;

(B) recommend how the quality of a building can be improved; and

(C) explain the factors that affect the quality of buildings.

(5) The student constructs buildings or scaled models using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) describe the chemical, mechanical, and physical properties and standard units of measure of architectural construction materials such as concrete, masonry, and metals;

(B) describe the processes used in construction; and

(C) construct a building or a model of a building using a variety of tools, equipment, and machines.

(6) The student works safely with construction technology. The student is expected to:

(A) master relevant safety tests;

(B) follow safety manuals, instructions, and requirements;

(C) identify and classify hazardous materials and wastes correctly;

(D) dispose of hazardous materials and waste appropriately; and

(E) recommend improvements in safety procedures.

(7) The student performs basic maintenance on selected construction equipment and machines. The student is expected to:

(A) maintain tools and materials correctly;

(B) perform manufacturers' maintenance procedures on selected tools, equipment, and machines; and

(C) develop a maintenance plan for selected machines and equipment.

(8) The student manages construction technology projects. The student is expected to:

(A) initiate a construction technology project;

(B) plan a construction technology project, including developing a project schedule and describing use of resources needed;

(C) execute a construction technology project;

(D) monitor and control a construction technology project; and

(E) close a construction technology project.

(9) The student follows the appropriate codes, laws, standards, or regulations related to architectural construction technology. The student is expected to:

(A) identify areas where codes, laws, standards, or regulations may be required;

(B) locate the appropriate codes, laws, standards, or regulations; and

(C) comply with the appropriate codes, laws, standards, or regulations.

(10) The student solves problems, thinks critically, and makes decisions related to architectural construction. The student is expected to:

(A) develop or improve a building or structure by following a problem-solving strategy;

(B) apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and

(C) apply decision-making techniques to the selection of technological solutions.

(11) The student determines the cost of constructing a building. The student is expected to:

(A) develop a budget for a construction project; and

(B) determine the most effective strategies to minimize costs.

(12) The student applies communication, mathematical, and scientific knowledge and skills to construction activities. The student is expected to:

(A) write technical reports;

(B) make technical presentations to groups of individuals;

(C) use mathematical concepts in construction technology; and

(D) apply scientific principles used in construction technology.

(13) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish between the roles of team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' expectations for appropriate work habits;

(F) define discrimination, harassment, and inequality;

(G) use time-management techniques to develop work schedules, maintain work schedules, and meet work schedule deadlines; and

(H) complete work according to established criteria.

(14) The student gains knowledge about the ingredients of concrete, various types of concrete, and methods to mix concrete. The student is expected to:

(A) identify the properties of cement;

(B) describe the composition of concrete;

(C) perform volume estimates for concrete quantity requirements;

(D) describe types of concrete reinforcement materials;

(E) describe various types of footings and explain their uses;

(F) identify the parts of various types of forms;

(G) explain the safety procedures associated with the construction of concrete forms; and

(H) explain how to erect, plumb, and brace a simple concrete form with reinforcement.

(15) The student uses a systems approach to investigate mechanical, fluid, electrical, and thermal systems. The student is expected to:

(A) apply the universal systems model to technological activities; and

(B) identify the inputs, processes, outputs, and feedback associated with each of the systems.

(16) The student works safely with mechanical, fluid, electrical, and thermal technology. The student is expected to:

(A) master relevant safety tests;

(B) follow safety manuals, instructions, and requirements;

(C) identify and classify hazardous materials and wastes; and

(D) dispose of hazardous materials and wastes appropriately.

(17) The student solves problems, thinks critically, and makes decisions related to construction. The student is expected to:

(A) apply problem-solving strategies;

(B) apply critical-thinking strategies;

(C) apply decision-making techniques to the selection of technological solutions; and

(D) evaluate the impact of technology on scientific thought, society, and the environment.

(18) The student applies communication, science, and mathematics knowledge and skills to construction activities. The student is expected to:

(A) prepare technical reports and presentations;

(B) solve algebraic equations;

(C) solve problems in U.S. standard and metric units; and

(D) perform unit conversions.

(19) The student knows the laws governing motion. The student is expected to:

(A) analyze examples of uniform and accelerated motion, including linear, projectile, and circular motion;

(B) evaluate the effects of forces on the motion of objects;

(C) develop a free-body diagram for force analysis; and

(D) analyze motion relative to different frames of reference.

(20) The student knows the concept of momentum. The student is expected to:

(A) identify linear and angular momentum; and

(B) relate the conservation of momentum to linear and angular motion.

(21) The student knows the concept of waves and vibrations. The student is expected to:

(A) evaluate characteristics of wave motion; and

(B) demonstrate how waves transmit energy.

(22) The student knows the concept of energy conversion. The student is expected to:

(A) evaluate the purpose of energy converters;

(B) identify converters that change one form of energy to another; and

(C) evaluate the efficiency of converting energy from one form to another.

(23) The student knows the concept of energy transduction. The student is expected to:

(A) identify the function of a transducer;

(B) distinguish between an energy converter and a transducer; and

(C) identify transducers that change energy signals from one form to another.

(24) The student knows the concept of radiant energy. The student is expected to:

(A) describe radiation;

(B) compare fission and fusion in terms of end products, energy, advantages, and availability; and

(C) compare and contrast different types of radioactive decay.

(25) The student knows the concept of light and optics. The student is expected to:

(A) identify characteristics of optical devices;

(B) analyze the characteristics of light, including reflection, refraction, and interference; and

(C) interpret the effects of wave characteristics in daily applications such as lasers and optics in industrial and medical technology.

(26) The student knows the concept of time constants. The student is expected to:

(A) define a time constant; and

(B) distinguish between a linear and non-linear increase and decrease of a variable with time.

(27) The student describes basic product marketing processes and techniques used in construction. The student is expected to:

(A) prepare a marketing plan for an idea, product, or service; and

(B) discuss the effect of customer satisfaction on the image of a product or company.

(28) The student investigates career opportunities, requirements, and expectations in construction technology. The student is expected to:

(A) identify an area of interest in construction and investigate its entry-level and advancement requirements and its growth potential; and

(B) describe the careers available in construction.

(29) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish between the roles of team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' expectations and appropriate work habits;

(F) define discrimination, harassment, and inequality;

(G) use time-management techniques to develop and maintain work schedules and meet deadlines; and

(H) complete work according to established criteria.

§127.100. Construction Technology I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Construction or Principles of Architecture. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Construction Technology I, students will gain knowledge and skills needed to enter the workforce as carpenters or building maintenance supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in safety, tool usage, building materials, codes, and framing. For safety and liability considerations, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) apply critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) define effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student understands that safe working standards are imperative in the classroom and in the field. The student is expected to:

(A) explain the idea of a safety culture;

(B) explain the importance of a safety culture in the construction crafts;

(C) explain the role of Occupational Safety and Health Administration (OSHA) in job-site safety;

(D) explain fall protection, ladder safety, stair safety, and scaffold safety procedures;

(E) explain the importance of hazard communication (HazCom);

(F) explain the importance of Safety Data Sheets (SDS);

(G) explain OSHA's General Duty Clause;

(H) explain OSHA 1926 CFR Subpart C;

(I) identify causes of accidents;

(J) identify impacts of accident costs;

(K) identify struck-by hazards;

(L) identify caught-in-between hazards;

(M) identify other construction hazards on the jobsite, including hazardous material exposures, environmental elements, welding and cutting hazards, confined spaces, and fires;

(N) define safe work procedures around electrical hazards;

(O) define hazard recognition;

(P) define risk assessment techniques; and

(Q) demonstrate the use and care of appropriate personal protective equipment, including safety goggles and glasses, hard hats, gloves, safety harnesses, and safety shoes.

(3) The student identifies various opportunities in the field of carpentry and the characteristics a carpenter should possess. The student is expected to:

(A) identify job opportunities and their accompanying job duties such as carpentry, building maintenance supervisor, architect, and engineer; and

(B) research careers along with the education, job skills, and experience required to achieve them.

(4) The student gains knowledge about building materials used in the construction industry. The student is expected to:

(A) identify various types of building materials and their uses;

(B) state the uses of various types of hardwoods and softwoods;

(C) identify the different grades and markings of wood building materials;

(D) describe the proper method of storing and handling building materials;

(E) state the uses of various types of engineered lumber;

(F) calculate the quantities of lumber and wood products using industry-standard methods; and

(G) describe the fasteners, anchors, and adhesives used in construction work and explain their uses.

(5) The student applies the proper and safe use of hand and power tools associated with carpentry. The student is expected to:

(A) identify the hand tools commonly used by carpenters and describe their uses;

(B) use hand tools in a safe and appropriate manner;

(C) state the general safety rules for operating all power tools, regardless of type;

(D) identify the portable power tools commonly used by carpenters and describe their uses; and

(E) use portable power tools in a safe and appropriate manner.

(6) The student interprets architectural and engineering working drawings and specifications. The student is expected to:

(A) describe the types of drawings usually included in a set of plans and list the information found on each type;

(B) identify the different types of lines used on construction drawings;

(C) identify selected architectural symbols commonly used to represent materials on plans;

(D) identify selected electrical, mechanical, and plumbing symbols commonly used on plans;

(E) identify selected abbreviations commonly used on plans;

(F) read and interpret plans, elevations, schedules, sections, and details contained in basic construction drawings;

(G) state the purpose of written specifications;

(H) identify and describe the parts of a specification; and

(I) demonstrate or describe how to perform a quantity takeoff for materials.

(7) The student gains knowledge of wood framing and the layout and construction of wood-framed floor systems using common and engineered lumber. The student is expected to:

(A) identify the different types of framing systems;

(B) read and interpret drawings and specifications to determine floor system requirements;

(C) identify floor and sill framing and support members;

(D) name the methods used to fasten sills to the foundation;

(E) select the proper girder or beam size from a list of available girders or beams given specific floor load and span data;

(F) list and recognize different types of bridging;

(G) list and recognize different types of flooring materials;

(H) explain the purposes of subflooring and underlayment;

(I) select the appropriate fasteners to be used in various floor framing systems;

(J) estimate the amount of material needed to frame a floor assembly;

(K) lay out and construct a floor assembly;

(L) install bridging;

(M) install joists for a cantilever-floor;

(N) install a subfloor using butt-joint plywood or oriented strand board panels; and

(O) install a single floor system using tongue-and-groove (T&G) plywood or oriented strand board (OSB) panels.

(8) The student knows how to lay out and frame walls and ceilings, rough-in door and window openings, construct corners and partition Ts, brace walls and ceilings, and apply sheathing. The student is expected to:

(A) identify the components of a wall and ceiling layout;

(B) describe the procedure for laying out a wood frame wall, including the installation of plates, corner posts, door and window openings, partition Ts, bracings, and firestops;

(C) describe the correct procedure for assembling and erecting an exterior wall;

(D) identify the common materials and methods used for installing sheathing on walls;

(E) lay out, assemble, erect, and brace exterior walls for a frame building;

(F) describe wall framing techniques used in masonry construction;

(G) explain the use of metal studs in wall framing;

(H) cut and install ceiling joists on a wood frame building; and

(I) estimate the materials required for frame walls and ceilings.

(9) The student gains knowledge of various types of framed roofs and how to frame these roofs using both stick-build and truss-build systems. The student is expected to:

(A) demonstrate an understanding of the terms associated with roof framing;

(B) identify the roof framing members used in gable and hip roofs;

(C) identify the methods used to calculate the length of a rafter;

(D) identify the various types of trusses used in roof framing;

(E) use a framing square, speed square, and calculator in laying out a roof;

(F) identify various types of sheathing used in roof construction;

(G) frame a gable roof with vent openings;

(H) erect a gable roof using trusses;

(I) frame a roof opening; and

(J) estimate the materials used for framing and sheathing a roof.

(10) The student knows the ingredients of concrete, various types of concrete, and methods to mix concrete. The student is expected to:

(A) identify the properties of cement;

(B) describe the composition of concrete;

(C) perform volume estimates for concrete;

(D) identify types of concrete reinforcement materials and describe their uses;

(E) identify various types of footings and explain their uses;

(F) identify the parts of various types of concrete forms;

(G) explain the safety procedures associated with the construction and use of concrete forms; and

(H) erect, plumb, and brace a simple concrete form with reinforcement.

(11) The student gains knowledge of various types of windows, skylights, and exterior doors. The student is expected to:

(A) identify various types of fixed, sliding, and swinging windows;

(B) identify the parts of a window installation;

(C) state the requirements for proper window installation;

(D) install a pre-hung window;

(E) identify the common types of exterior doors and explain how they are constructed;

(F) identify the parts of a door installation;

(G) identify types of thresholds used with exterior doors;

(H) install a pre-hung exterior door;

(I) identify the various types of locksets used on exterior doors and explain how the locksets are installed;

(J) install a lockset; and

(K) identify and explain the use and installation of various door and window hardware, including security hinges, keepers, deadbolts, and peep holes.

(12) The student is introduced to various types of stairs and the common building code requirements related to stairs. The student is expected to:

(A) identify the various types of stairs;

(B) identify the various parts of stairs;

(C) identify the materials used in the construction of stairs;

(D) interpret construction drawings of stairs;

(E) calculate the total rise, number and size of risers, and the number and size of treads required for a given stairway;

(F) lay out and cut stringers, risers, and treads; and

(G) build a small stair unit with a temporary handrail.

§127.101. Construction Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Construction Technology I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Construction Technology II, students will gain advanced knowledge and skills needed to enter the workforce as carpenters, building maintenance technicians, or supervisors or to prepare for a postsecondary degree in construction management, architecture, or engineering. Students will build on the knowledge base from Construction Technology I and are introduced to exterior and interior finish out skills. For safety and liability considerations, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) define effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student is provided with the knowledge to interpret various types of working drawings as they pertain to commercial construction. The student is expected to:

(A) recognize the difference between commercial and residential construction drawings;

(B) identify the basic keys, abbreviations, and other references contained in a set of commercial drawings;

(C) accurately read a set of commercial drawings;

(D) identify and document specific items from a door and window schedule;

(E) explain basic construction details and concepts employed in commercial construction; and

(F) calculate the floor area of each room in a floor plan.

(3) The student selects and installs common roofing materials for residential and light commercial projects. The student is expected to:

(A) identify the materials and methods used in roofing;

(B) explain the safety requirements for roof jobs;

(C) install fiberglass shingles on gable and hip roofs;

(D) close up a valley using fiberglass shingles;

(E) explain how to make various roof projections watertight when using fiberglass shingles;

(F) complete the proper cuts and install the main and hip ridge caps using fiberglass shingles;

(G) lay out, cut, and install a cricket or saddle;

(H) install wood shingles and shakes on roofs;

(I) describe how to close up a valley using wood shingles and shakes;

(J) complete the cuts and install the main and hip ridge caps using wood shakes or shingles; and

(K) demonstrate the techniques for installing other selected types of roofing materials.

(4) The student selects and installs various types of insulation in walls, floors, and attics. The student is expected to:

(A) describe the requirements for insulation;

(B) describe the characteristics of various types of insulation material;

(C) calculate the required amounts of insulation for a structure;

(D) install selected insulation materials;

(E) describe the requirements for moisture control and ventilation;

(F) install selected vapor barriers;

(G) describe various methods of waterproofing;

(H) describe air infiltration control requirements; and

(I) install selected building wraps.

(5) The student learns the processes to install various exterior siding materials. The student is expected to:

(A) describe the purpose of wall insulation and flashing;

(B) install selected common cornices;

(C) demonstrate lap and panel siding estimating methods;

(D) describe the types and applications of common wood siding;

(E) describe fiber-cement siding and its uses;

(F) describe the types and styles of vinyl and metal siding;

(G) describe the types and applications of stucco and masonry veneer finishes; and

(H) install three types of siding commonly used in the local area.

(6) The student knows the types and grades of steel framing materials and the process for installing metal framing for interior walls, exterior nonbearing walls, and partitions. The student is expected to:

(A) identify the components of a steel framing system;

(B) identify and select the tools and fasteners used in a steel framing system;

(C) identify applications for steel framing systems;

(D) demonstrate the ability to build back-to-back, box, and L-headers;

(E) layout and install a steel stud structural wall with openings to include bracing and blocking; and

(F) layout and install a steel-stud, non-structural wall with openings to include bracing and blocking.

(7) The student knows various types of gypsum drywall and their uses and the fastening devices and methods used to install them. The student is expect to:

(A) identify the different types of drywall and their uses;

(B) select the type and thickness of drywall required for specific installations;

(C) select fasteners for drywall installations;

(D) explain the fastener schedules for different types of drywall installations;

(E) perform single-layer and multi-layer drywall installations using different types of fastening systems, including nails, drywall screws, and adhesives;

(F) install gypsum drywall on steel studs;

(G) explain how soundproofing is achieved in drywall installations; and

(H) estimate material quantities for a drywall installation.

(8) The student knows the materials, tools, and methods used to finish and patch gypsum drywall. The student is expected to:

(A) state the differences between the six levels of finish established by industry standards and distinguish between finish levels by observation;

(B) identify the hand tools used in drywall finishing and demonstrate the ability to use these tools;

(C) identify the automatic tools used in drywall finishing;

(D) identify the materials used in drywall finishing and state the purpose and use of each type of material, including compounds, joint reinforcing tapes, trim materials, textures, and coatings;

(E) finish drywall using hand tools;

(F) recognize various types of problems that occur in drywall finishes and identify their causes;

(G) identify the correct methods for solving each type of problem that occurs in drywall finishes; and

(H) patch damaged drywall.

(9) The student installs metal doors and related hardware in steel-framed, wood-framed, and masonry walls. The student is expected to:

(A) identify various types of door jambs and frames;

(B) demonstrate the installation procedures for placing door jambs and frames in different types of interior partitions;

(C) identify different types of interior doors;

(D) identify different types of interior door hardware and demonstrate the installation procedures for them;

(E) list and identify items included on a typical door schedule; and

(F) demonstrate the procedure for placing and hanging a door.

(10) The student gains knowledge of the materials, layout, and installation of various types of suspended ceilings used in commercial construction as well as ceiling tiles, drywall suspension systems, and pan-type ceilings. The student is expected to:

(A) establish a level line;

(B) explain the common terms related to sound waves and acoustical ceiling materials;

(C) identify the different types of suspended ceilings;

(D) interpret plans related to ceiling layout;

(E) sketch the ceiling layout for a basic suspended ceiling; and

(F) install selected suspended ceilings.

(11) The student knows the types of trim used in finish work. The student is expected to:

(A) identify the different types of standard moldings and describe their uses;

(B) make square and miter cuts using a miter box or power miter saw;

(C) make coped joint cuts using a coping saw;

(D) select and use fasteners to install trim, including door trim, window trim, base trim, and ceiling trim; and

(E) estimate the quantities of different trim materials required for selected rooms.

(12) The student selects and installs base and wall cabinets and countertops. The student is expected to:

(A) state the classes and sizes of typical base and wall kitchen cabinets;

(B) identify cabinet components and hardware and describe their purposes;

(C) lay out factory-made cabinets, countertops, and backsplashes;

(D) explain the installation of an island base;

(E) recognize the common types of woods used to make cabinets;

(F) identify and cut the various types of joints used in cabinetmaking;

(G) build a cabinet from a set of drawings; and

(H) install plastic laminate on a countertop core.

§127.102. Mill and Cabinetmaking Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Architecture and Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Mill and Cabinetmaking Technology, students will gain knowledge and skills needed to enter the workforce in the area of mill work and cabinet manufacturing and installation. Students may also apply these skills to professions in carpentry or building maintenance supervision or use the skills as a foundation for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in cabinet design, tool usage, jointing methods, finishes, and industry-level practices such as numerical and computer-control production methods.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and preparation requirements, for mill and cabinetmaking;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) identify employers' expectations for appropriate work habits;

(D) apply the competencies related to resources, information, systems, and technology in appropriate settings and situations; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student relates core academic skills to the requirements of mill and cabinetmaking. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(B) complete work orders and related paperwork;

(C) estimate supplies, materials, and labor costs for work orders;

(D) apply the principles of mathematics for accurate standard and metric measurements; and

(E) read and interpret appropriate blueprints, drawings, charts, and diagrams.

(3) The student knows the concepts and skills that form the core knowledge of mill and cabinetmaking. The student is expected to:

(A) demonstrate knowledge of cabinetmaking design;

(B) demonstrate knowledge of the use of woods, fasteners, hardware, glass, and mirrors; and

(C) demonstrate knowledge of the industrial processes and procedures used in mill and cabinetmaking.

(4) The student knows the function and application of the tools, equipment, technologies, and materials used in mill and cabinetmaking. The student is expected to:

(A) use in a safe manner hand and power tools and equipment commonly employed in mill and cabinetmaking;

(B) handle and dispose of environmentally hazardous materials used in mill and cabinetmaking;

(C) demonstrate the proper procedures to saw, plane, shape, turn, bore, mortise, and sand various types of woods; and

(D) demonstrate knowledge of new and emerging technologies that may affect mill and cabinetmaking.

(5) The student applies the concepts and skills of mill and cabinetmaking to simulated and actual work situations. The student is expected to:

(A) identify and construct the various joints used in cabinetmaking;

(B) demonstrate the proper procedures to glue, clamp, laminate, veneer, and inlay wood;

(C) demonstrate the proper procedures to construct and install cabinet doors, furniture doors, drawers, drawer guides, shelves, cabinet interiors, legs, posts, table tops, and cabinet tops; and

(D) apply proper finishing techniques.

§127.103. Masonry Technology I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Masonry Technology I provides information and techniques related to basic masonry and safety precautions. For safety and liability considerations, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) define effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student describes materials and techniques used in basic masonry. The student is expected to:

(A) explain how concrete masonry units (CMUs), or blocks, are used in construction;

(B) explain how clay masonry units (bricks) are used in construction;

(C) explain how stone is used in construction;

(D) describe how mortar and grout are used in masonry construction; and

(E) describe how wall structures are created using masonry units.

(3) The student identifies safe practices and expectations for the masonry industry. The student is expected to:

(A) identify the costs of job accidents;

(B) identify the causes of job accidents;

(C) recognize the hazards;

(D) demonstrate proper housekeeping techniques;

(E) observe mortar and concrete safety; and

(F) observe flammable liquid safety.

(4) The student demonstrates awareness of safe practices and expectations for the masonry industry and recognizes proper personal protective equipment. The student is expected to:

(A) explain protective lenses and face shields;

(B) describe hearing protection;

(C) identify gloves used in the masonry trade; and

(D) use respirators.

(5) The student understands the importance of being trained in and aware of safe practices and expectations for the masonry industry, including working safely from elevated surfaces. The student is expected to:

(A) explain fall protection procedures;

(B) describe personal fall arrest systems;

(C) list basic scaffold safety guidelines; and

(D) explain how to protect against falling objects.

(6) The student explains safe practices and expectations for the masonry industry. The student is expected to:

(A) explain the safe use of hand tools;

(B) demonstrate the safe use of saws;

(C) explain the safe use of mixers;

(D) explain the safe use of grinders;

(E) describe the safe use of powder-actuated tools;

(F) explain how to work safely around a fork lift;

(G) list basic electrical safety guidelines;

(H) explain how to store and stockpile masonry materials safely; and

(I) demonstrate how to stack brick safely.

(7) The student identifies masonry hand tools. The student is expected to:

(A) demonstrate how to use trowels;

(B) demonstrate how to use hammers and chisels;

(C) demonstrate how to use jointers and brushes; and

(D) identify other hand tools used in masonry.

(8) The student understands the importance of measurements and measuring tools used in masonry. The student is expected to:

(A) demonstrate how to use the modular spacing rule, brick spacing rule, oversized brick spacing rule, and steel tape measure;

(B) demonstrate how to use levels;

(C) demonstrate how to use chalk boxes, squares, plumb-bobs, and laser levels; and

(D) demonstrate how to use corner poles, lines, and fasteners.

§127.104. Masonry Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Masonry Technology I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Masonry Technology II is designed to further enhance the skills and knowledge of the beginning masonry student. For safety and liability considerations, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) define effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student recognizes mathematical concepts used in masonry and is able to apply mathematical concepts used in masonry. The student is expected to:

(A) read a six-foot rule;

(B) read other measuring devices;

(C) read a mason's rule;

(D) apply the 3-4-5 formula to square a corner;

(E) recognize modular increments;

(F) describe how to determine areas and circumferences;

(G) explain the basic parts of a set of drawings;

(H) identify lines, symbols, and abbreviations used on drawings;

(I) explain scales and dimensions used on drawings;

(J) explain types of construction drawings;

(K) identify the purpose of specifications, standards, and codes used in the building industry and the sections that pertain to masonry;

(L) explain the purpose of specifications, standards, and codes; and

(M) describe the purpose of inspections and testing.

(3) The student learns to describe the ingredients and types of mortar. The student is expected to:

(A) explain the use of Portland cement, hydrated lime, and sand;

(B) identify masonry cement;

(C) explain pre-blended mortars;

(D) explain the use of water and admixtures;

(E) list the types of masonry mortars;

(F) explain the properties of plastic mortar;

(G) identify the properties of hardened mortar;

(H) identify the common problems found in mortar application and their solutions;

(I) describe the effects of improper proportioning and poor-quality materials;

(J) explain the effects of severe weather and tempering;

(K) describe efflorescence;

(L) set up, maintain, and dispose of mortar;

(M) maintain the mortar mixing area;

(N) set up a mixing area; and

(O) mix mortar with a power mixer.

(4) The student describes how to install concrete masonry units. The student is expected to:

(A) identify the characteristics of concrete masonry units;

(B) explain how to set up, layout, and bond concrete masonry units;

(C) explain how to lay and tool concrete masonry units;

(D) explain how to clean concrete masonry units;

(E) identify the characteristics of brick;

(F) demonstrate how to set up, layout, and bond brick;

(G) demonstrate how to lay and tool brick;

(H) demonstrate how to clean brick;

(I) cut with chisels and hammers;

(J) cut with masonry hammers;

(K) cut with saws and splitters;

(L) check units and cuts;

(M) install masonry reinforcements; and

(N) install masonry accessories.

§127.105. Architectural Design I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisites: Algebra I and English I. Recommended prerequisites: Geometry, Principles of Architecture, and Principles of Construction. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Architectural Design I, students will gain knowledge and skills needed to enter a career in architecture or construction or prepare a foundation toward a postsecondary degree in architecture, construction science, drafting, interior design, or landscape architecture. Architectural Design I includes the knowledge of the design, design history, techniques, and tools related to the production of drawings, renderings, and scaled models for nonresidential or residential architectural purposes.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and preparation requirements, in the field of architecture;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) identify employers' expectations and appropriate work habits;

(D) apply the competencies related to resources, information, systems, and technology in appropriate settings and situations; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student applies key cognitive skills and academic behaviors to the requirements of architectural studies. The student is expected to:

(A) self-monitor learning needs and seek assistance when needed;

(B) practice study habits necessary to manage academic pursuits and requirements;

(C) strive for accuracy and precision;

(D) complete and master tasks;

(E) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(F) complete work orders and related paperwork;

(G) estimate jobs, schedules, and practices related to legal restrictions;

(H) read and interpret appropriate architectural symbols, schematics, blueprints, work drawings, manuals, and bulletins; and

(I) apply descriptive geometry related to auxiliary views, revolutions, and intersections.

(3) The student knows the concepts and skills that form the technical knowledge of architectural design. The student is expected to:

(A) demonstrate knowledge of architectural design principles;

(B) determine building code and zoning requirements for building types in a selected area; and

(C) demonstrate knowledge of the various grades and types of construction materials.

(4) The student knows the function and application of the tools, equipment, technologies, and materials used in architectural drawing. The student is expected to:

(A) use the tools, materials, and equipment commonly employed in the field of architecture in a safe manner;

(B) handle and dispose of environmentally hazardous materials; and

(C) demonstrate knowledge of new and emerging technologies that may affect the field of architecture.

(5) The student applies the concepts and skills of the profession to simulated or actual work situations. The student is expected to:

(A) use problem-solving skills to analyze a situation and identify a problem to be solved;

(B) break a complex problem into component parts that can be analyzed and solved separately;

(C) strive for accuracy and precision;

(D) work independently;

(E) work collaboratively;

(F) research an architectural project;

(G) design and present an effective architectural product;

(H) present a final architectural product for critique;

(I) apply architectural lettering techniques;

(J) develop preliminary sketches of a nonresidential or residential architectural design;

(K) use traditional technical architectural drafting techniques to create drawings;

(L) demonstrate through drawings the development of maximum efficiency of circulation within areas or rooms;

(M) develop a site plan using maximum orientation of the building relative to views, sun, and wind direction;

(N) develop building designs to ensure compatibility between interior and exterior to enhance overall appearance;

(O) draw schematic site plans, floor plans, building elevations, sections, perspectives, and character sketches from bubble diagrams;

(P) draw scaled wall thickness plans, elevations, and sections;

(Q) develop details of floor and wall sections as required;

(R) demonstrate knowledge of the Americans with Disabilities Act;

(S) assemble an architectural design in three dimensions;

(T) customize screen menus to fit specific problems or needs;

(U) construct points, lines, and other geometric forms using accepted computer-aided design methods;

(V) create a freehand simple one-point perspective;

(W) use a computer system to create a bill of materials;

(X) use a computer system to create and modify architectural drawings; and

(Y) plot architectural drawings for presentation.

(6) The student begins exploration, development, and organization of ideas from the surroundings. The student is expected to:

(A) begin illustrating ideas for architectural projects from direct observation, experiences, imagination; and

(B) begin comparing and contrasting the use of architectural elements such as color, texture, form, line, space, value, and architectural principles such as emphasis, pattern, rhythm, balance, proportion, and unity in personal architectural projects and those of others using vocabulary accurately.

(7) The student begins expressing ideas through original architectural projects using a variety of media with appropriate skill. The student is expected to:

(A) create beginning visual solutions by elaborating on direct observation, experiences, and imagination;

(B) create beginning designs for practical applications; and

(C) demonstrate beginning effective use of architectural media and tools in design, drawing, painting, printmaking, and sculpture such as model building.

(8) The student demonstrates an understanding of architectural history and culture as records of human achievement from ancient Egypt to the present. The student is expected to:

(A) compare and contrast historical and contemporary styles, identifying general themes and trends;

(B) describe general characteristics in architectural projects from a variety of cultures; and

(C) compare and contrast career opportunities in architecture.

(9) The student makes beginning informed judgments about personal architectural projects and the architectural projects of others. The student is expected to:

(A) interpret, evaluate, and justify architectural artistic decisions in personal architectural projects; and

(B) select and analyze original architectural projects, portfolios, and exhibitions by peers or others to form precise conclu-

sions about formal qualities, historical and cultural contexts, intents, and meanings.

(10) The student makes informed career decisions that reflect career goals. The student is expected to:

(A) determine employment and entrepreneurial opportunities and preparation requirements in architecture and related fields;

(B) propose short-term and long-term career goals;

(C) describe technology used in architectural careers;

(D) maintain a project portfolio that documents experience by using graphic or written documentation of architectural-related projects; and

(E) develop a professional resume.

(11) The student applies communication, science, and mathematics knowledge and skills to architectural projects. The student is expected to:

(A) prepare professional communications, technical reports, and presentations;

(B) apply mathematical equations; and

(C) apply scientific principles and concepts.

(12) The student knows the concept of sustainability. The student is expected to:

(A) identify the nature of energy;

(B) relate potential energy, kinetic energy, and heat energy to conservation;

(C) create an energy model;

(D) evaluate different methods of energy transfer;

(E) recognize sustainable design as it relates to architectural design; and

(F) define green architecture as related to the field of architecture.

§127.106. Architectural Design II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisites: Architectural Design I or Advanced Interior Design and Geometry. Recommended prerequisites: Principles of Architecture and Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Architectural Design II, students will gain advanced knowledge and skills needed to enter a career in architecture or construction or prepare a foundation toward a postsecondary degree in architecture, construction science, drafting, interior design, or landscape architecture. Architectural Design II includes the advanced knowledge of the design, design history, techniques, and tools related to the production of drawings, renderings, and scaled models for nonresidential or residential architectural purposes.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and preparation requirements, in the field of architecture;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) identify employers' expectations and appropriate work habits;

(D) apply the competencies related to resources, information, systems, and technology in appropriate settings and situations; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student relates core academic skills to the requirements of architecture. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(B) complete work orders and related paperwork;

(C) estimate jobs, schedules, and standard industry practices related to legal restrictions;

(D) read and interpret architectural symbols, schematics, blueprints, work drawings, manuals, and bulletins; and

(E) apply descriptive geometry related to auxiliary views, revolutions, and intersections.

(3) The student knows the concepts and skills that form the technical knowledge of architectural computer-aided drafting. The student is expected to:

(A) demonstrate knowledge of architectural design principles;

(B) determine building code and zoning requirements for building types in a selected area; and

(C) demonstrate knowledge of the various grades and types of construction materials.

(4) The student knows the function and application of the tools, equipment, technologies, and materials used in architectural computer-aided design. The student is expected to:

(A) use the tools, materials, and equipment commonly employed in the field of architectural computer-aided design in a safe manner;

(B) handle and dispose of environmentally hazardous materials used in the field of architecture in accordance with the material safety data sheet (MSDS), the Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency (EPA) regulations; and

(C) demonstrate knowledge of new and emerging technologies that may affect the field of architecture.

(5) The student applies the concepts and skills of the trade to simulated and actual work situations. The student is expected to:

(A) use problem-solving skills to analyze a situation to identify a problem to be solved;

(B) break a complex problem into component parts that can be analyzed and solved separately;

(C) strive for accuracy and precision;

(D) work independently;

(E) work collaboratively;

(F) research an architectural project;

(G) design and present an effective architectural product;

(H) present a final architectural product for critique;

(I) apply architectural lettering techniques;

(J) develop preliminary sketches of a residential plan or nonresidential plan;

(K) demonstrate through drawings the development of maximum efficiency of circulation within areas or rooms;

(L) develop a site plan using maximum orientation of the building relative to views, sun, and wind direction;

(M) draw building designs and styles to ensure compatibility between interior and exterior to enhance overall appearance;

(N) draw schematic site plans, floor plans, roof plans, building elevations, sections, perspectives, and character sketches using design development techniques;

(O) draw scaled wall thickness plans, interior elevations, and sections;

(P) develop details, sections, floor and wall sections, ceiling and roof sections, door and window sections, and other sections as required;

(Q) assemble an architectural design in three dimensions;

(R) research the Green Building Rating System as defined by the U.S. Green Building Council; and

(S) create a project demonstrating sustainable design as it relates to architectural design as defined by the U.S. Green Building Council.

(6) The student applies the concepts and skills of the trade to simulated and actual work situations. The student is expected to:

(A) customize screen menus to fit specific problems or needs;

(B) construct architectural drawings using advanced computer-aided design drafting skills;

(C) create two- or three-point perspectives;

(D) create three-dimensional solid models;

(E) view three-dimensional objects in several different positions;

(F) use a computer system to create a bill of materials;

(G) use a computer-aided drafting system to create and modify nonresidential or residential architectural drawings;

(H) plot architectural drawings for presentation; and

(I) render three-dimensional objects with applied materials.

(7) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) describe how teams function;

(B) use teamwork to solve problems;

(C) distinguish between the roles of team leaders and team members;

(D) identify characteristics of good leaders;

(E) identify employers' expectations and appropriate work habits;

(F) define discrimination, harassment, and inequality;

(G) use time-management techniques to develop and maintain work schedules and meet deadlines; and

(H) complete work according to established criteria.

(8) The student sustains exploration, development, and organization of ideas from their surroundings. The student is expected to:

(A) use advanced skills to illustrate ideas for architectural projects from direct observation, experiences, and imagination; and

(B) use advanced skills comparing and contrasting the use of architectural elements such as color, texture, form, line, space, and value and architectural principles such as emphasis, pattern, rhythm, balance, proportion, and unity in personal architectural projects and those of others using vocabulary accurately.

(9) The student uses advanced skills expressing ideas through original architectural projects using a variety of media with appropriate skill. The student is expected to:

(A) create, using advanced skills, visual solutions by elaborating on direct observation, experiences, and imagination;

(B) create, using advanced skills, designs for practical applications; and

(C) demonstrate, using advanced skills, effective use of architectural media and tools in design, drawing, painting, printmaking, and sculpture such as advanced model building.

(10) The student demonstrates an understanding of architectural history and culture as records of human achievement by examining the connections between twentieth and twenty-first century architecture and art and connections between Greek and Roman architecture and art. The student is expected to:

(A) compare and contrast historical and contemporary styles by identifying general themes and trends;

(B) describe general characteristics in architectural artworks from a variety of cultures; and

(C) compare and contrast career opportunities in architecture.

(11) The student makes advanced, informed judgments about personal architectural projects and the architectural projects of others. The student is expected to:

(A) interpret, evaluate, and justify architectural artistic decisions in personal architectural artworks; and

(B) select and analyze original architectural artworks, portfolios, and exhibitions by peers and others to form precise conclusions about formal qualities, historical and cultural contexts, intents, and meanings.

(12) The student exhibits employability skills that lead to job success in the architectural design industry. The student is expected to:

(A) demonstrate effective verbal, nonverbal, written, and electronic communication skills;

(B) demonstrate effective methods to secure, maintain, and terminate employment;

(C) demonstrate positive interpersonal skills, including conflict resolution, negotiation, teamwork, and leadership;

(D) evaluate the relationship of good physical and mental health to job success and achievement;

(E) demonstrate appropriate grooming and appearance for the workplace;

(F) demonstrate appropriate business and personal etiquette in the workplace;

(G) exhibit productive work habits and attitudes; and

(H) maintain a project portfolio that documents architectural projects using a variety of multimedia techniques.

§127.107. Interior Design I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisites: Algebra I and English I. Recommended prerequisites: Principles of Architecture and Principles of Construction or Architectural Design I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Interior Design I is a technical course that addresses psychological, physiological, and sociological needs of individuals by enhancing the environments in which they live and work. Students will use knowledge and skills related to interior and exterior environments, construction, and furnishings to make wise consumer decisions, increase productivity, promote sustainability, and compete in industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply oral and written communication skills clearly, concisely, convincingly, and effectively to explain and justify actions in a socially acceptable manner that is easily understood by others;

(B) solve problems using job-appropriate mathematical skills;

(C) demonstrate an understanding of leadership skills;

(D) cooperate, contribute, and collaborate as a member of a group;

(E) exhibit professionalism through dress, speech, and manners that are appropriate to the profession and worksite;

(F) review accurately both quantitative and qualitative work processes and end products;

(G) follow written and oral instructions and adhere to established practices, policies, and procedures, including health and safety rules; and

(H) use and apply task- and job-appropriate computer applications such as printing and plotting elevations, floor plans, and additional presentation documents or illustrations.

(2) The student demonstrates effective decision-making skills related to housing needs throughout the life cycle. The student is expected to:

(A) determine housing characteristics common to various world cultures and regions such as roof styles and materials, foundation types, and construction materials;

(B) describe factors affecting housing choices;

(C) describe the relationship between family housing and economics;

(D) assess the impact of demographic trends on psychological, physiological, and social needs when making housing decisions;

(E) analyze the impact of housing decisions on family relationships and the management of multiple family, community, and wage-earner roles;

(F) analyze aspects of community planning that impact housing decisions; and

(G) compare the availability, desirability, and financial feasibility of housing alternatives.

(3) The student demonstrates effective management practices related to the housing budget. The student is expected to:

(A) research consumer rights and responsibilities associated with housing;

(B) contrast the impact of needs and wants on the costs of housing;

(C) analyze legal and financial aspects of purchasing, leasing, and renting housing; and

(D) summarize laws and public policies that impact housing decisions and costs.

(4) The student recommends practices that will create a safe, secure, and well-maintained home. The student is expected to:

(A) research the effect of housing conditions on health, safety, and the environment;

(B) develop a plan for detecting safety hazards and maintaining a safe home; and

(C) research and describe housing features for individuals with special needs.

(5) The student proposes methods to create quality living environments. The student is expected to:

(A) apply elements and principles of design to living environments;

(B) apply principles of space utilization, zoning, and traffic patterns in planning and furnishing housing; and

(C) propose design and furnishings features to meet the special needs of individuals and families.

(6) The student considers factors affecting housing construction when making plans and consumer decisions related to housing. The student is expected to:

(A) identify architectural styles and architectural features exemplified in housing;

(B) summarize considerations for housing site selection;

(C) evaluate basic housing construction and finishing considerations; and

(D) research and describe the effects of technology on current and future housing trends.

(7) The student evaluates factors influencing the housing industry. The student is expected to:

(A) research and describe the interrelationship of the housing industry with the economy; and

(B) determine sources and availability of construction materials.

(8) The student assesses environmental issues affecting housing. The student is expected to:

(A) evaluate the effects of landscaping on housing and the environment; and

(B) determine techniques, materials, and technological applications that can be used in housing to conserve energy and other resources and promote sustainability.

(9) The student uses effective design practices to evaluate residential and nonresidential interiors. The student is expected to:

(A) apply elements and principles of design to interiors;

(B) plan for effective use of space zones and placement of furnishings;

(C) apply drafting techniques, including scaled drawings that facilitate space planning and technological applications;

(D) determine the effect of technological applications on interior design practices;

(E) differentiate design practices to meet individual, business, and special needs;

(F) research energy conservation and sustainability practices that affect interior design; and

(G) summarize laws, public policies, and regulations impacting interior environments.

(10) The student determines appropriate lighting for residential and nonresidential interiors. The student is expected to:

(A) analyze the functions and principles of lighting;

(B) compare lighting types and methods of control; and

(C) recommend lighting applications for specific interior needs, including safety, conservation, and sustainability.

(11) The student chooses appropriate background materials to complement various residential and nonresidential interior settings. The student is expected to:

(A) compare criteria for selection, use, and care of floor coverings;

(B) evaluate selection, use, and care of wall treatments;

(C) evaluate selection and care of ceilings; and

(D) evaluate selection, use, and care of window treatments and their suitability for various window types.

(12) The student demonstrates effective decision-making skills in applying principles of design and space to residential and nonresidential interior environments. The student is expected to:

(A) examine the relationship of interior decisions to individual and family needs and wants;

(B) examine the influences of demographics, society, and culture on interior design decisions;

(C) explain the relationship of local and global economics to interior environments;

(D) propose strategies for controlling costs and allocating resources; and

(E) budget for acquisition of products to enhance interior environments.

(13) The student evaluates the role of furniture in interior design for residential and nonresidential settings. The student is expected to:

(A) distinguish between various characteristics of period styles throughout history;

(B) determine the influence of period styles on interior design throughout history;

(C) summarize selection and care of quality furniture;

(D) assess aesthetic and functional aspects of furniture, including ergonomics and special needs requirements; and

(E) research and describe the impact of technology on furniture, including current trends.

(14) The student determines the role of appliances in interior design for residential and nonresidential settings. The student is expected to:

(A) analyze the functional and aesthetic aspects of appliances;

(B) determine the process for selection of appliances, including consideration of special needs;

(C) research and explain the safe use and care of appliances, including current trends; and

(D) research technological advancements in appliances.

(15) The student evaluates the role of accessories in interior design for residential and nonresidential settings. The student is expected to:

(A) identify types of accessories, including eco-friendly accessories;

(B) describe criteria for selection of accessories;

(C) analyze care of accessories;

(D) demonstrate a knowledge of arranging accessories; and

(E) research eco-friendly options for accessories.

(16) The student applies the concepts and skills of the industry to simulated work situations. The student is expected to:

(A) customize screen menus to fit specific problems or needs;

(B) construct points, lines, and other geometric forms using accepted computer-aided design methods;

(C) create a freehand, simple one-point perspective;

(D) use applications to create a bill of materials, including budgeting considerations;

(E) use technological applications to create and modify architectural interior drawings; and

(F) print and plot architectural interior drawings for presentation.

(17) The student creates a professional portfolio featuring original projects using a variety of media. The student is expected to:

(A) illustrate ideas for interior design from direct observation, experiences, and imagination;

(B) compare and contrast the use of interior design elements and principles in personal design plans and design plans of others using industry terminology;

(C) create visual solutions by elaborating on direct observation, experience, and imagination;

(D) create designs for practical applications; and

(E) demonstrate effective use of interior design media and tools in designing, drawing, painting, printmaking, and sculpture making such as model building.

(18) The student maintains a professional portfolio to document knowledge, skills, and abilities. The student is expected to:

(A) select educational and work history highlights to create a personal resume;

(B) develop a resume using word processing technology;

(C) contact professional references to acquire recommendations;

(D) obtain appropriate letters of recommendation; and

(E) document and maintain a record of work experiences, licenses, certifications, credentials, and education and training to build a portfolio.

(19) The student applies the concepts and skills of the profession to simulated or actual work situations. The student is expected to:

(A) use problem-solving skills to analyze a situation and to identify a problem to be solved;

(B) break a complex problem into component parts that can be analyzed and solved separately;

(C) strive for accuracy and precision;

(D) work independently;

(E) work collaboratively;

(F) research an interior design project;

(G) design and present an effective interior design product; and

(H) present a final interior design product for critique that demonstrates clear and effective communication.

§127.108. Interior Design II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisites: English II, Geometry, and Interior Design I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Interior Design II is a technical laboratory course that includes the application of the employability characteristics, principles, processes, technologies, communication, tools, equipment, and materials related to interior design to meet industry standards.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply oral and written communication skills clearly, concisely, convincingly, and effectively to explain and justify actions in a socially acceptable manner that is easily understood by others;

(B) problem-solve using job-appropriate mathematical skills;

(C) demonstrate an understanding of leadership skills;

(D) cooperate, contribute, and collaborate as a member of a group;

(E) exhibit professionalism through dress, speech, and manners that are appropriate to the profession and worksite;

(F) review quantitative and qualitative work processes and end products;

(G) follow written and oral instructions and adhere to established practices, policies, and procedures, including health and safety rules; and

(H) use and apply job-appropriate computer applications for the given task such as printing and plotting elevations, floor plans, and additional presentation documents or illustrations.

(2) The student knows the employability characteristics of a successful worker in the modern workplace. The student is expected to:

(A) research employment opportunities, including internship, entrepreneurship, and preparation requirements, in the field of architectural interior design;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) research employers' expectations and appropriate work habits;

(D) apply the competencies related to resources, information, systems, and technology in appropriate settings and situations;

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations; and

(F) maintain a project portfolio that documents interior design projects using a variety of multimedia techniques with a professional resume reflecting current trends.

(3) The student applies core academic skills to the requirements of architectural interior design. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(B) complete work orders and related paperwork;

(C) estimate cost of supplies, materials, and labor; and

(D) read and interpret schematics, floor plans, work drawings, catalogs, manuals, and bulletins.

(4) The student knows the concepts and skills that form the core knowledge of architectural interior design. The student is expected to:

(A) demonstrate knowledge of interior design theory;

(B) apply layout and design lines, symbols, and drawings;

(C) demonstrate knowledge of the theory and use of color in interior design; and

(D) demonstrate knowledge of the principles of computer-aided drafting.

(5) The student knows the function and application of the tools, equipment, technologies, and materials used in architectural interior design. The student is expected to:

(A) use tools, materials, and equipment commonly employed in the field of architectural interior design in a safe manner;

(B) demonstrate an understanding of how to properly handle and dispose of environmentally hazardous materials used in the field of architectural interior design in accordance with the material safety data sheet (MSDS), Occupational Safety and Health Administration (OSHA), and Environmental Protection Agency (EPA) regulations; and

(C) demonstrate knowledge of new and emerging technologies that may affect the field of architectural interior design.

(6) The student applies the concepts and skills of interior design to simulated and actual work situations. The student is expected to:

(A) apply architectural lettering techniques;

(B) render freehand nonresidential or residential interior design working drawings;

(C) draw a single-line floor plan from design development techniques for a residential or nonresidential project;

(D) select interior furnishings and finish materials for a residence or a nonresidential office interior;

(E) prepare and draw dimension plans for construction documents;

(F) produce interior drawings using one-point and two-point perspective;

(G) develop and complete schematic design drawings;

(H) apply the essential knowledge and skills in architectural interior design to career preparation learning experiences, including job shadowing, mentoring, or apprenticeship training programs;

(I) create an original, sustainable design as it relates to interior design;

(J) customize screen menus in drawing programs; and

(K) apply industry-accepted, computer-aided drafting skills.

(7) The student uses valid and reliable research strategies to determine current industry standards. The student is expected to:

(A) research and define green architecture as related to the field of interior design;

(B) research the Americans with Disabilities Act;

(C) research the guidelines for kitchen and bath design as defined by The National Kitchen and Bath Industry (NKBA);

(D) research traditional and period design styles of upholstery;

(E) research new and emerging technologies that may affect the field of furniture repair and upholstery services;

(F) research the types, properties, and uses of paints, varnishes, polishes, and waxes; and

(G) research an architectural project such as urban renewal, green architecture, or innovative design.

(8) The student understands the concepts and skills that form the core knowledge of furniture repair and upholstery. The student is expected to:

(A) identify styles and periods of furniture;

(B) identify the various types and properties of woods; and

(C) identify different fabrics, materials, and finishes and their characteristics.

(9) The student knows the function and application of the tools, equipment, technologies, and materials used in furniture repair and upholstery. The student is expected to:

(A) use tools, materials, and equipment commonly employed in the field of furniture repair and upholstery services; and

(B) handle and dispose of environmentally hazardous materials used in the field of furniture repair and upholstery.

(10) The student applies the concepts and skills of furniture repair and upholstery to simulated and actual work situations. The student is expected to:

(A) apply the woodworking skills required for furniture finishing and repair;

(B) demonstrate knowledge of the types, properties, and uses of paints, varnishes, polishes, and waxes;

(C) disassemble and reassemble furniture;

(D) repair dents, marks, and scratches by using fillers and stains;

(E) perform the tasks of fabrication and repair and disassembly and reassembly such as tacking, nailing, gluing, measuring, layout, cutting, sewing, and fitting materials;

(F) apply materials to furniture such as filling, padding, springs, and fabric;

(G) use problem-solving skills to analyze a situation to identify a problem to be solved;

(H) break a complex problem into component parts that can be separately analyzed and solved;

(I) strive for accuracy and precision;

(J) work independently;

(K) work collaboratively;

(L) design and present an effective interior design product; and

(M) present a final interior design product for critique that demonstrates clear and effective communication.

§127.109. Electrical Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Architecture or Principles of Construction. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Electrical Technology I, students will gain knowledge and skills needed to enter the workforce as an electrician or building maintenance supervisor, prepare for a postsecondary degree in a specified field of construction or construction management, or pursue an approved apprenticeship program. Students will acquire knowledge and skills in safety, electrical theory, tools, codes, installation of electrical equipment, and the reading of electrical drawings, schematics, and specifications.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify job opportunities with their accompanying job duties such as electrician, building maintenance technician, manager, and electrical engineer; and

(B) research career pathways, including education, job skills, and experience required to achieve that pathway.

(2) The student identifies the issues associated with electrical hazards found on a jobsite. The student is expected to:

(A) demonstrate safe working procedures in a construction environment;

(B) explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job;

(C) identify electrical hazards and how to avoid or minimize them in the workplace; and

(D) explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection.

(3) The student learns conduit bending and installation. The student is expected to:

(A) identify the methods of hand bending conduit;

(B) identify the various methods used to install conduit;

(C) use mathematical formulas to determine conduit bends;

(D) make 90 degree bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender; and

(E) cut, ream, and thread conduit.

(4) The student gains knowledge of the hardware and systems used by an electrician to mount and support boxes, receptacles, and other electrical components. The student is expected to:

(A) identify and explain the use of threaded fasteners;

(B) identify and explain the use of non-threaded fasteners;

(C) identify and explain the use of anchors;

(D) demonstrate the correct applications for fasteners and anchors; and

(E) install fasteners and anchors.

(5) The student learns the electrical concepts used in Ohm's law applied to direct current and series circuits and understands series parallel circuits, resistive circuits, Kirchhoff's voltage and current laws, and circuit analysis. The student is expected to:

(A) recognize what atoms are and what atoms are composed of;

(B) define voltage and identify the ways in which it can be produced;

(C) explain the difference between conductors and insulators;

(D) define the units of measurement used to measure the properties of electricity;

(E) explain how voltage, current, and resistance are related to each other;

(F) calculate an unknown value using the formula for Ohm's law;

(G) explain the different types of meters used to measure voltage, current, and resistance;

(H) calculate the amount of power used by a circuit using the power formula;

(I) explain the basic characteristics of a series, parallel, and combined series-parallel circuit;

(J) calculate, using Kirchhoff's current law, the total current in parallel and series-parallel circuits; and

(K) find the total amount of resistance in a series, parallel, or combined series-parallel circuit.

(6) The student gains knowledge in selecting, using, and safely maintaining common electrical test equipment. The student is expect to:

(A) explain how to operate test equipment such as ammeter, ohmmeter, volt-ohm-multimeter, continuity tester, and voltage tester;

(B) explain how to read specific test equipment and convert from one scale to another when using specified test equipment;

(C) explain the importance of proper meter polarity; and

(D) explain the difference between digital and analog meters.

(7) The student uses the National Electrical Code. The student is expected to:

(A) explain the purpose and history of the National Electrical Code;

(B) describe the layout of and explain how to navigate the National Electrical Code;

(C) describe the purpose of the National Electrical Manufacturers Association and National Fire Protection Association; and

(D) explain the role of testing laboratories.

(8) The student learns the types and applications of raceways, wireways, and ducts. The student is expected to:

(A) describe various types of cable trays and raceways;

(B) identify and select various types and sizes of raceways;

(C) identify and select various types and sizes of cable raceways;

(D) identify and select various types of raceway fittings;

(E) identify various methods used to install raceways;

(F) demonstrate knowledge of National Electrical Code raceway requirements;

(G) describe procedures for installing raceways and boxes on masonry surfaces, metal stud systems, wood-framed systems, and drywall surfaces; and

(H) recognize safety precautions that must be followed when working with boxes and raceways.

(9) The student learns the types and applications of conductors and wiring techniques. The student is expected to:

(A) demonstrate the various wire sizes using a wire in accordance with American Wire Gauge standards;

(B) identify insulation and jacket types according to conditions and applications;

(C) describe voltage ratings of conductors and cables;

(D) read and identify markings on conductors and cables;

(E) use the tables in the National Electrical Code to determine the ampacity of a conductor;

(F) state the purpose of stranded wire;

(G) state the purpose of compressed conductors;

(H) describe the different materials from which conductors are made;

(I) describe the different types of conductor insulation;

(J) describe the color coding of insulation;

(K) describe instrumentation control wiring;

(L) describe the equipment required for pulling wire through conduit;

(M) describe the procedure for pulling wire through conduit;

(N) install conductors in conduit; and

(O) pull conductors in a conduit system.

(10) The student learns electrical symbols and their use in design drawings. Additionally, students learn to interpret schematics, one-line diagrams, and wiring diagrams. The student is expected to:

(A) explain the basic layout of a design drawing;

(B) describe the information included in the title block of a drawing;

(C) identify common symbols and the various types of lines used on drawings;

(D) understand the use of architect's and engineer's scales;

(E) interpret electrical drawings such as site plans, floor plans, and detail drawings;

(F) read equipment schedules found on electrical drawings; and

(G) describe the type of information included in electrical specifications.

(11) The student learns the electrical devices and wiring techniques used in commercial and industrial construction and maintenance. The student is expected to:

(A) identify and state the functions and ratings of special switches such as single-pole, double-pole, three-way, four-way, dimmer, and safety switches;

(B) explain National Electrical Manufacturers Association classifications as they relate to switches and enclosures;

(C) explain the National Electrical Building Code requirements concerning wiring devices;

(D) identify and state the functions and ratings of wiring devices such as straight blade, twist lock, and pin and sleeve receptacles;

(E) identify and define receptacle terminals and disconnects;

(F) identify and define ground fault circuit interrupters;

(G) explain the box mounting requirements in the National Building Code;

(H) use appropriate tools and connectors to strip and splice wires together;

(I) identify and state the functions of limit switches and relays; and

(J) identify and state the function of switchgear.

(12) The student learns the electrical devices and wiring techniques used in residential construction maintenance. The student is expected to:

(A) describe how to determine electric service requirements for dwellings;

(B) explain the grounding requirements of a residential electric service;

(C) calculate and select service-entrance equipment;

(D) select the proper wiring methods for various types of residences;

(E) explain the role of the National Electrical Code in residential wiring;

(F) compute branch circuit loads and explain their installation requirements;

(G) explain the types and purposes of equipment grounding conductors;

(H) explain the purpose of ground-fault circuit interrupters and tell where they must be installed;

(I) determine the size of outlet boxes and select the proper type for different wiring methods;

(J) describe rules for installing electric space heating and heating, ventilating, and air conditioning equipment;

(K) describe the installation rules for electrical systems around swimming pools, spas, and hot tubs;

(L) describe the installation and control of lighting fixtures; and

(M) explain how wiring devices are selected and installed.

§127.110. Electrical Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Electrical Technology I. Recommended prerequisite: Principles of Architecture or Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Electrical Technology II, students will gain advanced knowledge and skills needed to enter the workforce as an electrician, a building maintenance technician, or a supervisor; prepare for a postsecondary degree in a specified field of construction or construction management; or pursue an approved apprenticeship program. Students will acquire knowledge and skills in safety, electrical theory, tools, codes, installation of electrical equipment, alternating current and direct current motors, conductor installation, installation of electrical services, and electric lighting installation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify job opportunities with their accompanying job duties such as electrician, building maintenance technician, manager, and electrical engineer; and

(B) research careers along with the education, job skills, and experience required to achieve a career goal.

(2) The student knows the issues associated with electrical hazards found on a jobsite. The student is expected to:

(A) demonstrate safe working procedures in a construction environment;

(B) explain the purpose of the Occupational Safety and Health Administration (OSHA) and how it promotes safety on the job;

(C) identify electrical hazards and how to avoid or minimize them in the workplace; and

(D) explain safety issues concerning lockout and tagout procedures, personal protection using assured grounding and isolation programs, confined space entry, respiratory protection, and fall protection.

(3) The student gains knowledge of alternating current and direct current motors with specific attention being given to main parts, circuits, and connections. The student is expected to:

(A) define terms such as ampacity, branch circuit, circuit breaker, controller, duty, full-load amps, ground fault circuit interrupter, interrupting rating, motor circuit switch, thermal protector, National Electrical Manufacturers Association design letter, non-automatic, overcurrent, overload, rated full-load speed, rated horsepower, remote control circuit, service factor, and thermal cutout;

(B) describe the various types of motor enclosures;

(C) describe how the rated voltage of a motor differs from the system voltage;

(D) describe the basic construction and components of a three-phase squirrel cage induction motor;

(E) explain the relationships among speed, frequency, and the number of poles in a three-phase induction motor;

(F) describe how torque is developed in an induction motor;

(G) explain how and why torque varies with rotor reactance and slip;

(H) define percent slip and speed regulation;

(I) explain how the direction of a three-phase motor is reversed;

(J) describe the component parts and operating characteristics of a three-phase wound-rotor induction motor;

(K) define torque, starting current, and armature reaction as they apply to direct current motors;

(L) explain how the direction of rotation of a direct current motor is changed;

(M) describe the design and characteristics of direct current shunt, series, and compound motors;

(N) describe dual-voltage motors and their applications;

(O) describe the methods for determining various motor connections; and

(P) describe general motor protection requirements as delineated by the National Electrical Code.

(4) The student learns the purpose for grounding and bonding electrical systems. The student is expected to:

(A) explain the purpose of grounding and the scope of the National Electrical Code;

(B) distinguish between a short circuit and a ground fault;

(C) define the National Electrical Code ground-related terms;

(D) distinguish between system grounding and equipment grounding;

(E) use the National Electrical Code to size the grounding electrode conductor for various alternating current systems;

(F) explain the National Electrical Code requirements for the installation and physical protection of grounding electrode conductors;

(G) explain the function of the grounding electrode system and determine which grounding electrodes must be used;

(H) define electrodes and explain the resistance requirements for electrodes using the National Electrical Code;

(I) use the National Electrical Code to size the equipment grounding conductor for raceways and equipment;

(J) explain the function of the main bonding jumper and system bonding jumpers in the grounding system and size the bonding jumpers for various applications;

(K) size the main bonding jumper for a service using multiple service disconnecting means;

(L) explain the National Electrical Code requirements for bonding of enclosures and equipment;

(M) explain effective grounding and its importance in clearing ground faults and short circuits;

(N) explain the purposes of the grounded conductor neutral in operation of overcurrent devices;

(O) explain the National Electrical Code requirements for grounding separately derived systems, including transformers and generators;

(P) explain the National Electrical Code requirements for grounding at more than one building; and

(Q) explain the National Electrical Code grounding requirements for systems over 600 volts.

(5) The student properly bends all sizes of conduit up to six inches. The student is expected to:

(A) describe the process of conduit bending using power tools;

(B) identify all parts of popular electric and hydraulic benders;

(C) avoid excessive waste when working with conduit systems;

(D) bend offsets, kicks, saddles, and segmented and parallel bends;

(E) explain the requirements for the National Electrical Code for bending conduit;

(F) compute the radius, degrees in bend, developed length, and gain for conduit up to six inches; and

(G) explain how to correct damaged conduit and modify existing bends.

(6) The student learns to select and size outlet boxes, pull boxes, and junction boxes. The student is expected to:

(A) describe the different types of nonmetallic and metallic boxes;

(B) calculate the required box size for any number and size of conductors;

(C) explain the National Electrical Code regulations for volume required per conductor in outlet boxes;

(D) locate, install, and support boxes of all types;

(E) describe the National Electrical Code regulations governing pull and junction boxes;

(F) explain the radius rule when installing conductors in pull boxes;

(G) understand the National Electrical Code requirements for boxes supporting lighting fixtures;

(H) describe the purpose of conduit bodies and Type FS boxes;

(I) install the different types of fittings used in conjunction with boxes;

(J) describe the installation rules for boxes and fittings in hazardous areas;

(K) explain how boxes and fittings are selected and installed; and

(L) describe the various types of box supports.

(7) The student knows transportation, storage, and setup of cable reels, methods of rigging, and procedures to complete cable pulls in raceways and cable trays. The student is expected to:

(A) describe the various methods of installing conductors in conduit;

(B) plan and set up for a cable pull;

(C) describe how cable reels are transported to the pulling site;

(D) set up reel stands and spindles for a wire-pulling installation;

(E) explain how mandrels, swabs, and brushes are used to prepare conduit for conductors;

(F) install a pull line for a cable-pulling operation;

(G) explain the operation of power fish tape systems;

(H) prepare the ends of conductors for pulling;

(I) describe the types of cable pullers;

(J) describe the process of high-force cable pulling;

(K) explain how to support conductors in vertical conduit runs;

(L) describe the installation of cables in cable trays;

(M) explain the importance of communication during a cable-pulling operation; and

(N) calculate the probable stress or tension in cable pulls.

(8) The student installs cable trays and modifies cable trays and cable. The student is expected to:

(A) describe the components that make up a cable tray assembly;

(B) explain the methods used to hang and secure a cable tray;

(C) describe how cable enters and exits cable trays;

(D) select the proper cable tray fitting for the situation;

(E) explain the National Electrical Manufacturers Association standards for cable tray installations;

(F) explain the National Electrical Code requirements for cable tray installations;

(G) select the required fittings to ensure equipment grounding continuity in cable tray systems;

(H) interpret electrical working drawings showing cable tray fittings;

(I) size a cable tray for the number and type of conductors contained in the system;

(J) select rollers and sheaves for pulling cable in specific cable tray situations; and

(K) designate the required locations of rollers and sheaves for a specific cable pull.

(9) The student knows the methods of terminating and splicing conductors of all types and sizes and the preparation and taping of conductors. The student is expected to:

(A) describe how to make a good conductor termination;

(B) prepare cable ends for terminations and splices;

(C) install lugs and connectors onto conductors;

(D) train cable at termination points;

(E) explain the role of the National Electrical Code in making cable terminations and splices;

(F) explain why mechanical stress should be avoided at cable termination points;

(G) describe the importance of using proper bolt torque when bolting lugs onto bus bars;

(H) describe crimping techniques;

(I) select the proper lug or connector for the job;

(J) describe splicing techniques; and

(K) explain how to use hand and power crimping tools.

(10) The student installs single- and three-phase services, including metering equipment. The student is expected to:

(A) describe various types of electric services for commercial and industrial installations;

(B) read electrical drawings and diagrams describing service installation;

(C) calculate and select service-entrance equipment;

(D) explain the role of the National Electrical Code in service installations;

(E) install main disconnect switches, panel boards, and overcurrent protection devices;

(F) identify the circuit loads, number of circuits required, and installation requirements for distribution panels;

(G) explain the types and purposes of service grounding;

(H) explain the purpose and required locations of ground fault circuit interrupters;

(I) describe single-phase service connections; and

(J) describe both wye-phase and delta-connected three-phase services.

(11) The student knows the practical application of fuses and circuit breakers. The student is expected to:

(A) explain the necessity of overcurrent protection devices in electrical circuits;

(B) define the terms associated with fuses and circuit breakers;

(C) describe the operation of a circuit breaker;

(D) select the most suitable overcurrent device for the application;

(E) describe the operation of single-element and time-delay fuses;

(F) explain how ground fault circuit interrupters can save lives;

(G) calculate short circuit currents; and

(H) describe troubleshooting and maintenance techniques for overcurrent devices.

(12) The student knows the practical applications of contactors and relays. The student is expected to:

(A) describe the operating principles of contactors and relays;

(B) select contactors and relays for use in specific electrical systems;

(C) explain how mechanical contactors operate;

(D) explain how solid-state contactors operate;

(E) install contactors and relays according to National Electrical Code requirements;

(F) select and install contactors and relays for lighting control;

(G) describe how overload relays operate;

(H) connect a simple control circuit; and

(I) test control circuits.

(13) The student learns the basic principles of human vision and the characteristics of light. The student is expected to:

(A) explain how the human eye works;

(B) describe the characteristics of light;

(C) recognize the different kinds of lamps and explain the advantages and disadvantages of each type, including incandescent, halogen, fluorescent, and high-intensity discharge;

(D) select and install lamps into lighting fixtures; and

(E) recognize and install various types of lighting fixtures, including surface mounted, recessed, suspended, and track-mounted units.

§127.111. Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Architecture, Principles of Construction, or Construction Technology I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology I, students will gain knowledge and skills needed to enter the industry as technicians in the HVAC and refrigeration industry or building maintenance industry, prepare for a postsecondary degree in a specified field of construction management, or pursue an approved apprenticeship program. Students will acquire knowledge and skills in safety, principles of HVAC theory, use of tools, codes, and installation of HVAC and refrigeration equipment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify job opportunities with their accompanying job duties in occupations such as electrician, building maintenance technician or manager, and electrical engineer; and

(B) research career pathways along with the education, job skills, and experience required to achieve a career goal.

(2) The student learns the basic principles of HVAC and refrigeration. The student is expected to:

(A) explain the basic principles of HVAC;

(B) describe what the Clean Air Act means to the HVAC and refrigeration industry; and

(C) identify the types of schedules and drawings used by the HVAC and refrigeration industry.

(3) The student applies knowledge and skills in mathematics as they relate to HVAC and the principles of refrigeration. The student is expected to:

(A) identify similar units of measurement in both English and the International System (SI) of units;

(B) calculate and convert measured values and volumes expressed in mathematical equations and formulas; and

(C) convert temperature values between Celsius and Fahrenheit.

(4) The student selects, prepares, connects, and installs copper and plastic piping and fittings. The student is expected to:

(A) state the precautions that must be taken when installing refrigerant piping;

(B) select, cut, and bend the right copper tubing for the job;

(C) safely connect tubing, using flare and compression fittings;

(D) determine the correct hardware and supports needed for refrigerant pipe installations;

(E) describe the basic requirements needed to identify and install various types of plastic pipe and state their uses;

(F) demonstrate various methods used to pressure test HVAC systems;

(G) identify types of plastic pipe and state their uses; and

(H) cut and join lengths of plastic pipe.

(5) The student cuts, threads, and joins ferrous piping. The student is expected to:

(A) assemble and operate the tools used for soldering;

(B) prepare tubing and fittings for soldering;

(C) identify the purposes and uses of solder and solder fluxes;

(D) solder copper tubing fittings;

(E) assemble and operate the tools used for brazing;

(F) prepare tubing and fittings for brazing;

(G) identify the purposes and uses of filler metals and fluxes used for brazing;

(H) braze copper tubing and fittings;

(I) identify the inert gases that can be used safely to purge tubing when brazing;

(J) identify the types of ferrous metal pipes;

(K) accurately measure the sizes of ferrous metal pipes;

(L) identify the common malleable iron fittings;

(M) cut, ream, and thread ferrous metal pipe;

(N) join lengths of threaded pipe together and install fittings;

(O) describe the main points to consider when installing pipe runs; and

(P) describe the methods used to join grooved piping.

(6) The student knows electrical principles, power generation and distribution, electrical components, direct current circuits, and electrical safety. The student is expected to:

(A) explain how electrical power is distributed;

(B) describe how voltage, current, resistance, and power are related;

(C) calculate the current, voltage, and resistance in a circuit using Ohm's law;

(D) calculate how much power is consumed by a circuit using the power formula;

(E) describe the differences between series and parallel circuits and calculate loads in each;

(F) describe the purpose and operation of the various electrical components used in HVAC equipment;

(G) state and demonstrate the safety precautions that must be followed when working on electrical equipment;

(H) make voltage, current, and resistance measurements using electrical test equipment; and

(I) read and interpret common electrical symbols.

(7) The student learns the principles of heat transfer, refrigeration, pressure temperature relationships, and the components and accessories used in air conditioning systems. The student is expected to:

(A) explain how heat transfer occurs in a cooling system, demonstrating an understanding of the terms and concepts used in the refrigeration cycle;

(B) calculate the temperature and pressure relationships at key points in the refrigeration cycle;

(C) under supervision, use temperature- and pressure-measuring instruments to make readings at key points in the refrigeration cycle;

(D) identify commonly used refrigerants and demonstrate the procedures for handling these refrigerants;

(E) identify the major components of a cooling system and explain how each type works;

(F) identify the major accessories available for cooling systems and explain how each works;

(G) identify the control devices used in cooling systems and explain how each works; and

(H) demonstrate the correct methods to be used when piping a refrigeration system.

(8) The student learns heating fundamentals, types and designs of furnaces and their components, and basic procedures for installing and servicing furnaces. The student is expected to:

(A) explain the three methods by which heat is transferred and give an example of each;

(B) describe how combustion occurs and identify the by-products of combustion;

(C) identify the various types of fuels used in heating;

(D) identify the major components and accessories of an induced draft and condensing gas furnace and explain the function of each component;

(E) describe the factors that must be considered when installing a furnace;

(F) identify the major components of a gas furnace and describe how each works;

(G) use a manometer under supervision to measure and adjust manifold pressure on a gas furnace;

(H) identify the major components of an oil furnace and describe how each component works; and

(I) perform furnace preventive maintenance procedures such as cleaning and filter replacement under supervision.

(9) The student gains knowledge and skills related to air distribution systems. The student is expected to:

(A) describe the airflow and pressures in a basic forced-air distribution system;

(B) explain the differences between propeller and centrifugal fans and blowers;

(C) identify the various types of duct systems and explain why and where each type is used;

(D) demonstrate or explain the installation of metal, fiberboard, and flexible duct;

(E) demonstrate or explain the installation of fittings and transitions used in duct systems;

(F) demonstrate or explain the use and installation of diffusers, registers, and grilles used in duct systems;

(G) demonstrate or explain the use and installation of dampers used in duct systems;

(H) demonstrate or explain the use and installation of insulation and vapor barriers used in duct systems;

(I) identify the instruments used to make measurements in air systems and explain the use of each instrument; and

(J) make accurate temperature, air pressure, and velocity measurements in an air distribution system.

§127.112. Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology I. Recommended prerequisite: Principles of Architecture or Principles of Construction. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II, students will gain advanced knowledge and skills needed to enter the industry as HVAC and refrigeration technicians or building maintenance technicians or supervisors, prepare for a postsecondary degree in a specified field of construction or construction management, or pursue an approved apprenticeship program. Students will acquire knowledge and skills in safety, electrical theory, use of tools, codes, installation of commercial HVAC equipment, heat pumps, troubleshooting techniques, various duct systems, and maintenance practices.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify job opportunities with their accompanying job duties in occupations such as electrician, building maintenance technician or manager, and electrical engineer; and

(B) research career pathways along with the education, job skills, and experience required to achieve a career goal.

(2) The student learns the principles of commercial air systems. The student is expected to:

(A) identify the differences between types of commercial air systems;

(B) identify the type of building in which a particular type of system is used; and

(C) explain the typical range of capacities for a commercial air system.

(3) The student knows the principles of venting fossil-fuel furnaces and the proper methods for selecting and installing vent systems for gas-fired heating equipment. The student is expected to:

(A) describe the principles of combustion and explain complete and incomplete combustion;

(B) describe the content of flue gas and explain how it is vented;

(C) identify the components of a furnace vent system;

(D) describe how to select and install a vent system;

(E) perform the adjustments necessary to achieve proper combustion in a gas furnace;

(F) describe the techniques for venting different types of furnaces;

(G) explain the various draft control devices used with natural-draft furnaces;

(H) calculate the size of a vent required for a given application; and

(I) adjust a thermostat heat anticipator.

(4) The student gains knowledge of hot water heating systems, focusing on safe operation of the low-pressure boiler and piping systems commonly used in residential applications. The student is expected to:

(A) explain the terms and concepts used when working with hot-water heating;

(B) identify the major components of hot-water heating;

(C) explain the purpose of each component of hot-water heating;

(D) demonstrate the safety precautions used when working with hot-water systems;

(E) demonstrate how to operate selected hot-water systems;

(F) demonstrate how to safely perform selected operating procedures on low-pressure systems;

(G) identify the common piping configurations used with hot-water heating;

(H) explain how to read the pressure across a water system circulating pump;

(I) calculate heating water flow rates; and

(J) select a pump for a given application.

(5) The student learns the basic principles, processes, and devices used to control humidity and air clean-lines as well as devices used to conserve energy in HVAC systems. The student is expected to:

(A) explain why it is important to control humidity in a building;

(B) recognize the various kinds of humidifiers used with HVAC systems and explain why each is used;

(C) demonstrate how to install and service the humidifiers used in HVAC systems;

(D) recognize the kinds of air filters used with HVAC systems and explain why each is used;

(E) demonstrate how to install and service the filters used in HVAC systems;

(F) use a manometer or differential pressure gauge to measure the friction loss of an air filter;

(G) identify accessories commonly used with air conditioning systems to improve indoor air quality and reduce energy cost and explain the function of each, including humidity control devices, air filtration devices, and energy conservation devices; and

(H) demonstrate or describe how to clean an electronic air cleaner.

(6) The student gains the knowledge and skills in the handling of refrigerant and equipment servicing procedures to service HVAC systems in an environmentally safe manner. The student is expected to:

(A) identify the common types of leak detectors and explain how each is used;

(B) perform leak detection tests using selected methods;

(C) identify the service equipment used for evacuating a system and explain why each item of equipment is used;

(D) perform system evacuation and dehydration;

(E) identify the service equipment used for recovering refrigerant from a system and for recycling the recovered refrigerant and explain why each item of equipment is used;

(F) perform a refrigerant recovery;

(G) evacuate a system to a deep vacuum;

(H) identify the service equipment used for charging refrigerant into a system and explain why each item of equipment is used;

(I) use nitrogen to purge a system; and

(J) charge refrigerant into a system using various methods, including weight, superheat, sub-cooling, and charging pressure chart.

(7) The student gains knowledge of transformers, single-phase and three-phase power distribution, capacitors, theory and operation of induction motors, and instruments and techniques used in testing alternating current circuits and components. The student is expected to:

(A) describe the operation of various types of transformers;

(B) explain how alternating current is developed and draw a sine wave;

(C) identify single-phase and three-phase wiring arrangements;

(D) explain how phase shift occurs in inductors and capacitors;

(E) describe the types of capacitors and their applications;

(F) explain the operation of single-phase and three-phase induction motors;

(G) identify the various types of single-phase motors and their applications;

(H) state and demonstrate the safety precautions that must be followed when working with electrical equipment; and

(I) test alternating current components, including capacitors, transformers, and motors.

(8) The student learns the theory of solid-state electronics as well as the operation, use, and testing of the various electronic components used in HVAC equipment. The student is expected to:

(A) explain the theory of electronics and semiconductors;

(B) explain how various semiconductor devices such as diodes, light emitting diodes, and photo diodes work and how the devices are used in power and control circuits;

(C) identify different types of resistors and explain how their resistance values can be determined;

(D) describe the operation and function of thermistors and cad cells;

(E) test semiconductor components; and

(F) identify the connectors on a personal computer.

(9) The student learns the operation, testing, and adjustment of conventional and electronic thermostats as well as the operation of common electrical, electronic, and pneumatic circuits used to control HVAC systems. The student is expected to:

(A) explain the function of a thermostat in an HVAC system;

(B) describe different types of thermostats and explain how the thermostats are used;

(C) demonstrate the correct installation and adjustment of a thermostat;

(D) explain the principles applicable to all control systems;

(E) identify the various types of electromechanical, electronic, and pneumatic HVAC controls and explain their function and operation;

(F) describe a systematic approach for electrical troubleshooting of HVAC equipment and components;

(G) recognize and use equipment manufacturers' troubleshooting aids to troubleshoot HVAC equipment;

(H) demonstrate how to isolate electrical problems to faulty power distribution, load, or control circuits;

(I) identify the service instruments needed to troubleshoot HVAC electrical equipment;

(J) make electrical troubleshooting checks and measurements on circuits and components common to all HVAC equipment; and

(K) isolate and correct malfunctions in a cooling system control circuit.

(10) The student learns the tools, instruments, and techniques used in troubleshooting gas heating appliances, including how to isolate and correct faults. The student is expected to:

(A) describe the operating sequence for gas heating equipment;

(B) interpret control circuit diagrams for gas heating systems;

(C) describe the operation of various types of burner ignition methods;

(D) identify the tools and instruments used when troubleshooting gas heating systems;

(E) demonstrate using the tools and instruments required for troubleshooting gas heating systems; and

(F) isolate and correct malfunctions in gas heating systems.

(11) The student learns the techniques and equipment used in troubleshooting cooling equipment and analyzing system temperatures and pressures in order to isolate faults. The student is expected to:

(A) describe a systematic approach for troubleshooting cooling systems and components;

(B) isolate problems to electrical and mechanical functions in cooling systems;

(C) recognize and use equipment manufacturers' troubleshooting aids to troubleshoot cooling systems;

(D) identify and use the service instruments needed to troubleshoot cooling systems;

(E) troubleshoot selected problems in cooling equipment; and

(F) state the safety precautions associated with cooling troubleshooting.

(12) The student learns the principles of reverse-cycle heating, the operation of various types of heat pumps, and the mechanisms of heat pump control circuits and learns to install and service heat pumps. The student is expected to:

(A) describe the principles of reverse-cycle heating;

(B) identify heat pumps by type and general classification;

(C) describe various types of geothermal water loops and their application;

(D) list the components of heat pump systems;

(E) describe the role and operation of electric heat in common heat pump systems;

(F) describe common heat pump ratings such as coefficient of performance, heating season performance factor, and seasonal energy efficiency ratio;

(G) demonstrate heat pump installation and service procedures;

(H) identify and install refrigerant circuit accessories commonly associated with heat pumps;

(I) analyze a heat pump control circuit; and

(J) isolate and correct malfunctions in a heat pump.

(13) The student selects the application and installation of various types of fasteners, gaskets, seals, and lubricants as well as the installation and adjustment of different types of belt drives, bearings, and couplings. The student is expected to:

(A) identify, explain, and install threaded and non-threaded fasteners;

(B) identify, remove, and install types of gaskets, packings, and seals;

(C) identify types of lubricants and explain their uses;

(D) use lubrication equipment to lubricate motor bearings;

(E) identify the types of belt drives, explain their uses, and demonstrate procedures used to install or adjust them;

(F) identify and explain types of couplings;

(G) demonstrate procedures used to remove, install, and align couplings;

(H) identify types of bearings and explain their uses;

(I) explain causes of bearing failures;

(J) demonstrate procedures used to remove and install bearings;

(K) perform preventive maintenance inspection and cleaning procedures; and

(L) list ways to develop and maintain good customer relations.

(14) The student demonstrates how to lay out, fabricate, install, and join sheet metal ductwork. The student is expected to:

(A) identify and describe the types of sheet metal;

(B) define properties of steel and aluminum alloys;

(C) describe a layout method and perform proper cutting;

(D) join sheet metal duct sections using proper seams and connectors;

(E) describe proper hanging and support methods for sheet metal ductwork;

(F) describe thermal and acoustic insulation principles;

(G) select, apply, and seal the proper insulation for sheet metal ductwork;

(H) describe guidelines for installing components such as register, diffusers, grilles, dampers, access doors, and zoning accessories; and

(I) install takeoffs and attach flexible duct to a sheet metal duct.

(15) The student gains the knowledge and skills to lay out, fabricate, install, join, attach, and support fiberglass ductwork and fittings. The student is expected to:

(A) identify types of fiberglass duct, including flexible duct;

(B) describe fiberglass duct layout and some basic fabrication methods;

(C) describe the various closure methods for sealing fiberglass duct;

(D) fabricate selected duct modules and fittings using the appropriate tools;

(E) describe hanging and support methods for fiberglass duct;

(F) describe how to repair major and minor damage to fiberglass duct; and

(G) install takeoffs and attach flexible duct to a fiberglass duct.

§127.113. Plumbing Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Architecture, Principles of Construction, or Construction Technology I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Plumbing Technology I, students will gain knowledge and skills needed to enter the industry as a plumbing apprentice, building maintenance technician, or supervisor or prepare for a postsecondary degree in construction management, architecture, or engineering. Students will acquire knowledge and skills in industry workplace basics and employer/customer expectations, including how to use a plumbing code book; how to identify and use power and hand tools; how to be safe on the jobsite and when using hand and power tools; how to apply basic plumbing mathematics and plumbing drawing; and how to identify, fit, and use plastic, copper, cast iron, carbon steel, and corrugated stainless steel pipe. In addition, students will be introduced to gas, drainage, and water supply systems and continue their knowledge of workplace basics and green technologies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student is expected to demonstrate professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate oral communication, written communication, leadership skills, teamwork skills, conflict management, customer service, professionalism, work ethic, integrity, multitasking, initiative, creativity, and how to follow directions;

(B) understand the importance of showing up to work on time, maintaining appropriate personal appearance, working as a team member, and being honest;

(C) demonstrate an understanding of the responsibilities of driving a company vehicle;

(D) demonstrate an understanding of why and how listening is a critical life skill; and

(E) demonstrate an understanding of the importance of being a self-starter and of increasing one's knowledge and skills in a chosen career field.

(2) The student understands the causes of accidents and their consequences and repercussions in terms of delays, increased expenses, injury, and loss of life. The student is expected to:

(A) describe the common unsafe acts and conditions that cause accidents;

(B) describe how to handle unsafe acts and conditions;

(C) explain the impact and cost of accidents and illnesses;

(D) demonstrate the use and care of appropriate personal protective equipment;

(E) identify job-site hazards specific to plumbers;

(F) demonstrate the proper use of ladders;

(G) explain how to work around a trench;

(H) describe and demonstrate the lockout/tagout process; and

(I) understand the purpose of material safety data sheets (MSDS) and their importance to job-site and personal safety.

(3) The student understands and demonstrates what employer and customer expectations are and is familiar with industry workplace basics and their importance. The student is expected to:

(A) identify job opportunities and their accompanying job duties such as a plumber, building maintenance technician or supervisor, manager, and mechanical engineer;

(B) research careers along with the education, job skills, and experience required to achieve career goals;

(C) identify the industries and associations that make up the modern plumbing profession;

(D) demonstrate how to properly treat company and customer property;

(E) understand the importance of keeping the work area clean and how that applies to job safety; and

(F) understand the importance of using industry standards and techniques for the job.

(4) The student understands and demonstrates what green technology is and how it relates to the plumbing profession and environment. The student is expected to:

(A) identify different green plumbing fixtures;

(B) identify different types of reuse plumbing systems; and

(C) design and demonstrate a particular reuse water plumbing system.

(5) The student selects and safely uses different types of hand and power tools related to a specific task. The student is expected to:

(A) identify the hand and power tools used in the plumbing industry;

(B) demonstrate the proper use of hand and power plumbing tools;

(C) demonstrate the ability to know when and how to select the proper tools for tasks;

(D) demonstrate proper maintenance and care for hand and power tools;

(E) demonstrate how to prepare a surface for tool use;

(F) describe the safety requirements for using plumbing tools; and

(G) identify and demonstrate how to read and use various rulers and measuring tools.

(6) The student applies mathematical concepts to whole numbers, fractions, decimals, and squared numbers and examines how these concepts apply to specific situations. The student is expected to:

(A) add, subtract, multiply, and divide whole numbers, fractions, and decimals;

(B) convert fractions to decimals and decimals to fractions;

(C) demonstrate mathematical competency in the metric system and how the metric system is used in the plumbing industry;

(D) square various numbers and determine the square roots of numbers with and without a calculator;

(E) identify and demonstrate the parts of a plumbing fitting and use common pipe-measuring techniques;

(F) use fitting dimensions tables to determine fitting allowances and thread makeup; and

(G) demonstrate how to measure end-to-end, center-to-center, and end-to-center measurements using fitting allowances and thread makeup.

(7) The student learns the various types of drawings used in the plumbing industry to lay out and install plumbing systems. The student is expected to:

(A) use current architectural technology to identify pictorial, isometric and oblique, schematic, and orthographic drawings and discuss how different views are used to depict information about objects;

(B) identify the basic symbols used in schematic drawings of pipe assemblies;

(C) explain the types of drawings that may be included in a set of plumbing drawings and the relationship among the different drawings;

(D) interpret plumbing-related information from a set of drawings;

(E) demonstrate how to sketch orthographic drawings;

(F) demonstrate the use of an architect's scale to draw lines to scale and to measure lines drawn to scale; and

(G) explain how code requirements apply to certain drawings.

(8) The student learns the types and schedules of plastic pipe and fittings used in plumbing applications, including acrylonitrile butadiene styrene or ABS, polyvinyl chloride or PVC, chlorinated polyvinyl chloride or CPVC, polyethylene or Poly pipe, crosslinked polyethylene or PEX, and polybutylene. The student is expected to:

(A) identify types of materials and schedules of plastic piping;

(B) identify proper and improper applications of plastic piping;

(C) identify types of fittings and valves used with plastic fittings;

(D) identify and determine the kinds of hangers and supports needed for plastic piping;

(E) identify the various techniques used in hanging and supporting plastic piping;

(F) demonstrate how to measure, cut, and join the different types of plastic piping;

(G) explain proper procedures for the handling, storage, and protection of plastic pipes; and

(H) explain how code requirements apply to different types of plastic pipe.

(9) The student understands the applications of copper pipe and fittings, the types of valves that can be used on copper pipe systems,

and the methods for cutting, reaming, joining, and installing copper tubing. The student is expected to:

(A) identify the different types of copper tubing;

(B) identify the material properties and storage and handling requirements of copper tubing;

(C) identify the types of fittings and valves used with copper tubing;

(D) identify the various techniques used in hanging and supporting copper tubing;

(E) demonstrate, using industry standards, how to safely solder copper tubing using different heat sources;

(F) demonstrate how to measure, ream, and cut copper piping;

(G) identify the hazards and safety precautions associated with copper piping; and

(H) explain how code requirements apply to copper tubing.

(10) The student measures, cuts, threads, reams, joins, and hangs carbon steel pipe and becomes familiar with labeling and sizing carbon steel pipe. The student is expected to:

(A) recognize proper applications of carbon steel piping;

(B) identify the material properties, storage, and handling requirements of carbon steel piping;

(C) identify the various techniques used in hanging and supporting carbon steel piping;

(D) demonstrate how to measure, cut, ream, thread, and join carbon steel piping; and

(E) explain how code requirements apply to carbon steel pipe.

(11) The student gains knowledge and skills to connect and install corrugated stainless steel tubing in various installation conditions. The student is expected to:

(A) identify the common manufacturers of corrugated stainless steel tubing;

(B) recognize proper and improper applications of corrugated stainless steel tubing;

(C) identify the various techniques used in hanging and supporting corrugated stainless steel tubing;

(D) demonstrate how to measure, cut, and join corrugated stainless steel tubing;

(E) identify the material properties, storage, and handling requirements of corrugated stainless steel tubing; and

(F) explain how code requirements apply to corrugated stainless steel tubing.

(12) The student understands the way drain, waste, and vent systems remove waste safely. The student understands how pipes, drains, traps, and vents work and the different types of materials used for drain waste and vent (DWV) piping. The student is expected to:

(A) explain how waste moves from a fixture through the drain system to the public or private sewer system;

(B) identify the major components of a drainage system and describe their functions;

(C) identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals;

(D) identify the various types of drain, waste, and vent fittings and describe their applications;

(E) identify significant code and health issues, violations, and consequences related to drain, waste, and vent systems;

(F) identify DWV symbols and lines on an isometric drawing and a floor plan;

(G) demonstrate how to draw an isometric DWV system to make a materials list;

(H) recognize and explain the use of different pipe and fitting materials used for DWV piping and how they are assembled; and

(I) understand how code requirements apply to DWV systems.

(13) The student identifies major components of a municipal water system and how water is distributed to residential or commercial houses or buildings. The student is expected to:

(A) describe and explain the earth's water cycle;

(B) describes different water sources;

(C) describe and show how water gets from the water well or water meter to the house or building; and

(D) discuss and explain different types of valves and devices found in a residential or commercial water system.

(14) The student identifies and draws hot and cold water lines on a floor plan using an isometric drawing. The student is expected to:

(A) identify hot and cold water lines and their symbols on a floor plan;

(B) demonstrate how to draw hot and cold water lines on a floor plan using an isometric drawing; and

(C) demonstrate how to properly size a residential hot and cold water system.

(15) The student describes and demonstrates the different types of valves and their uses. The student is expected to:

(A) explain why and where open-close valves are used;

(B) explain why and where flow regulation valves are used;

(C) explain why and where pressure reducing valves are used; and

(D) explain why and where pressure and vacuum relief valves are used.

§127.114. Plumbing Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Plumbing Technology I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Plumbing Technology II, students will gain the advanced knowledge and skills needed to enter the industry as a plumber, building maintenance technician, or supervisor or prepare for a postsecondary degree in mechanical engineering. Students will acquire knowledge and skills in plumbing codes, industry workplace basics, and employer/customer expectations, including tool and jobsite safety, advanced plumbing mathematics, commercial drawings, basic electricity, hanger installation, supports and structural penetrations, roof drains, fixture installation, valves and faucets, and oxy-fuel safety. Students will also learn about setup, cutting, brazing and welding water system sizing; gas, drain, waste and vent installation and testing; and water heater installation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) use industry standards to demonstrate oral communication, written communication, leadership, teamwork, conflict management, customer service, professionalism, work ethic, integrity, multitasking, initiative, creativity, and how to follow directions;

(B) demonstrate an understanding of the importance of showing up to work on time, maintaining appropriate personal appearance, working as a team member, and being honest;

(C) demonstrate an understanding of the responsibilities of driving a company vehicle;

(D) demonstrate an understanding of why and how listening is a critical skill; and

(E) demonstrate an understanding of the importance of being a self-starter and of increasing one's knowledge and skills in a chosen career field.

(2) The student identifies and demonstrates the use of hand and power tools such as pipe wrenches; rulers; measuring devices; drill bits; pipe stands; pipe vises; levels; pipe fabrication tools; and pipe cutting, threading, and reaming tools. The student is expected to:

(A) demonstrate how to measure with a 6-foot folding rule and 25-foot measuring tape;

(B) read and use rulers and measuring devices;

(C) demonstrate how to measure end-to-end, center-to-center, and end-to-center pipe measurements; and

(D) identify and safely demonstrate the use of selected hand and power tools.

(3) The student understands different types of drill bits used in the plumbing profession. The student is expected to:

(A) explain the differences among and applications for masonry, twist steel, hole saw, paddle, and self-feeding wood bits; and

(B) demonstrate the use and application of masonry, twist steel, hole saw, paddle, and self- feeding wood bits.

(4) The student applies algebra and geometry to solve plumbing-related problems. The student is expected to:

(A) demonstrate how to determine the volume of a cylinder;

(B) demonstrate how to determine volume and length measurements using cubic feet and yards;

(C) demonstrate how to determine fall and grades of a pipe;

(D) demonstrate how to calculate simple and rolling offsets on parallel runs using constants;

(E) demonstrate how to calculate pressure, velocity, friction, and flow; and

(F) size a water system based on velocity limitations and pressure drop.

(5) The student reviews employer and customer expectations. The student is expected to:

(A) identify job opportunities such as a plumber, building maintenance technician or supervisor, manager, and mechanical engineer and their accompanying job duties;

(B) research careers along with the education, job skills, and experience required to achieve career goals;

(C) identify the industries and associations that make up the modern plumbing profession;

(D) demonstrate an understanding of how to properly treat company and customer property;

(E) demonstrate an understanding of the importance of keeping the work area clean and how that applies to job safety; and

(F) demonstrate an understanding of the importance of using proper methods and techniques for the job being performed.

(6) The student understands and applies electrical testing equipment. The student is expected to:

(A) apply the use of a volt/ohm meter to different kinds of plumbing equipment;

(B) install hangers and supports and make penetrations according to plumbing code;

(C) demonstrate an understanding of how to choose the right hanger for the application;

(D) choose and build pipe supports;

(E) demonstrate an understanding of code standards on structural penetrations; and

(F) size and install roof drains according to plumbing code.

(7) The student understands and applies how to install plumbing fixtures according to plumbing code. The student is expected to:

(A) demonstrate how to install a toilet; and

(B) demonstrate how to install sinks and different faucets.

(8) The student learns plot plans, structural design, shop drawings, elevation drawings, as-built drawings, equipment arrangement drawings, pipe and instrumentation drawings, isometric drawings, and detail drawings. The student is expected to:

(A) identify types of drawings;

(B) identify and use drawing symbols associated with piping plans and details;

(C) create field sketches; and

(D) interpret drawing indexes and line lists.

(9) The student installs, stores, and handles various types of valves. The student is expected to:

(A) identify types of valves that start and stop flow;

(B) identify types of valves that regulate flow;

(C) identify valves that relieve pressure;

(D) identify valves that regulate the direction of flow;

(E) identify types of valve actuators;

(F) explain how to properly store and handle valves;

(G) explain valve locations and positions;

(H) explain the factors that influence valve selection; and

(I) interpret valve markings and nameplate information.

(10) The student understands and applies how to braze weld and cut with oxy-fuel torch. The student is expected to:

(A) demonstrate an understanding of different parts of oxy-fuel equipment;

(B) identify and implement the proper procedure for attaching and adjusting oxy fuel pressure regulators, gauges, hoses, and torches to oxy fuel bottles;

(C) identify and apply fillers and fluxes for soldering and brazing; and

(D) demonstrate an understanding of safety and safety equipment used with oxy-fuel equipment.

(11) The student understands and applies how to size, install, and test a residential water piping system according to plumbing code. The student is expected to:

(A) identify what factors are critical for sizing a water system such as water pressure, velocity, friction, and flow;

(B) identify what fixture units are and how they apply to sizing a water system;

(C) install a water piping system; and

(D) test a water piping system.

(12) The student understands what cross connections are and their degree of hazard and how to protect against them. The student is expected to:

(A) identify different types of backflow such as gravity, back-pressure, and back siphonage;

(B) demonstrate an understanding of degree of hazard such as toxic, nontoxic, polluted, and contaminated; and

(C) demonstrate an understanding of cross connection protection such as air gap, reduced pressure zone backflow preventer, double check valve assembly, pressure type vacuum breaker, and atmospheric type vacuum breaker.

(13) The student understands and applies how to size, install, and test a natural gas system according to plumbing code. The student is expected to:

(A) identify the factors involved in sizing a natural gas system; and

(B) size, install, and test a natural gas system using carbon steel pipe and corrugated stainless steel tubing.

(14) The student understands how to size, install, and test a drain waste and vent (DWV) system according to plumbing code. The student is expected to:

(A) identify different types of DWV fittings and their use;

(B) size a DWV system;

(C) identify and apply different materials used for a DWV system;

(D) determine slope of a pipe using formulas;

(E) demonstrate an understanding of how to test a DWV system; and

(F) demonstrate an understanding of the different parts and their purpose of a DWV system such as stacks, vents, traps, building drain, and building sewer.

(15) The student understands different types of water heaters, water heaters parts, and their proper installation according to plumbing code. The student is expected to:

(A) demonstrate an understanding of storage tank (electric and gas), point of use, on demand (electric and gas), and solar water heaters;

(B) demonstrate an understanding of parts of the different heaters; and

(C) demonstrate an understanding of the installation of a gas and electric water heater.

§127.145. Practicum in Construction Management (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Construction Management II. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant

technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Practicum in Construction Management is an occupationally specific course designed to provide classroom technical instruction or on-the-job training experiences. Safety and career opportunities are included in addition to work ethics and job-related study in the classroom.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective verbal, nonverbal, written, and electronic communication skills;

(B) demonstrate effective methods to secure, maintain, and terminate employment;

(C) demonstrate positive interpersonal skills, including conflict resolution, negotiation, teamwork, and leadership;

(D) evaluate the relationship of good physical and mental health to job success and achievement;

(E) demonstrate appropriate grooming and appearance for the workplace;

(F) demonstrate appropriate business and personal etiquette in the workplace; and

(G) exhibit productive work habits and attitudes.

(2) The student develops a management plan for a project or an activity. The student is expected to:

(A) identify and describe the steps required to complete a project using project management processes, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) determine and acquire the resources needed to complete a project; and

(C) develop a project schedule.

(3) The student applies the appropriate codes, laws, standards, or regulations related to a research and development project. The student is expected to:

(A) identify areas where codes, laws, standards, or regulations may be required;

(B) locate the appropriate codes, laws, standards, or regulations; and

(C) interpret the appropriate codes, laws, standards, or regulations.

(4) The student describes the intended and unintended effects of construction management solutions. The student is expected to:

(A) use an assessment strategy to determine the risks and benefits of a research project; and

(B) describe how construction management has affected individuals, societies, cultures, economies, and environments.

(5) The student solves problems, thinks critically, and makes decisions related to research, design, and development. The student is expected to:

(A) develop or improve a product by following a problem-solving strategy;

(B) apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and

(C) apply decision-making techniques to the selection of technological solutions.

(6) The student describes the costs associated with research and development activities. The student is expected to:

(A) develop a budget for a research and development project; and

(B) determine the most effective way to minimize project costs.

(7) The student applies knowledge and skills in communication, mathematics, and science to construction management activities. The student is expected to:

(A) write technical reports;

(B) deliver technical presentations to groups of individuals;

(C) apply the mathematical concepts used in projects; and

(D) apply the science concepts used in projects.

(8) The student predicts the marketability of a project, product, or service. The student is expected to:

(A) determine the customer's expectations concerning a project, product, or service;

(B) evaluate a project, product, or service to determine if it will meet the customer's expectations; and

(C) assess customer responses.

(9) The student uses advanced tools, materials, processes, and procedures in construction management. The student is expected to:

(A) determine and use the appropriate technology needed to solve a problem or complete a task;

(B) evaluate the use of technology in a given situation; and

(C) describe the factors that influence the use of technology in a variety of situations.

(10) The student designs a project using appropriate design processes and techniques. The student is expected to:

(A) design an object or a service using an accepted design process;

(B) develop drawings, illustrations, or models; and

(C) establish design criteria and constraints.

(11) The student predicts the impacts of emerging applications of construction technology. The student is expected to:

(A) describe the emerging technologies in a field; and

(B) identify the factors that may influence the adoption of emerging technologies.

(12) The student improves the quality of a product or service using different quality-control techniques. The student is expected to:

(A) define quality;

(B) assess the quality of a specific product or service; and

(C) determine how the quality of a product or service can be improved.

(13) The student recommends new ways to build products using different tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) build products in a more efficient manner using a variety of tools, equipment, machines, materials, and processes; and

(B) demonstrate advanced construction-management skills.

(14) The student proposes safety devices required to complete different tasks. The student is expected to:

(A) recommend improvements to safety standards; and

(B) specify safety devices that allow for the safe completion of a task.

(15) The student performs advanced equipment maintenance. The student is expected to:

(A) maintain tools and materials correctly;

(B) locate and perform manufacturers' maintenance procedures on selected tools, equipment, and machines; and

(C) describe the results of negligent or improper maintenance.

(16) The student suggests how the cost of a project, product, or service can be reduced. The student is expected to:

(A) identify the factors that influence the cost of a project, product, or service; and

(B) select materials or processes that will reduce the cost of producing the product or delivering the service.

(17) The student applies knowledge and skills in mathematics, science, English language arts, and social studies as they relate to construction management. The student is expected to:

(A) develop a school-based learning activity that provides an in-depth study of at least one aspect of construction management;

(B) establish at least one industry-related mentor for the school-based learning activity;

(C) present the product in at least two formats to a panel of students, teachers, and practitioners in construction management; and

(D) deliver a final product that demonstrates the use of a variety of resources, technologies, and communication skills.

(18) The student determines employment opportunities and preparation requirements for careers in the construction-management industries. The student is expected to:

(A) determine preparation requirements for various levels of employment in a variety of careers in construction management;

(B) analyze the future employment outlook of construction management;

(C) describe entrepreneurial opportunities in construction management;

(D) determine how interests, abilities, personal priorities, and family responsibilities affect career choice;

(E) compare rewards and demands for various levels of employment in a variety of careers; and

(F) determine continuing education opportunities that enhance career advancement.

(19) The student demonstrates ethical and legal practices for careers in construction management. The student is expected to:

(A) summarize the rights and responsibilities of employers and employees;

(B) exhibit ethical practices as defined in construction management; and

(C) analyze legal aspects of construction management.

(20) The student selects the appropriate technological resources to conduct research, design, and development activities. The student is expected to:

(A) apply technology to individual or community problems;

(B) describe the factors that affect the purchase and use of items;

(C) differentiate among research, design, and development; and

(D) distinguish among adaptation, imitation, innovation, and invention.

(21) The student designs or improves a product using appropriate design processes and techniques. The student is expected to:

(A) develop or improve a product or service that meets a specified need;

(B) identify how quality, reliability, and safety can be designed into a product;

(C) describe the functions and methodologies used in basic and applied research; and

(D) develop a project portfolio that documents a research and development project.

§127.146. Extended Practicum in Construction Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Construction

Management II. Corequisite: Practicum in Construction Management. This course must be taken concurrently with Practicum in Construction Management and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Extended Practicum in Construction Management is an occupationally specific course designed to provide classroom technical instruction or on-the-job training experiences. Safety and career opportunities are included in addition to work ethics and job-related study in the classroom.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to construction management;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as punctuality, time management, initiative, and cooperation with increased fluency;

(D) complete tasks with high standards to ensure quality products and services;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) apply appropriate content knowledge, technical concepts, and vocabulary when analyzing information and following directions;

(B) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(C) analyze, interpret, and effectively communicate information, data, and observations;

(D) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(E) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions; and

(B) analyze elements of a problem to develop creative and innovative solutions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations;

(B) demonstrate safe operation of tools and equipment;

(C) describe and perform hazard analysis;

(D) specify safety devices that allow for the safe completion of a task; and

(E) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in construction management. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(C) exhibit ethical practices as defined in construction management; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a construction management experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised construction management experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate advanced construction-management skills by building products in a more efficient manner using a variety of tools, equipment, machines, materials, and processes;

(D) design or improve a product using appropriate design processes and techniques;

(E) maintain tools and materials correctly;

(F) design an object or a service using an accepted design process;

(G) demonstrate growth of technical skill competencies;

(H) evaluate strengths and weaknesses in technical skill proficiency; and

(I) collect representative work samples.

§127.147. Practicum in Construction Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Construction Technology II, Building Maintenance Technology II; Electrical Technology II; Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II; Plumbing Technology I; or Mill and Cabinetmaking Technology. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Practicum in Construction Technology, students will be challenged with the application of knowledge and skills gained in previous construction-related coursework. In many cases students will be allowed to work at a job (paid or unpaid) outside of school or be involved in local projects the school has approved for this class.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) demonstrate effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student develops a management plan for a project or an activity. The student is expected to:

(A) identify and describe the steps required to complete a project using project management processes, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) determine and acquire the resources needed to complete a project; and

(C) develop a project schedule.

(3) The student applies the appropriate codes, laws, standards, or regulations related to a research and development project. The student is expected to:

(A) identify areas where codes, laws, standards, or regulations may be required;

(B) locate the appropriate codes, laws, standards, or regulations; and

(C) interpret and comply with the appropriate codes, laws, standards, or regulations.

(4) The student describes the expectations for each project using a flowchart. The student is expected to:

(A) use an assessment strategy to determine the task's needs;

(B) describe why each task needs to be in the order it has been assigned;

(C) assess the time frame for each task; and

(D) plot a completed project flowchart expectation.

(5) The student solves problems, thinks critically, and makes decisions related to research, design, and development. The student is expected to:

(A) develop or improve the project by following a problem-solving strategy;

(B) apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and

(C) apply decision-making techniques to the selection of technological solutions.

(6) The student describes the costs associated with the project. The student is expected to:

(A) develop a bill of materials list for the complete project;

(B) develop a budget, including a cost list, for the complete project; and

(C) determine the most effective way to minimize project costs.

(7) The student applies communication, mathematics, and science knowledge and skills to the construction activities. The student is expected to:

(A) write technical reports;

(B) deliver technical presentations to the instructor;

(C) identify and describe the mathematical concepts used in projects; and

(D) identify and describe the science concepts used in projects.

(8) The student uses advanced tools, materials, processes, and procedures in the construction project. The student is expected to:

(A) determine and use the appropriate technology needed to solve a problem or complete a task;

(B) evaluate the use of technology in a given situation; and

(C) describe the factors that influence the use of technology in a variety of situations.

§127.148. Extended Practicum in Construction Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Construction Technology II, Building Maintenance Technology II; Electrical Technology II; Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II; Plumbing Technology I; or Mill and Cabinetmaking Technology. Corequisite: Practicum in Construction Technology. This course must be taken concurrently with Practicum in Construction Technology and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) In Extended Practicum in Construction Technology, students will be challenged with the application of knowledge and skills gained in previous construction-related coursework. In many cases students will be allowed to work at a job (paid or unpaid) outside of school or be involved in local projects the school has approved for this class.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to construction technology;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as punctuality, time management, initiative, and cooperation with increased fluency;

(D) complete tasks with high standards to ensure quality products and services;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) apply appropriate content knowledge, technical concepts, and vocabulary with increased fluency when analyzing information and following directions;

(B) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(C) analyze, interpret, and effectively communicate information, data, and observations;

(D) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(E) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) develop or improve a project by following a problem-solving strategy;

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in construction technology. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a construction technology experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised construction technology experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) develop a management plan for a project or an activity;

(D) apply the appropriate codes, laws, standards, or regulations related to a research and development project;

(E) develop a flowchart to plan a project;

(F) determine and use the appropriate technology to solve a problem or complete a task;

(G) demonstrate growth of technical skill competencies;

(H) evaluate strengths and weaknesses in technical skill proficiency; and

(I) collect representative work samples.

§127.149. Practicum in Masonry Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Masonry Technology II. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Practicum in Masonry Technology is an occupationally specific course designed to provide classroom technical instruction or work-based learning experiences. Instruction may be delivered through laboratory training or through career preparation delivery arrangements. Safety and career opportunities are included, in addition to work ethics and job-related study in the classroom. Trade and industrial education provides the knowledge, skills, and technologies required for employment in masonry construction. Students will develop knowledge of the concepts and skills related to this trade in order to apply them to personal/career development. Trade and industrial education depends on and supports integration of academic, career, and technical knowledge and skills. To prepare for success, students must have opportunities to reinforce, apply, and transfer their knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for success. For safety and liability considerations, including power tools usage during training, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the role of an employee in the construction industry;

(B) demonstrate critical-thinking skills;

(C) demonstrate the ability to solve problems using critical-thinking skills;

(D) demonstrate knowledge of basic computer systems;

(E) explain common uses for computers in the construction industry;

(F) demonstrate effective relationship skills; and

(G) recognize workplace issues such as sexual harassment, stress, and substance abuse.

(2) The student demonstrates trowel proficiency. The student is expected to:

(A) demonstrate proficiency spreading mortar;

(B) demonstrate proficiency spreading mortar at various heights;

(C) demonstrate proficiency spreading mortar on different types and sizes of brick;

(D) demonstrate proficiency spreading mortar on different types and sizes of concrete masonry units (CMU); and

(E) demonstrate proficiency buttering masonry units laid in different positions in a masonry wall.

(3) The student constructs single wythe brick walls with level. The student is expected to:

(A) build a brick lead with a level;

(B) build a brick wall with a level;

(C) build an outside corner with a level;

(D) build an inside corner with a level; and

(E) build a double wythe brick wall with a level.

(4) The student constructs a brick wall demonstrating different brick positions in a wall. The student is expected to:

(A) lay a stretcher in a masonry wall;

(B) lay a header in a masonry wall;

(C) lay a rowlock in a masonry wall;

(D) lay a sailor in a masonry wall;

(E) lay a soldier in a masonry wall; and

(F) lay a shiner (rowlock stretcher) in a masonry wall.

(5) The student builds a brick column. The student is expected to:

(A) construct a four-brick column with a level;

(B) construct a six-brick column with a level;

(C) construct an eight-brick column with a level; and

(D) construct a ten-brick column with a level.

(6) The student lays CMU. The student is expected to:

(A) build a block CMU lead with a level;

(B) build a block CMU wall with a level; and

(C) build a block CMU corner with a level.

(7) The student builds a block CMU column. The student is expected to:

(A) build a four-block column of 8-inch block CMU;

(B) build a six-block column of 8-inch block CMU;

(C) build a ten-block column of 8-inch block CMU;

(D) build a four-block column of 4-inch CMU; and

(E) build a four-block column of 6-inch CMU.

(8) The student constructs a composite masonry wall of brick and block. The student is expected to:

(A) build a composite wall of brick and 8-inch block CMU; and

(B) build a composite wall of brick and 4-inch block CMU.

(9) The student installs coping on a masonry wall. The student is expected to:

(A) lay single brick rowlock coping on a masonry wall;

(B) lay double brick rowlock coping on a masonry wall;

(C) lay 12-inch bonded brick rowlock coping on a masonry wall;

(D) lay 16-inch bonded brick rowlock coping on a masonry wall;

(E) install limestone coping on a masonry wall;

(F) install cast stone coping on a masonry wall; and

(G) install prefab concrete coping on a masonry wall.

(10) The student constructs a natural stone wall. The student is expected to:

(A) set natural stone in a random pattern in a masonry wall;

(B) set natural stone in an ashlar pattern in a masonry wall; and

(C) install flat work of natural stone in a random pattern.

(11) The student installs manufactured stone. The student is expected to:

(A) install manufactured stone on a wall in a random pattern; and

(B) install manufactured stone on a wall in an ashlar pattern.

(12) The student lays brick to a line. The student is expected to:

(A) lay modular brick to a line;

(B) lay king-size brick to a line;

(C) lay queen-size brick to a line; and

(D) lay utility brick to a line.

(13) The student lays CMU to a line. The student is expected to:

(A) lay 8-inch block CMU to a line;

(B) lay 4-inch block CMU to a line;

(C) lay 6-inch block CMU to a line; and

(D) lay 12-inch block CMU to a line.

§127.150. Extended Practicum in Masonry Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Masonry Technology II. Corequisite: Practicum in Masonry Technology. This course must be taken concurrently with Practicum in Masonry Technology and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Extended Practicum in Masonry Technology is an occupationally specific course designed to provide classroom technical instruction or work-based learning experiences. Instruction may be delivered through laboratory training or through career preparation delivery arrangements. Safety and career opportunities are included, in addition to work ethics and job-related study in the classroom. Trade and industrial education provides the knowledge, skills, and technologies required for employment in masonry construction. Students will develop knowledge of the concepts and skills related to this trade in order to apply them to personal/career development. Trade and industrial education depends on and supports integration of academic, career, and technical knowledge and skills. To prepare for success, students must have opportunities to reinforce, apply, and transfer their knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for success. For safety and liability considerations, including power tools usage during training, limiting course enrollment to 15 students is recommended.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to masonry technology;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as punctuality, time management, initiative, and cooperation with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(C) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in masonry technology. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a masonry technology experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised masonry technology experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate proficiency spreading mortar;

(D) construct single wythe brick walls with level;

(E) construct a brick wall demonstrating different brick positions in a wall;

(F) build a brick column with advanced proficiency;

(G) lay concrete masonry unit (CMU) with advanced proficiency;

(H) build a block CMU column with advanced proficiency;

(I) construct a composite masonry wall of brick and block;

(J) install coping on a masonry wall with advanced proficiency;

(K) construct a natural stone wall with advanced proficiency;

(L) install manufactured stone with advanced proficiency;

(M) lay brick and CMU to a line with advanced proficiency;

(N) demonstrate growth of technical skill competencies;

(O) evaluate strengths and weaknesses in technical skill proficiency; and

(P) collect representative work samples.

§127.151. Practicum in Architectural Design (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Architectural Design II. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Practicum in Architectural Design is an occupationally specific course designed to provide technical instruction in architectural design. Safety and career opportunities are included in addition to work ethics and architectural design study.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development

in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship and preparation requirements, for the student's chosen field;

(B) demonstrate an understanding of group participation and leadership related to citizenship and career preparation;

(C) demonstrate productive work habits and attitudes;

(D) apply the competencies related to resources, information, interpersonal skills, systems, and technology in appropriate settings and situations; and

(E) demonstrate knowledge of the concepts and skills related to health and safety in the workplace, as specified by appropriate governmental regulations.

(2) The student relates communication, mathematics, and science to the requirements of the student's chosen field. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures, including fellow workers, managers, and customers;

(B) apply mathematics principles and practices;

(C) apply and identify scientific principles used in projects; and

(D) read and interpret appropriate schematics, charts, graphs, drawings, construction documents, directions, manuals, bulletins, and regulations.

(3) The student knows the function and application of the tools, equipment, technologies, and materials used in the student's chosen field. The student is expected to:

(A) identify and select basic materials and processes used in the student's chosen field;

(B) use the tools and equipment commonly employed in the student's chosen field in a safe manner;

(C) handle and dispose of environmentally hazardous materials used in the student's chosen field in a proper manner; and

(D) demonstrate knowledge of new and emerging technologies in the student's chosen field.

(4) The student selects and uses multimedia communication and rendering technology to meet specific architectural design needs. The student is expected to:

(A) apply multimedia communication and rendering technology to individual or community problems;

(B) describe the factors that affect the use and interpretation of communication products; and

(C) identify and describe the roles of communication such as informing, persuading, and educating.

(5) The student designs multimedia communication and rendering products using appropriate architectural design processes and techniques. The student is expected to:

(A) develop or improve communication products that meet specified needs; and

(B) maintain a project portfolio that documents architectural projects using a variety of multimedia techniques.

(6) The student produces multimedia communication and rendering products using the appropriate tools, equipment, machines, materials, and processes. The student is expected to:

(A) use a variety of tools, equipment, and machines; and

(B) produce an architectural project using multimedia communication techniques.

(7) The student follows appropriate codes, laws, standards, or regulations. The student is expected to:

(A) identify areas where codes, laws, standards, or regulations may be required;

(B) locate the appropriate codes, laws, standards, or regulations; and

(C) comply with the appropriate codes, laws, standards, or regulations.

(8) The student demonstrates the ability to solve problems, think critically, and make decisions. The student is expected to:

(A) develop or improve a product by following a problem-solving strategy;

(B) apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and

(C) apply decision-making techniques.

(9) The student applies communication, mathematics, and science knowledge and skills to job-related activities. The student is expected to:

(A) apply written, verbal, and visual communication techniques consistent with industry standards;

(B) use mathematics concepts in communication technology; and

(C) identify and apply scientific principles.

(10) The student determines employment opportunities and preparation requirements for careers in the field of architecture. The student is expected to:

(A) determine preparation requirements for various levels of employment in a variety of careers;

(B) analyze the future employment outlook;

(C) describe entrepreneurial opportunities in architecture and related fields;

(D) determine how interests, abilities, personal priorities, and family responsibilities affect career choice;

(E) compare rewards and demands for various levels of employment in a variety of careers; and

(F) determine continuing education opportunities that enhance career advancement and promote lifelong learning.

(11) The student demonstrates ethical and legal practices for careers in the architectural-related workplace. The student is expected to:

(A) summarize the rights and responsibilities of employers and employees;

(B) exhibit ethical practices as defined by the architectural industry;

(C) analyze legal aspects of the architectural-related workplace;

(D) develop a school-based learning activity in collaboration with the teacher and at least one related mentor that provides an in-depth study of at least one aspect of a selected business, industry, and labor independent study;

(E) present the project in at least two formats such as model, graphic, verbal, or written to a panel of students, teachers, and practitioners in the career concentration;

(F) maintain a project portfolio that documents experience by using graphic or written documentation of architectural-related projects; and

(G) develop and update a professional resume that includes appropriate education history, work history, professional references, letters of recommendation, and all relevant information for any licenses, certifications, and credentials.

§127.152. Extended Practicum in Architectural Design (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Architectural Design II. Corequisite: Practicum in Architectural Design. This course must be taken concurrently with Practicum in Architectural Design and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Extended Practicum in Architectural Design is an occupationally specific course designed to provide technical instruction in architectural design. Safety and career opportunities are included in addition to work ethics and architectural design study.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to architectural design;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations effectively;

(D) analyze, interpret, and effectively communicate information, data, and observations; and

(E) observe and interpret verbal and nonverbal cues and behaviors to enhance communication.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of problems to develop creative and innovative solutions;

(C) apply decision-making techniques with increased fluency to the selection of technological solutions;

(D) develop or improve a product by following a problem-solving strategy;

(E) apply critical-thinking strategies to the analysis and evaluation of proposed technological solutions; and

(F) conduct technical research to gather information necessary for decision making.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations;

(B) handle and dispose of environmentally hazardous materials used in the student's chosen field in a proper manner; and

(C) demonstrate use of tools and equipment commonly employed in the architectural design field in a safe manner.

(5) The student understands the professional, ethical, and legal responsibilities in architectural design. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(C) exhibit ethical practices as defined by the architectural industry; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised architectural design experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised architectural design experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) read and interpret appropriate schematics, charts, graphs, drawings, construction documents, directions, manuals, bulletins, and regulations;

(D) design multimedia communication and rendering products using appropriate architectural design processes and techniques;

(E) produce multimedia communication and rendering products using the appropriate tools, equipment, machines, and materials;

(F) evaluate strengths and weaknesses in technical skill proficiency; and

(G) collect representative work samples.

§127.153. Practicum in Interior Design (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Interior Design II. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Practicum in Interior Design is an occupationally specific course designed to provide job-specific skills through laboratory training, job shadowing, or work situations in areas compatible with identified career goals in interior design. In addition, students will be expected to develop knowledge and skills related to housing, furnishings, and equipment construction or equipment management and services.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply oral and written communication skills clearly, concisely, convincingly, and effectively to explain and justify actions in a socially acceptable manner that is easily understood by others;

(B) problem-solve using job-appropriate mathematical skills;

(C) demonstrate an understanding of leadership skills;

(D) cooperate, contribute, and collaborate as a member of a group;

(E) exhibit professionalism through dress, speech, and manners that are appropriate to the profession and worksite;

(F) review accurately both quantitative and qualitative work processes and end products;

(G) follow written and oral instructions and adhere to established practices, policies, and procedures, including health and safety rules; and

(H) use and apply job-appropriate computer applications for the given task.

(2) The student determines the use of elements and principles of design in residential and nonresidential environments and furnishings. The student is expected to:

(A) differentiate between the elements and principles of design;

(B) exhibit how the elements of design can create various effects;

(C) apply elements and principles of design for coordinating furnishings; and

(D) analyze societal and cultural influences on the design of residential and nonresidential environments and their furnishings.

(3) The student analyzes the workmanship, characteristics, use, and care of materials used in the design and construction of residential and nonresidential furnishings and equipment. The student is expected to:

(A) analyze characteristics of materials and workmanship in relationship to durability and use;

(B) identify characteristics of materials and workmanship in relationship to appearance, performance, use, and care of furnishings;

(C) explain labeling requirements and appropriate procedures for the care of various furnishings;

(D) interpret information provided in equipment use and care manuals; and

(E) demonstrate procedures for the care and maintenance of different types of furnishings and equipment.

(4) The student determines treatments and accessories suitable for residential and nonresidential applications. The student is expected to:

(A) analyze products to determine the appropriate style of design;

(B) determine appropriate use of accessories, lighting, materials, and space in various environments, including environments designed to meet special needs;

(C) describe trends in materials, including eco-friendly and sustainable materials, accessories, lighting, and use of space;

(D) illustrate appropriate window treatments for specific windows;

(E) evaluate cost considerations and budgets in accessorizing for various settings;

(F) describe characteristics, use, and care of wall treatments; and

(G) identify characteristics of types of flooring in relationship to design and construction.

(5) The student assesses factors influencing the selection of furniture and equipment for residential and nonresidential applications. The student is expected to:

(A) describe furniture and equipment used in residential and nonresidential applications;

(B) compare furniture and equipment needs of families in different stages of the life cycle;

(C) evaluate economic considerations when selecting furniture and equipment;

(D) arrange furniture and equipment to accommodate floor plans to meet needs and wants;

(E) describe considerations for selecting furniture and equipment to accommodate persons with special needs; and

(F) research trends and technology related to furnishings and equipment.

(6) The student applies safety and sanitation practices. The student is expected to:

(A) apply safety rules in performing various workplace procedures according to industry standards;

(B) identify potential hazards;

(C) promote prevention practices;

(D) summarize laws pertaining to safety and sanitation practices;

(E) demonstrate appropriate responses to emergency situations; and

(F) determine workplace procedures that protect the environment.

(7) The student determines appropriate use and care of tools and equipment used in construction of furnishings. The student is expected to:

(A) identify tools and equipment used in construction of furnishings;

(B) demonstrate safe and skillful tool care and use; and

(C) describe the impact of technology on tools, equipment, and construction.

(8) The student demonstrates skills in selected product design and construction. The student is expected to:

(A) evaluate characteristics of good workmanship in furnishings products;

(B) apply knowledge of design application, selection, and construction to complete furnishings projects; and

(C) analyze uses of technology in furnishings, design, and construction.

(9) The student identifies types of business promotion practices and their benefit to the housing and furnishings retailer. The student is expected to:

(A) discuss business promotion objectives in the retail housing and furnishings industry;

(B) analyze techniques using sales promotion, advertising, and displays;

(C) describe the use of technology and other forms of advertising media in housing and furnishings business promotions;

(D) analyze how business promotion reflects the environment in which a person lives; and

(E) predict how societal trends and changing demographics influence housing and furnishings business promotions.

(10) The student evaluates customer relations as a tool for successful business operations. The student is expected to:

(A) analyze the importance of good customer relations in building and maintaining a business;

(B) demonstrate techniques for maintaining good client relationships; and

(C) describe conflict-resolution techniques when dealing with customer complaints.

(11) The student exhibits employability skills that lead to job success in the housing, furnishings, and equipment industries. The student is expected to:

(A) demonstrate effective verbal, nonverbal, written, and electronic communication skills;

(B) demonstrate effective methods to secure, maintain, and terminate employment;

(C) demonstrate positive interpersonal skills, including conflict resolution, negotiation, teamwork, and leadership;

(D) evaluate the relationship of good physical and mental health to job success and achievement;

(E) demonstrate appropriate grooming and appearance for the workplace;

(F) demonstrate appropriate business and personal etiquette in the workplace;

(G) exhibit productive work habits and attitudes; and

(H) maintain a project portfolio that documents interior design projects using a variety of multimedia techniques with a professional resume.

(12) The student determines employment opportunities and preparation requirements for careers in the housing, furnishings, and equipment industries. The student is expected to:

(A) determine preparation requirements for various levels of employment in a variety of careers in the housing, furnishings, and equipment industries;

(B) analyze the future employment outlook in the housing, furnishings, and equipment industries;

(C) describe entrepreneurial opportunities in the housing, furnishings, and equipment industries;

(D) determine how interests, abilities, personal priorities, and family responsibilities affect career choice;

(E) analyze rewards and demands for various levels of employment in a variety of careers; and

(F) research continuing education opportunities that enhance career advancement and promote lifelong learning.

(13) The student demonstrates ethical and legal practices for careers in the housing, furnishings, and equipment industries. The student is expected to:

(A) research and summarize the rights and responsibilities of employers and employees;

(B) exhibit ethical practices as defined by the housing, furnishings, and equipment industries; and

(C) analyze legal aspects of the housing, furnishings, and equipment industries.

§127.154. Extended Practicum in Interior Design (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Architecture and Construction Career Cluster. Prerequisite: Interior Design II. Corequisite: Practicum in Interior Design. This course must be taken concurrently with Practicum in Interior Design and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Architecture and Construction Career Cluster focuses on designing, planning, managing, building, and maintaining the built environment.

(3) Extended Practicum in Interior Design is an occupationally specific course designed to provide job-specific skills through laboratory training, job shadowing, or work situations in areas compatible with identified career goals in interior design. In addition, students will be expected to develop knowledge and skills related to housing, furnishings, and equipment construction or equipment management and services.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to interior design;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations effectively;

(D) analyze, interpret, and effectively communicate information, data, and observations; and

(E) observe and interpret verbal and nonverbal cues and behaviors to enhance communication.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of problems to develop creative and innovative solutions; and

(C) conduct technical research to gather information necessary for decision making.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations;

(B) apply safety rules in performing various workplace procedures according to industry standards; and

(C) demonstrate safe and skillful tool care and use.

(5) The student understands the professional, ethical, and legal responsibilities in interior design. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(C) exhibit ethical practices as defined by the housing, furnishings, and equipment industries and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised interior design experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised interior design experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) apply elements and principles of design for coordinating furnishings with advanced proficiency;

(D) identify characteristics of materials and workmanship in relationship to appearance, performance, use, and care of furnishings;

(E) demonstrate advanced procedures for the care and maintenance of different types of furnishings and equipment;

(F) determine appropriate use of accessories, lighting, materials, and space in various environments;

(G) arrange furniture and equipment to accommodate floor plans to meet needs and wants;

(H) apply knowledge of design application, selection, and construction to complete furnishings projects;

(I) evaluate strengths and weaknesses in technical skill proficiency; and

(J) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500569

Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER E. ARTS, AUDIO VISUAL TECHNOLOGY, AND COMMUNICATIONS

19 TAC §§127.160 - 127.193, 127.224 - 127.235

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.160. Principles of Arts, Audio/Video Technology, and Communications (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grade 9. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in the Arts, Audio/Video Technology, and Communications Career Cluster require a creative aptitude, a strong background in computer and technology applications, a strong academic foundation, and a proficiency in oral and written communication. Within this context, students will be expected to develop an understanding of the various and multifaceted career opportunities in this cluster and the knowledge, skills, and educational requirements for those opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explore opportunities in training, education, and certifications for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment;

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples; and

(E) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies English language arts in Arts, Audio/Video Technology, and Communications projects. The student is expected to:

(A) demonstrate use of content, technical concepts, and vocabulary;

(B) use correct grammar, punctuation, and terminology to write and edit documents;

(C) identify assumptions, purpose, and propaganda techniques;

(D) compose and edit copy for a variety of written documents;

(E) evaluate oral and written information; and

(F) research topics for the preparation of oral and written communication.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) develop and interpret tables, charts, and figures to support written and oral communications;

(G) listen to and speak with diverse individuals; and

(H) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student uses technology applications when completing Arts, Audio/Video Technology, and Communications projects and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for Arts, Audio/Video Technology, and Communications projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands arts, audio/video technology, and communications systems. The student is expected to:

(A) describe the nature and types of businesses in arts, audio/video technology, and communications;

(B) analyze and summarize the history and evolution of the arts, audio/video technology, and communications fields of study;

(C) analyze the arts, audio/video technology, and communications economic base; and

(D) analyze and summarize evidence of interdependence between the technical and the artistic sides of arts, audio/video technology, and communications.

(7) The student understands principles of audio/video production. The student is expected to:

(A) apply knowledge of audio and video script production;

(B) discuss the impact of audio and video selection on human emotion;

(C) demonstrate the use of audio and video for a three-screen environment, including cell phones, television monitors, and computer screens;

(D) demonstrate various videography techniques, including picture composition, video composition, audio composition, editing, and delivery;

(E) understand the differences between linear and non-linear systems; and

(F) demonstrate knowledge of control peripherals for capturing or ingesting media.

(8) The student understands principles of fashion design that impact consumer purchasing of fashion and apparel accessories. The student is expected to:

(A) describe social, cultural, and life cycle influences;

(B) explain how fashion trends are determined; and

(C) analyze the influence of advertising on consumer apparel choices.

(9) The student understands principles of video game design. The student is expected to:

(A) demonstrate knowledge and appropriate use of computer operating systems;

(B) demonstrate appropriate use of hardware components, software programs, and storage devices;

(C) demonstrate knowledge of sound editing;

(D) demonstrate knowledge of file formats and cross-platform compatibility;

(E) acquire and exchange information in a variety of electronic file sharing formats; and

(F) combine graphics, images, and sound.

(10) The student understands principles of graphic design and illustration. The student is expected to:

(A) research the history of visual arts and design;

(B) explain the evolution of art and design;

(C) compare current visual arts technologies with historical technologies;

(D) understand general characteristics in artwork from a variety of cultures; and

(E) analyze and apply art elements and principles in photographic works, multimedia applications, and digital and print media.

(11) The student understands principles of commercial photography. The student is expected to:

(A) demonstrate knowledge of photographic composition and layout; and

(B) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills.

(12) The student understands principles, elements, and techniques of animation. The student is expected to:

(A) describe and use audience identification, script writing, character design, storyboarding, and audio and delivery formats;

(B) describe and use cell, stop motion, tweening, motion paths, masking, looping, scripting/programming, and interactivity;

(C) describe lighting and camera shots; and

(D) describe and use flip books, claymation, or cut-outs;

(13) The student understands principles of printing and imaging. The student is expected to:

(A) identify processes required for the production of various printed products;

(B) identify basic design elements such as text, graphics, and white space; and

(C) demonstrate basic knowledge of color theory.

(14) The student applies safety regulations. The student is expected to:

(A) implement personal and classroom safety rules and regulations; and

(B) follow emergency procedures as needed.

(15) The student identifies and develops leadership characteristics. The student is expected to:

(A) identify leadership characteristics; and

(B) participate in student leadership and professional development activities.

(16) The student applies ethical decision making and understands and complies with laws regarding use of technology in arts, audio/video technology, and communications. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and giving proper credit for ideas;

(B) examine the First Amendment, Federal Communications Commission regulations, Freedom of Information Act, liability laws, and other regulations for compliance issues;

(C) examine the liabilities, copyright laws, fair use, and duplication of materials associated with productions and performances;

(D) analyze the impact of arts, audio/video technology, and communications industries on society;

(E) demonstrate an understanding of proper digital etiquette, personal security guidelines, use of network resources, and the district's acceptable use policy for technology; and

(F) identify and demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, willingness to learn new knowledge and skills, and pride in quality work.

(17) The student understands communications strategies as they relate to arts, audio/video technology, and communications. The student is expected to:

(A) adapt the language and design of a project for audience, purpose, situation, and intent;

(B) organize oral, written, and graphic information into formal and informal projects;

(C) interpret and communicate information for multiple audiences; and

(D) collaborate to create original projects, including seeking and responding to advice from others such as peers or experts in the creation and evaluation process.

(18) The student uses a variety of strategies to plan, obtain, evaluate, and use valid information. The student is expected to:

(A) obtain print and digital information such as graphics, audio, and video from a variety of resources while citing the sources;

(B) evaluate information for accuracy and validity; and

(C) present accurate information using techniques appropriate for the intended audience.

(19) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(20) The student develops a basic understanding of arts, audio/video technology, and communications. The student is expected to:

(A) research the scope of career opportunities;

(B) develop an understanding of the elements and principles of art;

(C) develop an understanding of the industry by explaining the history and evolution of the arts, audio/video technology, and communications career fields and defining and using related terminology;

(D) evaluate works of art using critical-thinking skills;

(E) determine the use of art elements such as color, texture, form, line, and space; and

(F) determine the use of principles of design such as continuity, pattern, rhythm, balance, proportion, and unity in products.

(21) The student makes informed judgments about product designs and the designs of others. The student is expected to:

(A) interpret, evaluate, and justify artistic decisions; and

(B) select and analyze original product designs by peers and others to form precise conclusions about formal qualities and historical and cultural contexts, intents, and meanings.

§127.161. Animation I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Art I or Principles of Art, Audio/Video Technology, and Communications. Recommended corequisite: Animation I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of motion graphics. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the history and techniques of the animation industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment;

(D) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(E) demonstrate skills in evaluating and comparing employment opportunities; and

(F) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in animation projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods and conflict-management skills. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for animation projects.

(6) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) demonstrate leadership skills independently and in a group setting;

(B) conduct and participate in groups; and

(C) model mentoring skills.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in animation. The student is expected to:

(A) exhibit ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and giving proper credit for ideas;

(B) discuss and apply copyright laws;

(C) model respect of intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) analyze the impact of the animation industry on society.

(9) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(10) The student develops an understanding of animation technology. The student is expected to:

(A) demonstrate appropriate use of hardware components, software programs, and storage devices;

(B) demonstrate knowledge of sound editing;

(C) demonstrate knowledge of file formats and cross-platform compatibility; and

(D) acquire and exchange information in a variety of electronic file sharing formats.

(11) The student evaluates visual information. The student is expected to:

(A) recognize the use of principles and elements of design; and

(B) recognize the use of typography.

(12) The student uses an appropriate design process to create and modify solutions to problems. The student is expected to:

(A) combine graphics, images, and sound;

(B) apply principles of design;

(C) develop and reference technical documentation; and

(D) edit products.

(13) The student creates animation projects. The student is expected to:

(A) use a variety of techniques and software programs; and

(B) publish and deliver products using a variety of media.

(14) The student researches the history and evolution of animation. The student is expected to:

(A) explain the history of animation;

(B) describe how changing technology is affecting the industry;

(C) analyze the use of symbols in the animation of diverse cultures;

(D) compare current animation technologies with historical technologies;

(E) compare various styles of animation; and

(F) explore emerging and innovative animation technologies and software.

(15) The student understands and applies animation principles, elements, and techniques. The student is expected to:

(A) describe and use audience identification, script writing, character design, storyboarding, and audio and delivery formats;

(B) describe and use cells, stop motion, tweening, motion paths, masking, looping, scripting/programming, and interactivity;

(C) describe lighting and camera shots;

(D) describe and use flip books, claymation, or cut-outs;

(E) render; and

(F) describe and use postproduction processes such as editing and creating titles, credits, and special effects.

(16) The student presents oral or written evaluations of animation projects. The student is expected to:

(A) identify the intended audience;

(B) describe aesthetics;

(C) explain the storyline;

(D) summarize subject matter; and

(E) discuss the use of sound.

§127.162. Animation I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Art I and Principles of Arts, Audio/Video Technology, and Communications. Corequisite: Animation I. This course must be taken concurrently with Animation I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Animation I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of motion graphics. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the history and techniques of the animation industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment;

(D) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(E) demonstrate skills in evaluating and comparing employment opportunities; and

(F) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in animation projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, and fractions and knowledge of arithmetic operations.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods and conflict-management skills. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for animation projects.

(6) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) demonstrate leadership skills independently and in a group setting;

(B) conduct and participate in groups; and

(C) model mentoring skills.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in animation. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and giving proper credit for ideas;

(B) discuss and apply copyright laws;

(C) model respect of intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) analyze the impact of the animation industry on society.

(9) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(10) The student develops an understanding of animation technology. The student is expected to:

(A) demonstrate appropriate use of hardware components, software programs, and storage devices;

(B) demonstrate knowledge of sound editing;

(C) demonstrate knowledge of file formats and cross-platform compatibility; and

(D) acquire and exchange information in a variety of electronic file sharing formats.

(11) The student evaluates visual information. The student is expected to:

(A) recognize the use of principles and elements of design; and

(B) recognize the use of typography.

(12) The student uses an appropriate design process to create and modify solutions to problems. The student is expected to:

(A) combine graphics, images, and sound;

(B) apply principles of design;

(C) develop and reference technical documentation; and

(D) edit products.

(13) The student creates animation projects. The student is expected to:

(A) use a variety of techniques and software programs; and

(B) publish and deliver the product using a variety of media.

(14) The student researches the history and evolution of animation. The student is expected to:

(A) explain the history of animation;

(B) describe how evolving technology is affecting the industry;

(C) analyze the use of symbols in the animation of diverse cultures;

(D) compare current animation technologies with historical technologies;

(E) compare various styles of animation; and

(F) explore emerging and innovative animation technologies and software.

(15) The student understands and applies animation principles, elements, and techniques. The student is expected to:

(A) describe and use audience identification, script writing, character design, storyboarding, and audio and delivery formats;

(B) describe and use cells, stop motion, tweening, motion paths, masking, looping, scripting/programming, and interactivity;

(C) describe lighting and camera shots;

(D) describe and use flip books, claymation, or cut-outs;

(E) render; and

(F) describe and use postproduction processes such as editing and creating titles, credits, and special effects.

(16) The student presents oral or written evaluations of animation projects. The student is expected to:

(A) identify the intended audience;

(B) describe aesthetics;

(C) explain the storyline;

(D) summarize subject matter; and

(E) discuss the use of sound.

§127.163. Animation II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Animation I. Recommended corequisite: Animation II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of motion graphics. Within this context, in addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to create two- and three-dimensional animations. The instruction also assists students seeking careers in the animation industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills; and

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in animation projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods and conflict-management skills. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for animation projects.

(6) The student understands animation systems. The student is expected to analyze and summarize the history and evolution of the animation field.

(7) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(C) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(D) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time, producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(E) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in animation. The student is expected to:

(A) exhibit ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies.

(10) The student applies advanced technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops an advanced technical understanding of animation. The student is expected to:

(A) operate communication systems to prepare and conduct verbal and visual communication;

(B) use production elements such as transitions, edits, framing, angle, and lighting techniques;

(C) use orthographic and isometric drawing techniques; and

(D) demonstrate familiarity with commercial production applications.

(12) The student demonstrates animation principles and elements. The student is expected to:

(A) apply animation principles such as arcs, timing, and exaggeration; and

(B) identify animation elements such as cycles, layers, transitions, and transparency.

(13) The student applies the elements and principles of art to animation projects. The student is expected to:

(A) identify animation design elements such as line, color, shape, and texture;

(B) explain the use of additive color theory; and

(C) compare various styles of animation.

(14) The student applies pre-production processes. The student is expected to:

(A) analyze target audience to identify needs and wants;

(B) write and edit scripts;

(C) create storyboards; and

(D) select aspect ratio and frame rate appropriate to delivery method.

(15) The student applies production processes. The student is expected to:

(A) design color and compositional elements;

(B) design characters, environments, and props;

(C) model characters, environments, and props;

(D) light sets or animating lights as needed;

(E) develop rigs for animating characters;

(F) assemble particle systems for visual effects such as rain, snow, and fire;

(G) animate characters, environments, or cameras;

(H) incorporate music and sound effects; and

(I) render scenes.

(16) The student applies post-production processes. The student is expected to:

(A) edit;

(B) produce titles and credits;

(C) add visual effects and processing;

(D) add audio effects and processing; and

(E) produce output.

§127.164. Animation II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Animation I. Corequisite: Animation II. This course must be taken concurrently with Animation II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Animation II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of motion graphics. Within this context, in addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to create two- and three-dimensional animations. The instruction also assists students seeking careers in the animation industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills; and

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in animation projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student demonstrates professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods and conflict-management skills. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for animation projects.

(6) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time, producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(8) The student applies ethical decision making and complies with laws regarding use of technology in animation. The student is expected to:

(A) exhibit ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies.

(9) The student applies advanced technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(10) The student develops an advanced technical understanding of animation. The student is expected to:

(A) operate communication systems to prepare and conduct verbal and visual communication;

(B) use production elements such as transitions, edits, framing, angle, and lighting techniques;

(C) use orthographic and isometric drawing techniques; and

(D) demonstrate familiarity with commercial production applications.

(11) The student demonstrates animation principles and elements. The student is expected to:

(A) apply animation principles such as arcs, timing, and exaggeration; and

(B) identify animation elements such as cycles, layers, transitions, and transparency.

(12) The student applies the elements and principles of art to animation projects. The student is expected to:

(A) identify animation design elements such as line, color, shape, and texture;

(B) explain the use of additive color theory; and

(C) compare various styles of animation.

(13) The student applies pre-production processes. The student is expected to:

(A) analyze target audience to identify needs and wants;

(B) write and edit scripts;

(C) create storyboards; and

(D) select aspect ratio and frame rate appropriate to delivery method.

(14) The student applies production processes. The student is expected to:

(A) design color and compositional elements;

(B) design characters, environments, and props;

(C) model characters, environments, and props;

(D) light sets or animating lights as needed;

(E) develop rigs for animating characters;

(F) assemble particle systems for visual effects such as rain, snow, and fire;

(G) animate characters, environments, or cameras;

(H) incorporate music and sound effects; and

(I) render scenes.

(15) The student applies post-production processes. The student is expected to:

(A) edit;

(B) produce titles and credits;

(C) add visual effects and processing;

(D) add audio effects and processing; and

(E) produce output.

§127.165. Audio/Video Production I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications. Recommended corequisite: Audio/Video Production I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio and video technology and film production span all aspects of the audio/video communications industry. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the industry with a focus on pre-production, production, and post-production audio and video products.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in audio and video projects. The student is expected to:

(A) apply English language arts knowledge and skills by demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, and manuals; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent through structure and style;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student uses technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands the evolution and current trends of the audio and video production industry. The student is expected to:

(A) summarize the history and evolution of the audio and video production industry; and

(B) analyze the current trends of the audio and video production industry.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations;

(B) follow emergency procedures; and

(C) examine and summarize safety-related problems that may result from working on location.

(8) The student develops leadership characteristics. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) participate in meetings; and

(D) participate in mentoring activities.

(9) The student applies ethical decision making and complies with laws regarding use of technology in audio and video production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and acquisition, trademark laws, and personal privacy laws;

(C) model respect for intellectual property;

(D) analyze the ethical impact of the audio and video production industry on society; and

(E) evaluate audio and video products for accuracy and validity.

(10) The student uses innovative thinking to develop new ideas and processes for solving real-world issues and conveying those ideas to a global audience through a digital product. The student is expected to:

(A) examine real-world issues relating to current topics such as health care, government, business, or education; and

(B) create unique methods and products for audiences beyond the classroom such as school officials, non-profit organizations, higher education officials, government, or other stakeholders.

(11) The student develops career-building characteristics. The student is expected to:

(A) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities;

(C) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, and industry professional organizations; and

(D) examine employment opportunities in entrepreneurship.

(12) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(13) The student develops a basic understanding of audio and video production. The student is expected to:

(A) understand the audio, video, and film industry, including the history, current practices, and future trends;

(B) explain the beginning and evolution of the audio, video, and film industry;

(C) describe how changing technology is impacting the audio, video, and film industry;

(D) define and use terminology associated with the audio, video, and film industry;

(E) identify various audio tape, tapeless, and file formats and the key elements required in audio scripts;

(F) apply writing skills to develop an audio script;

(G) explain how various styles of music can create a specific emotional impact;

(H) understand various microphones based upon type, pickup patterns, and various audio cables and connectors;

(I) identify the key elements required in video scripts;

(J) apply writing skills to develop a video script;

(K) identify various video tape, tapeless, and file formats;

(L) understand various video cables and connectors;

(M) distinguish between analog and digital formats;

(N) describe various videography techniques, including picture composition, focus, camera and tripod movements, and proper exposure and white balance;

(O) understand the basics of audio and video editing platforms such as differences between linear and nonlinear editing systems; and

(P) describe various digital platforms, including high definition and standard definition.

(14) The student understands the pre-production process. The student is expected to:

(A) design and implement procedures to track trends, set timelines, and evaluate progress for continual improvement in process and product;

(B) respond to advice from peers and professionals;

(C) create technology specifications;

(D) monitor process and product quality using established criteria;

(E) create a script and identify resources needed to begin the production;

(F) identify budgeting considerations for cast, crew, equipment, and location;

(G) analyze the script and storyboard development processes for a successful production;

(H) identify and participate in the team roles required for completion of a production;

(I) identify cast, crew, equipment, and location requirements for a scripted production; and

(J) understand the casting or audition process.

(15) The student understands the post-production process. The student is expected to:

(A) use technology applications to facilitate evaluation of work, both process and product, by evaluating the project's success in meeting established criteria; and

(B) research the best method for promoting the product by identifying and analyzing market research such as market share, audience-measurement ratings, sweeps periods, distribution, product release dates, demographics, target audience, and advertising rates and revenue.

§127.166. Audio/Video Production I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications or Digital Media in the Information Technology Career Cluster. Corequisite: Audio/Video Production I. This course must be taken concurrently with Audio/Video Production I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Audio/Video Production I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio and video technology and film production span all aspects of the audio/video communications industry. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the industry with a focus on pre-production, production, and post-production audio and video products. Requiring a lab corequisite for the course affords necessary time devoted specifically to the production and post-production process.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in audio and video projects. The student is expected to:

(A) apply English language arts knowledge and skills by demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, and manuals; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations;

(B) follow emergency procedures; and

(C) identify and report safety-related problems that may result from working on location.

(7) The student develops leadership characteristics. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) participate in meetings; and

(D) participate in mentoring activities.

(8) The student applies ethical decision making and complies with laws regarding use of technology in audio and video production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) apply copyright laws in relation to fair use and acquisition, trademark laws, and personal privacy laws; and

(C) model respect for intellectual property.

(9) The student develops career-building characteristics. The student is expected to:

(A) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities;

(C) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, industry professional organizations; and

(D) examine employment opportunities in entrepreneurship.

(10) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(11) The student develops a basic understanding of audio and video production. The student is expected to:

(A) use terminology associated with the industries;

(B) apply writing skills to develop an audio script;

(C) apply various styles of music as needed to create a specific emotional impact;

(D) use various audio tape, tapeless, and file formats;

(E) use various microphones based upon type and pickup patterns; and

(F) use various audio cables and connectors.

(12) The student employs knowledge regarding use of video. The student is expected to:

(A) apply writing skills to develop a video script;

(B) use various video tape, tapeless, and file formats;

(C) use various video cables and connectors;

(D) demonstrate operation of video cameras; and

(E) demonstrate how to properly maintain video equipment;

(13) The student employs various videography techniques. The student is expected to:

(A) demonstrate how to frame and maintain picture composition;

(B) demonstrate focusing techniques;

(C) demonstrate camera and tripod movements; and

(D) demonstrate proper exposure and white balance.

(14) The student edits basic audio and video productions. The student is expected to:

(A) demonstrate skills required for editing using linear and nonlinear systems; and

(B) employ knowledge of control peripherals for capturing or ingesting media.

(15) The student understands the pre-production process. The student is expected to:

(A) implement procedures to track trends, set timelines, and evaluate progress for continual improvement in process and product;

(B) respond to advice from peers and professionals;

(C) create technology specifications;

(D) monitor process and product quality using established criteria;

(E) create a script and identify resources needed to begin the production;

(F) apply budgeting considerations for cast, crew, equipment, and location;

(G) analyze the script and storyboard for a successful production;

(H) participate in the team roles required for completion of a production; and

(I) employ cast, crew, equipment, and location for a scripted production.

(16) The student understands the production process. The student is expected to:

(A) implement a coherent sequence of events to successfully produce a script;

(B) use lighting techniques, including three-point lighting, reflected light, color temperatures, and lighting filters;

(C) employ audio techniques, including microphone variances and sound mixing; and

(D) demonstrate knowledge of interpersonal skills with sensitivity to diversity when directing crew or talent.

(17) The student understands the post-production process. The student is expected to:

(A) demonstrate knowledge of video systems such as digital and analog systems, software applications, and communication and network components;

(B) make appropriate decisions regarding the selection of software;

(C) make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity;

(D) apply animation effects using character generators, fonts, colors, and principles of composition to create graphic images, captions, or titles for video and graphics;

(E) demonstrate proficiency in the use of a variety of electronic input devices;

(F) use a variety of strategies to acquire information from online resources;

(G) acquire electronic information in a variety of formats;

(H) use different compression standards and techniques to output for distribution;

(I) format digital information for effective communication with a defined audience using appropriate font attributes and color, white space and graphics, and camera perspective;

(J) use appropriate content selection and presentation;

(K) understand target audiences and demographics;

(L) determine appropriate delivery method based on distribution needs;

(M) deliver products in a variety of media by using various delivery formats such as disk, broadcast, cellular, portable device, electronic, and online delivery;

(N) use appropriate computer-based productivity tools to create and modify solutions to problems;

(O) create audio and video technology products for a variety of purposes and audiences;

(P) develop technical documentation related to audio and video technology; and

(Q) demonstrate innovative uses of a wide range of emerging technologies, including online learning, mobile devices, digital content, and Web 2.0 tools such as podcasting, wikis, and blogs.

§127.167. Audio/Video Production II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Audio/Video Production I. Recommended corequisite: Audio/Video Production II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio and video technology and film production span all aspects of the audio/video communications industry. Building upon the concepts taught in Audio/Video Production, in addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the industry with a focus on pre-production, production, and post-production products. This course may be implemented in an audio format or a format with both audio and video.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written commu-

nication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in production projects. The student is expected to:

(A) apply English language arts knowledge and skills by consistently demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by consistently demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent through structure and style;

(B) analyze and organize oral and written information;

(C) analyze, interpret, and communicate information, data, and observations;

(D) create and deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student uses technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands the evolution and current trends of the audio and video production industry. The student is expected to:

(A) summarize the history and evolution of the audio and video production industry; and

(B) analyze the current trends of the audio and video production industry.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations;

(B) recognize and resolve potential safety concerns; and

(C) follow emergency procedures.

(8) The student applies leadership characteristics to student organizations and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in audio/video production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) apply copyright laws in relation to fair use and acquisition, trademark laws, and personal privacy laws;

(C) model respect for intellectual property; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies.

(10) The student develops career-building characteristics. The student is expected to:

(A) update a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities;

(C) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, industry professional organizations; and

(D) examine employment opportunities in entrepreneurship.

(11) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(12) The student demonstrates knowledge of audio and video production. The student is expected to:

(A) understand set-up, execution, and trouble-shooting of standard systems for the audio/video industry, including editing systems, wireless and wired transmission systems, cabling, and configurations for production purposes;

(B) employ knowledge of recording equipment usage by explaining analog and digital formats;

(C) describe tape and tapeless formats;

(D) demonstrate the operation of recording devices, including metering a recording signal for proper levels and proper maintenance of recording equipment; and

(E) apply appropriate industry-related terminology.

(13) The student understands the pre-production process. The student is expected to:

(A) apply critical elements, including purpose, target audience, and distribution, in the pre-production stage to identify and evaluate the production;

(B) demonstrate procedures to establish timelines;

(C) develop a budget with considerations for cast, crew, equipment, and location;

(D) write documents of the scripting process such as treatments, storyboards, rundowns, and scripts for various types of programs using proper formatting for the specific type of production document;

(E) identify specific elements needed for successful production such as cast, crew, equipment, location, props, and sound effects;

(F) discuss how various styles of music can create a specific emotional impact;

(G) examine the end goal of the production to determine the appropriate format for recording and distributing;

(H) identify several means to work within budget restraints;

(I) conduct auditions for the talent and secure the crew required for a successful production; and

(J) examine various contracts related to industry tasks, including talent releases for productions, and key elements for contracts such as crew, talent, location, and distribution.

(14) The student understands the business aspects of the industry. The student is expected to:

(A) understand the roles of various industry professionals by identifying and discussing the responsibilities and relationships among the production team, including producers, directors, editors, engineers, talent, additional crew members, and sales team;

(B) understand the opportunities in the industry for freelance entrepreneurs by identifying standard freelance self-promotion techniques, proposals, technology applications for freelance entrepreneurs, best practices for various freelance job responsibilities, and standard billing practices for freelance labor, including invoices and collections rates;

(C) understand the unique characteristics of live productions such as roles, equipment, time accountability, back-timing, time-based mathematics, and financial support; and

(D) identify roles, costs, equipment, and strategies for financially supporting studio and field productions.

(15) The student demonstrates an understanding of regulatory agency guidelines for content appropriateness. The student is expected to:

(A) identify applicable guidelines based on production distribution methods; and

(B) distinguish between Federal Communications Commission (FCC), National Public Radio (NPR), and other regulatory agencies.

(16) The student understands the technical broadcast standards established by the FCC. The student is expected to:

(A) apply knowledge of broadcast formats by distinguishing between analog and digital formats;

(B) describe the difference in data signals and equipment for analog and digital technology;

(C) identify the evolution of the broadcast signal and standards such as High-Definition (HD), Standard-Definition (SDTV), National Television System Committee (NTSC), Phase Alternating Line (PAL), and Sequential Color with Memory (SECAM); and

(D) identify the location of radio and television frequencies in the electromagnetic spectrum.

(17) The student understands the evolution of various media formats. The student is expected to:

(A) identify the evolution of various media formats such as tape, tapeless, film, and electronic; and

(B) identify the evolution and application of digital media formats and compression standards.

§127.168. Audio/Video Production II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Audio/Video Production I. Corequisite: Audio/Video Production II. This course must be taken concurrently with Audio/Video Production II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Audio/Video Production II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio and video technology and film production span all aspects of the audio/video communications industry. Building upon the concepts taught in Audio/Video Production, in addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the industry with a focus on pre-production, production, and post-production products. Through diverse forms of storytelling and production, students will exercise and develop creativity, intellectual curiosity, and critical-thinking, problem-solving, and collaborative skills. This course may be implemented in an audio format or a format with both audio and video. Requiring a lab corequisite for the course affords necessary time devoted specifically to the production and post-production process.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment;

(D) update a resume, cover letter/letter of interest, and career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies academic knowledge and skills in production projects. The student is expected to:

(A) apply English language arts knowledge and skills by consistently demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by consistently demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student develops a perception of self, human relationships, and the world. The student is expected to:

(A) demonstrate the value and purpose of listening, observing, concentrating, cooperating, and using emotional and sensory recall;

(B) develop and practice effective voice and diction;

(C) analyze strategies such as advertising; perpetuating stereotypes; and using visual representations, special effects, and language used by media to inform, persuade, entertain, and transform culture;

(D) explore the emotional and intellectual effects of visual media on viewers; and

(E) analyze how visual and audio techniques such as special effects, editing, camera angles, reaction shots, sequencing, and music convey messages in media.

(4) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent through structure and style;

(B) analyze and organize oral and written information;

(C) analyze, interpret, and communicate information, data, and observations;

(D) create and deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals;

(G) collaborate with others in a production role such as talent, director, producer, videographer, and editor to tell a story through live or recorded productions; and

(H) exhibit public relations skills to increase internal and external customer/client satisfaction.

(5) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups;

(B) employ interpersonal skills in groups to solve problems; and

(C) demonstrate responsibility, artistic discipline, and creative problem solving by concentrating in one or more areas of audio and video production such as directing, producing, writing, videography, and editing.

(6) The student uses technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations throughout the production process;

(B) recognize and resolve potential safety concerns; and

(C) follow emergency procedures.

(8) The student applies leadership characteristics to student organizations and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by exhibiting problem-solving and management traits;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in audio/video production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) apply copyright laws in relation to fair use and acquisition, trademark laws, and personal privacy laws;

(C) model respect for intellectual property; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies.

(10) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(11) The student demonstrates an understanding of audio and video production. The student is expected to:

(A) understand set-up, execution, and trouble-shooting of standard systems for the audio/video industry, including editing systems, wireless and wired transmission systems, cabling, and configurations for production purposes;

(B) employ the operation of recording devices, including metering a recording signal for proper levels and proper maintenance of recording equipment; and

(C) apply appropriate industry-related terminology.

(12) The student understands the pre-production process. The student is expected to:

(A) apply critical elements, including purpose, target audience, and distribution, in the pre-production stage by identifying and evaluating the production;

(B) use advanced technology applications to facilitate pre-production by developing a budget with considerations for cast, crew, equipment, and location;

(C) write documents of the scripting process such as treatments, storyboards, rundowns, and scripts for various types of programs;

(D) use proper formatting for the specific type of production document;

(E) identify specific elements of the production document needed for successful production, such as cast, props, and sound effects;

(F) determine artistic impact of production plan;

(G) determine the use of art elements such as color, texture, form, line, and space;

(H) determine the principles of design such as continuity, pattern, rhythm, balance, proportion, and unity in products;

(I) determine cast, crew, equipment, and location requirements for a successful production;

(J) conduct auditions for the talent and secure the crew required for a successful production; and

(K) examine various contracts related to industry tasks by using talent releases for productions.

(13) The student applies the production process. The student is expected to:

(A) apply the coherent sequence of events to successfully produce a script;

(B) use lighting techniques, including three-point lighting, reflected light, color temperatures, lighting filters, lighting gels, and understand lighting and its emotional impact on productions;

(C) demonstrate a knowledge of audio techniques by using various microphone types;

(D) demonstrate an understanding of sound mixing and elements of a final audio mix;

(E) execute production of the script by demonstrating teamwork and knowledge of interpersonal skills with sensitivity to diversity when directing crew and talent;

(F) apply knowledge of the critical elements in designing activities in the production stage;

(G) employ knowledge of digital editing by addressing various distribution formats, including electronic, disk, tapeless, and tape;

(H) ingest media to an editing system for the purpose of manipulating recorded media;

(I) properly monitor equipment to ensure quality recordings;

(J) set appropriate levels before recording by using broadcast standard tools; and

(K) identify standards for logging notes during the recording process.

(14) The student understands the post-production process relating to video systems. The student is expected to:

(A) demonstrate knowledge of video systems such as digital and analog systems, software applications, and communication and network components;

(B) demonstrate an understanding of various input, processing, output, and storage devices;

(C) demonstrate an understanding of compatibility issues, including digital file formats and cross-platform connectivity; and

(D) demonstrate an understanding of high definition and standard definition output media.

(15) The student understands the post-production process relating to animation effects. The student is expected to:

(A) use character generators, fonts, colors, and principles of composition to create graphic images; and

(B) create captions or titles for video and graphics.

(16) The student understands the post-production process relating to output for distribution. The student is expected to:

(A) demonstrate proficiency in outputting production for distribution using various compression standards and techniques;

(B) understand the relationship between file size and quality;

(C) use various delivery formats such as disk, broadcast, cellular, portable devices, electronic, and online delivery;

(D) determine the appropriate delivery method based on distribution needs;

(E) extend the learning environment through digital sharing and gathering such as cloud computing, emerging collaboration technologies, data mining strategies, and mobile technologies;

(F) use appropriate computer-based productivity tools to create and modify solutions to problems;

(G) integrate productivity tools to develop and modify solutions to problems; and

(H) create technical documentation related to project specifications.

(17) The student understands the post-production process relating to level of project success. The student is expected to:

(A) critique production to determine how the various elements resulted in a successful or unsuccessful project; and

(B) recognize and evaluate final production as an art form.

§127.169. Digital Audio Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications or Digital Media or both Audio/Video Production I and Audio/Video Production I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Digital Audio Technology I was designed to provide students interested in audio production careers such as audio for radio and television broadcasting, audio for video and film, audio for animation and game design, music production and live sound, and additional opportunities and skill sets. Digital Audio Technology I does not re-place Audio Video Production courses but is recommended as a single credit, co-curricular course with an audio production technical emphasis. This course can also be paired with Digital Media. Students will be expected to develop an understanding of the audio industry with a technical emphasis on production and critical-listening skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in audio and video projects. The student is expected to:

(A) apply English language arts knowledge and skills by demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, and manuals; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands the evolution and current trends of the audio industry. The student is expected to:

(A) summarize the history and evolution of the audio production industry; and

(B) analyze the current trends of the audio production industry.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(8) The student develops leadership characteristics. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) participate in meetings; and

(D) participate in mentoring activities.

(9) The student applies ethical decision making and complies with laws and regulations regarding use of technology in audio production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) model respect for intellectual property;

(C) analyze the ethical impact of the audio production industry on society;

(D) understand and comply with all copyright and fair use laws; and

(E) understand and comply with all applicable rules and regulations of the associated governing authority such as the Federal Communications Commission (FCC), local school district, or client.

(10) The student develops career-building characteristics. The student is expected to demonstrate skills in evaluating and comparing employment opportunities.

(11) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(12) The student develops a basic understanding of the audio production industry. The student is expected to:

(A) identify various career pathways and job opportunities in the audio production industry;

(B) understand the roles of various industry audio professionals such as producers, editors, engineers, and talent as they apply to specific audio production career pathways;

(C) understand the history, current practices, and future trends for audio production careers such as radio and television broadcasting, video and film, animation and game design, music production, and live sound;

(D) describe how the changing technology is impacting the audio industry; and

(E) define and appropriately use terminology associated with the audio production industry.

(13) The student develops a basic understanding of audio production equipment. The student is expected to:

(A) understand types and application of microphones such as dynamic, condenser, ribbon, pressure zone (PZM), universal serial bus (USB), and wireless;

(B) understand pick-up patterns and application of microphones such as cardioid, omni-directional, and figure eight;

(C) understand the operation and application of audio consoles (mixers) such as broadcast consoles, live sound consoles, and recording consoles;

(D) understand the operation and application of audio processing equipment or software such as equalizer (EQ), dynamic compressor, noise gate, band pass filters, reverb, and delays;

(E) understand the operation and application of analog and digital audio recording devices such as handheld recorders, USB interfaces, multi-track devices, and digital audio workstations (DAW);

(F) understand the application of audio interconnect cabling and connectors such as XLR balanced, TRS balanced, TS unbalanced, RCA, 1/4" TRS/TS, and mini TRS/TS;

(G) understand the operation and application of additional audio hardware such as musical instrument digital interface (MIDI) controllers, direct boxes, audio splitters, and analog to digital converters as needed; and

(H) understand the types and applications of audio speakers such as broadcast monitors, studio monitors, and live sound speakers.

(14) The student develops an understanding of audio production elements. The student is expected to:

(A) identify key elements (stems) of an audio production such as dialogue, sound effects, music, and environmental;

(B) understand how music styles, sound effects, or vocal performance can create a specific emotional impact;

(C) identify key technical elements of audio production for effect such as panning, ducking, track doubling, retiming, and auto-tune; and

(D) understand and identify digital audio codecs and compression standards such as Waveform Audio (WAV), MP3, and advanced audio coding (AAC).

(15) The student identifies, creates, and obtains required assets for audio production projects. The student is expected to:

(A) identify key elements required in audio scripts;

(B) apply writing skills to develop an audio script; and

(C) create or obtain required audio assets through recording, synthesis, or permissions.

(16) The student develops a basic understanding of a DAW and audio editing. The student is expected to:

(A) understand how to record or import various types of audio content such as audio files, MIDI data or automation;

(B) understand types and application of audio track such as instrument track, master track, auxiliary track, and global attributes track;

(C) understand audio editing tools and transitions such as cut, trim, and fade;

(D) understand the use and application of software plug-ins such as EQ, dynamic compression, reverb, and software instruments;

(E) understand the use and application of software automation; and

(F) understand the various delivery formats such as disk, broadcast, cellular, portable device, electronic, and online delivery.

§127.170. Digital Audio Technology II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Digital Audio Technology I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Digital Audio Technology II was designed to provide additional opportunities and skill sets for students interested in audio production careers such as audio for radio and television broadcasting, audio for video and film, audio for animation and game design, and music production and live sound. Digital Audio Technology II does not replace Audio Video Production courses but is recommended as a single credit, co-curricular course with an audio production technical emphasis. This course can also be paired with Digital Media. Students will be expected to develop an understanding of the audio industry with a technical emphasis on production and critical-listening skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in audio and video projects. The student is expected to:

(A) apply English language arts knowledge and skills by demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, and manuals; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands the evolution and current trends of the audio industry. The student is expected to:

(A) summarize the history and evolution of the audio production industry; and

(B) analyze the current trends of the audio production industry.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(8) The student develops leadership characteristics. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) participate in meetings; and

(D) participate in mentoring activities.

(9) The student applies ethical decision making and complies with laws and regulations regarding use of technology in audio production. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others and providing proper credit for ideas;

(B) model respect for intellectual property;

(C) analyze the ethical impact of the audio production industry on society;

(D) understand and comply with all copyright and fair use laws; and

(E) understand and comply with all applicable rules and regulations of the associated governing authority such as the Federal Communications Commission (FCC), local school district, or client.

(10) The student develops career-building characteristics. The student is expected to:

(A) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, and industry professional organizations; and

(C) examine employment opportunities in entrepreneurship.

(11) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(12) The student develops a basic understanding of the audio production industry. The student is expected to:

(A) identify various career pathways and job opportunities in the audio production industry;

(B) understand the roles of various industry audio professionals such as producers, editors, engineers, and talent as they apply to specific audio production career pathways;

(C) understand the history, current practices, and future trends for audio production careers such as radio and television broadcasting, video and film, animation and game design, music production, and live sound;

(D) describe how the changing technology is impacting the audio industry; and

(E) define and appropriately use terminology associated with the audio production industry.

(13) The student develops a basic understanding of audio production equipment. The student is expected to:

(A) use types and applications of microphones such as dynamic, condenser, ribbon, pressure zone (PZM), universal serial bus (USB), and wireless;

(B) use pick-up patterns and applications of microphones such as cardioid, omni-directional, and figure eight;

(C) demonstrate the operation and application of audio consoles (mixers) such as broadcast consoles, live sound consoles, and recording consoles;

(D) demonstrate the operation and application of audio processing equipment or software such as equalizer (EQ), dynamic compressor, noise gate, band pass filters, reverb, and delays;

(E) demonstrate the operation and application of analog and digital audio recording devices such as handheld recorders, USB interfaces, multi-track devices, and digital audio workstations (DAW);

(F) demonstrate the application of audio interconnect cabling and connectors such as XLR balanced, TRS balanced, TS unbalanced, RCA, 1/4" TRS/TS, and mini TRS/TS;

(G) demonstrate the operation and application of additional audio hardware such as musical instrument digital interface (MIDI) controllers, direct boxes, audio splitters, and analog to digital converters as needed; and

(H) use the types and applications of audio speakers such as broadcast monitors, studio monitors, and live sound speakers.

(14) The student develops an understanding of audio production elements. The student is expected to:

(A) consistently identify key elements (stems) of an audio production such as dialogue, sound effects, music, and environmental;

(B) use music styles, sound effects, or vocal performances to create a specific emotional impact;

(C) use key technical elements of audio production for effect such as panning, ducking, track doubling, retiming, and autotune; and

(D) use digital audio codecs and compression standards such as Waveform Audio (WAV), MP3, and advanced audio coding (AAC).

(15) The student identifies, creates, and obtains required assets for audio production projects. The student is expected to:

(A) use key elements required in audio scripts;

(B) consistently apply writing skills to develop an audio script; and

(C) create or obtain required audio assets through recording, synthesis, or permissions.

(16) The student develops a basic understanding of a DAW and audio editing. The student is expected to:

(A) demonstrate how to record or import various types of audio content such as audio files, MIDI data, or automation;

(B) use types and application of audio tracks such as audio track, instrument track, master track, auxiliary track, and global attributes track;

(C) use audio editing tools and transitions such as cut, trim, and fade;

(D) demonstrate the use and application of software plug-ins such as EQ, dynamic compression, reverb, and software instruments;

(E) demonstrate the use and application of software automation; and

(F) use the various delivery formats such as disk, broadcast, cellular, portable device, electronic, and online delivery.

§127.171. Video Game Design (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Art, Audio/Video Technology, and Communications. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Video Game Design will allow students to explore one of the largest industries in the global marketplace and the new emerging careers it provides in the field of technology. Students will learn gaming, computerized gaming, evolution of gaming, artistic aspects of perspective, design, animation, technical concepts of collision theory, and programming logic. Students will participate in a simulation of a real video game design team while developing technical proficiency in constructing an original game design.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(B) demonstrate skills related to seeking and applying for employment;

(C) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(D) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies academic knowledge and skills in video game design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) apply active listening skills; and

(E) communicate with diverse individuals.

(4) The student understands and employs problem-solving methods and conflict-management skills. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(6) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) demonstrate leadership skills; and

(B) participate in a group setting.

(7) The student applies ethical decision making and understands and complies with laws regarding use of technology in video game design. The student is expected to:

(A) exhibit ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws;

(C) model respect of intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) analyze the impact of the video game design industry on society.

(8) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(9) The student develops an understanding of video game design. The student is expected to:

(A) demonstrate knowledge and appropriate use of computer operating systems;

(B) demonstrate appropriate use of hardware components, software programs, and storage devices;

(C) demonstrate knowledge of sound editing;

(D) demonstrate knowledge of file formats and cross-platform compatibility;

(E) acquire and exchange information in a variety of electronic file sharing formats; and

(F) evaluate visual information by recognizing the use of principles and elements of design.

(10) The students employs an appropriate design process to create and modify solutions to problems. The student is expected to:

(A) combine graphics, images, and sound;

(B) apply principles of design;

(C) develop and reference technical documentation; and

(D) edit products.

(11) The student researches the history and evolution of video game design. The student is expected to:

(A) explain the history of video game design;

(B) describe how changing technology is affecting the industry;

(C) analyze the use of symbols in video game design of diverse cultures;

(D) compare current video game design technologies with historical technologies;

(E) compare various styles of video game design; and

(F) explore emerging and innovative video game design technologies and software.

(12) The student understands and applies video game design principles, elements, and techniques. The student is expected to:

(A) employ audience identification, script writing, character design, storyboarding, and audio and delivery formats;

(B) describe and use motion paths, scripting, programming, and interactivity;

(C) describe lighting and perspective; and

(D) describe and use production processes such as titles, credits, and special effects.

(13) The student evaluates a product using critical-thinking skills. The student is expected to evaluate products and product quality against established criteria and rubrics.

(14) The student presents oral or written evaluations of video game design projects. The student is expected to:

(A) identify the intended audience;

(B) describe aesthetics;

(C) explain the storyline;

(D) summarize subject matter; and

(E) discuss the use of sound.

(15) The student creates video game design projects. The student is expected to use a variety of techniques and software programs.

(16) The student differentiates current programming languages. The student is expected to:

(A) discuss the use of computer programming languages in other fields of study; and

(B) demonstrate knowledge of specific programming terminology and concepts.

(17) The student applies problem-solving strategies. The student is expected to apply design specifications, step-wise refinement, or algorithm development.

(18) The student develops coding with correct and efficient use of expressions. The student is expected to use user-defined functions; proper operator precedence; and sequential, conditional, and repetitive control structures.

(19) The students applies constructive criticism to products. The student is expected to seek and respond to advice from peers and professionals in delineating technological tasks.

(20) The student uses research skills and electronic communication, with appropriate supervision, to create new knowledge. The student is expected to:

(A) participate with electronic communities as a learner, initiator, contributor, and teacher or mentor;

(B) extend the learning environment beyond the school walls with digital products created to increase teaching and learning in the foundation and enrichment curricula; and

(C) participate in relevant, meaningful activities in the larger community and society to create electronic projects.

(21) The student uses technology applications to facilitate evaluation of communication processes and products. The student is expected to:

(A) write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally; and

(B) debug and solve problems using reference materials and effective strategies.

(22) The student understands technology concepts, systems, and operations as they apply to game programming. The student is expected to:

(A) identify basic game components, including the game engine, game play subsystems, data structures, models, and interfaces;

(B) generate random numbers in a program;

(C) create a program implementing conditional statements;

(D) develop an appropriate data model;

(E) demonstrate an understanding of and apply object-oriented game programming;

(F) demonstrate an understanding of game programming essentials, including event-driven programming, communicating with messages, and device management;

(G) demonstrate an understanding of the role of game events, the animation loop, and game timing;

(H) demonstrate an understanding of the role of game engines;

(I) apply basic game screen design and layout, including visual controls, user interfaces, menus, and options;

(J) use game control design to understand, access, and control input devices;

(K) demonstrate an understanding of and apply game animation, including the principles of animation and frame-based animation;

(L) demonstrate an understanding of game events, including listeners, triggers, and timed events;

(M) demonstrate an understanding of and implement collision detection, including models and sprite collisions;

(N) demonstrate an understanding of player progression, including leveling, linear progression, and maintaining high score data; and

(O) demonstrate an understanding of algorithmic decision making.

§127.172. Printing and Imaging Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended corequisite: Printing and Imaging Technology I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the printing industry with a focus on digital prepress and digital publishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify appropriate training, education, or certification for printing and imaging technology employment;

(B) recognize positive work behaviors and personal qualities needed to be employable; and

(C) describe skills related to seeking, applying for, and obtaining a desired job.

(2) The student applies academic knowledge and skills in printing and imaging projects. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse groups of individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ communication skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in printing. The student is expected to:

(A) demonstrate an understanding of ethical conduct;

(B) understand copyright laws in relation to fair use and duplication of materials; and

(C) understand Creative Commons laws, including all licensing.

(9) The student develops career-building characteristics. The student is expected to:

(A) understand the use and importance of a portfolio in documenting information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities; and

(C) examine employment opportunities in entrepreneurship.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops a basic understanding of printing and imaging. The student is expected to:

(A) understand printing systems and their uses;

(B) describe the processes required for the production of various printed products;

(C) explain the impact of the printing industry on the U.S. economy;

(D) understand the impact of emerging technologies in hardware and software applications;

(E) understand how to manage the printing process, including customer service and sales, scheduling, and quality control;

(F) describe materials used in various printing projects;

(G) understand how to acquire information in a variety of formats;

(H) evaluate information for accuracy, validity, and usability;

(I) compare the features of graphics programs used in digital printing;

(J) explain how design elements such as text, graphics, headlines, use of color, and white space affect usability;

(K) explain the principles of typography, including font size and style;

(L) explain color theory and its use in the design process;

(M) identify graphic design concepts such as contrast, alignment, repetition, and proximity;

(N) reference technical documentation;

(O) understand file and cross-platform compatibility;

(P) identify and use the principles of design to discuss, analyze, critique, and write about visual aspects in print design, including the student's own designs; and

(Q) demonstrate knowledge of the principles of design in print design images, with a focus on composition, color, design, shape, shadow, negative space, and background.

(12) The student researches the history of the printing and imaging field. The student is expected to analyze and summarize the evolution of the printing and imaging field and its historical impact on society.

§127.173. Printing and Imaging Technology I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Corequisite: Printing and Imaging Technology I. This course must be taken concurrently with Printing and Imaging Technology I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Printing and Imaging Technology I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to demonstrate an understanding of the printing industry with a focus on digital prepress and digital publishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for printing and imaging technology employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job.

(2) The student applies academic knowledge and skills in printing and imaging projects. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ communication skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in printing. The student is expected to:

(A) demonstrate an understanding of ethical conduct;

(B) apply copyright laws in relation to fair use and duplication of materials;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) demonstrate an understanding of Creative Commons laws, including all licensing.

(9) The student develops career-building characteristics. The student is expected to:

(A) maintain a portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities; and

(C) examine employment opportunities in entrepreneurship.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops a basic understanding of printing and imaging. The student is expected to:

(A) understand printing systems and their uses;

(B) employ processes required for the production of various printed products;

(C) demonstrate print process management, including customer service and sales, scheduling, and quality control;

(D) evaluate customer needs and materials;

(E) acquire information in a variety of formats;

(F) evaluate information for accuracy, validity, and usability;

(G) apply digital publishing techniques to create products by using word processing, graphics, or drawing programs;

(H) apply design elements such as text, graphics, headlines, and white space;

(I) apply typography concepts, including font size and style;

(J) apply color theory;

(K) apply graphic design concepts such as contrast, alignment, repetition, and proximity;

(L) edit and evaluate products;

(M) develop technical documentation;

(N) demonstrate knowledge and appropriate use of hardware components, software programs, and storage devices;

(O) demonstrate knowledge of file and cross-platform compatibility; and

(P) deliver products in a variety of media.

§127.174. Printing and Imaging Technology II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Printing and Imaging Technology I and Printing and Imaging Technology I Lab. Recommended corequisite: Printing and Imaging Technology II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant

technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the printing industry with a focus on digital prepress and desktop digital publishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify appropriate training, education, or certification for employment;

(B) identify positive work behaviors and personal qualities needed to be employable; and

(C) identify skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills.

(2) The student applies academic knowledge and skills in printing and imaging projects. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents such as brochures, programs, and newsletters; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) present information formally and informally;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in printing. The student is expected to:

(A) demonstrate an understanding of ethical conduct;

(B) understand copyright laws;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies;

(E) understand Creative Commons laws, including all licensing; and

(F) analyze the impact of the printing industry on society.

(9) The student develops career-building characteristics. The student is expected to:

(A) understand the use and importance of a portfolio in documenting information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities; and

(C) examine employment opportunities in entrepreneurship.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops an advanced understanding of printing and imaging. The student is expected to:

(A) understand printing systems;

(B) explain how to manage the printing process;

(C) describe how to prepare customer materials for printing;

(D) understand a variety of printing processes;

(E) explain ink processes used for various types of printing, identify ink types, and describe how properties of ink affect coverage, color, and color separation;

(F) explain the uses of papers, including weights and finishes used for various types of printing;

(G) explain cleanup and maintenance of equipment;

(H) identify and use the principles of design to discuss, analyze, critique, and write about visual aspects in print design, including the student's own designs; and

(I) demonstrate knowledge of the principles of design in print design images with a focus on composition, color, design, shape, shadow, negative space, and background.

§127.175. Printing and Imaging Technology II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Corequisite: Printing and Imaging Technology II. This course must be taken concurrently with Printing and Imaging Technology II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Printing and Imaging Technology II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing advanced knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the printing industry with a focus on digital prepress and desktop digital publishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills;

(2) The student applies academic knowledge and skills in printing and imaging projects. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) demonstrate active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) demonstrate public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(7) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(8) The student applies ethical decision making and understands and complies with laws regarding use of technology in printing. The student is expected to:

(A) demonstrate an understanding of ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) understand Creative Commons laws, including all licensing.

(9) The student develops career-building characteristics. The student is expected to:

(A) maintain and update a portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(B) demonstrate skills in evaluating and comparing employment opportunities.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops an advanced understanding of printing and imaging. The student is expected to:

(A) understand printing systems and their uses;

(B) demonstrate print process management;

(C) prepare customer materials for printing;

(D) demonstrate and apply a variety of printing processes;

(E) demonstrate industry standard ink processes used for various types of printing, identify ink types, and describe how properties of ink affect coverage, color, and color separation;

(F) demonstrate knowledge of papers, including weights and finishes used for various types of printing; and

(G) perform cleanup and maintenance of equipment.

§127.176. Commercial Photography I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended corequisite: Commercial Photography I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography require skills that span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the commercial photography industry with a focus on creating quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to finding and obtaining a desired job.

(2) The student applies academic knowledge and skills in commercial photography. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects.

(6) The student understands commercial photography systems. The student is expected to analyze and summarize the history and evolution of commercial photography.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations in a photography studio and lab; and

(B) follow emergency procedures.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ communication skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(9) The student applies ethical decision making and understands and complies with laws regarding use of technology in commercial photography. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and duplication of images;

(C) model respect for intellectual property when manipulating, morphing, and editing digital images;

(D) analyze the impact of photography on society; and

(E) understand Creative Commons laws, including all licensing.

(10) The student develops career-building characteristics. The student is expected to:

(A) create a portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(B) examine employment opportunities in entrepreneurship.

(11) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(12) The student develops a basic understanding of commercial photography. The student is expected to:

(A) research career opportunities and qualifications in photography;

(B) research the history and evolution of photography;

(C) analyze principles of commercial photography such as working with clients, interpreting client instructions, developing production schedules, and delivering products in a competitive market;

(D) analyze and apply the elements and principles of art to photographs;

(E) demonstrate knowledge of different types of cameras and lenses and their applications to photography;

(F) demonstrate knowledge of photographic composition and layout;

(G) demonstrate knowledge of different types of photographic media;

(H) demonstrate knowledge of the basics of digital photography;

(I) demonstrate knowledge of photographic lighting techniques, including three-point lighting;

(J) identify characteristics and uses of various types of photographic paper;

(K) demonstrate an understanding of standard conventions for mounting, matting, or framing;

(L) produce a variety of photographs using appropriate, current, industry-standard production processes;

(M) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills;

(N) understand resolution and digital file format;

(O) identify and use the principles of design to discuss, analyze, critique, and write about visual aspects in photographic work, including the student's own work; and

(P) demonstrate knowledge of the principles of design in photographic work with a focus on composition, color, design, shape, shadow, negative space, and background.

§127.177. Commercial Photography I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Corequisite: Commercial Photography I. This course must be taken concurrently with Commercial Photography I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Commercial Photography I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography require skills that span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the commercial photography industry with a focus on creating quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to seeking employment to find and obtain a desired job.

(2) The student applies academic knowledge and skills in commercial photography. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects.

(6) The student understands commercial photography systems. The student is expected to analyze and summarize the history and evolution of commercial photography.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations in a photography studio and lab; and

(B) follow emergency procedures.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ communication skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(9) The student applies ethical decision making and understands and complies with laws regarding use of technology in commercial photography. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and duplication of images;

(C) model respect for intellectual property when manipulating, morphing, and editing digital images;

(D) analyze the impact of photography on society; and

(E) understand Creative Commons Laws, including all licensing.

(10) The student develops career-building characteristics. The student is expected to:

(A) create a portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(B) examine employment opportunities in entrepreneurship.

(11) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(12) The student demonstrates a basic understanding of commercial photography. The student is expected to:

(A) analyze principles of commercial photography such as working with clients, interpreting client instructions, developing production schedules, and delivering products in a competitive market;

(B) analyze and apply the elements and principles of art to photographs;

(C) demonstrate knowledge of different types of cameras and lenses and their applications to photography;

(D) demonstrate knowledge of photographic composition and layout;

(E) demonstrate knowledge of the characteristics of different types of photographic media;

(F) demonstrate knowledge of the basics of digital photography;

(G) demonstrate knowledge of photographic lighting techniques, including three-point lighting;

(H) identify characteristics and uses of various types of photographic paper;

(I) demonstrate an understanding of standard conventions for mounting, matting, or framing;

(J) produce a variety of photographs using appropriate, current, industry-standard production processes;

(K) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills; and

(L) demonstrate an understanding of resolutions and digital file format.

§127.178. Commercial Photography II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Commercial Photography I and Commercial Photography I Lab. Recommended corequisite: Commercial Photography II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the commercial photography industry with a focus on producing, promoting, and presenting professional quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills.

(2) The student applies academic knowledge and skills in commercial photography. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects.

(6) The student applies knowledge of commercial photography systems. The student is expected to analyze and summarize the history and evolution of the commercial photography field.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations in a photography studio and lab; and

(B) follow emergency procedures.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders with organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in commercial photography. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and duplication of images;

(C) model respect for intellectual property when manipulating, morphing, and editing digital images; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies, including Creative Common laws and licensing.

(10) The student develops career-building characteristics. The student is expected to:

(A) maintain and update a portfolio with information such as work experiences, licenses, certifications, and work samples; and

(B) demonstrate skills in evaluating and comparing employment opportunities.

(11) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks such as creating quotes and budgeting.

(12) The student develops an increased understanding of commercial photography. The student is expected to:

(A) identify photographs for commercial photography;

(B) recognize the elements and principles of art as they apply to a variety of commercial photography projects;

(C) use principles of commercial photography such as working with clients, interpreting client instructions, developing production schedules, and delivering products in a competitive market;

(D) identify appropriate cameras and lenses;

(E) recognize appropriate photographic composition and layout principles;

(F) identify the use of appropriate digital black and white and color photography;

(G) understand the use of effective photographic lighting techniques, including three-point, studio, portraiture, and product;

(H) recognize the elements of professional quality photographs;

(I) identify the most appropriate types of photographic paper for projects;

(J) recognize appropriate solutions for mounting, matting, or framing photographs;

(K) understand appropriate, current, and industry-standard production processes to produce photographs;

(L) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills;

(M) identify appropriate resolution and digital file formats;

(N) identify and use the principles of design to discuss, analyze, critique, and write about visual aspects of photographic work, including the student's own work; and

(O) demonstrate knowledge of the principles of design in photographic work with a focus on composition, color, design, shape, shadow, negative space, and background.

§127.179. Commercial Photography II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Commercial Photography I and Commercial Photography I Lab. Corequisite: Commercial Photography II. This course must be taken concurrently with Commercial Photography II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Commercial Photography II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the commercial photography industry with a focus on producing, promoting, and presenting professional quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills.

(2) The student applies academic knowledge and skills in commercial photography. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects.

(6) The student applies knowledge of commercial photography systems. The student is expected to analyze and summarize the history and evolution of the commercial photography field.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations in a photography studio and lab; and

(B) follow emergency procedures.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders with organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in commercial photography. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and duplication of images;

(C) model respect for intellectual property when manipulating, morphing, and editing digital images; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies, including Creative Common laws and licensing.

(10) The student develops career-building characteristics. The student is expected to:

(A) maintain and update a portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(B) demonstrate skills in evaluating and comparing employment opportunities.

(11) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to complete work tasks such as creating quotes and budgeting; and

(B) demonstrate skills in budgeting and creating quotes for freelance or contract projects.

(12) The student develops an increased understanding of commercial photography. The student is expected to:

(A) create photographs for defined purposes;

(B) apply the elements and principles of art to a variety of commercial photography projects;

(C) demonstrate the principles of commercial photography such as working with clients, interpreting client instructions, developing production schedules, and delivering products in a competitive market;

(D) demonstrate the use of appropriate cameras and lenses;

(E) apply appropriate photographic composition and layout principles;

(F) demonstrate appropriate digital black and white and color photography;

(G) apply effective photographic lighting techniques, including three point, studio, portraiture, and product;

(H) produce professional quality photographs;

(I) use the most appropriate types of photographic paper for projects;

(J) use the most appropriate solutions for mounting, matting, or framing photographs;

(K) demonstrate use of appropriate, current, and industry-standard production processes to produce photographs;

(L) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills; and

(M) demonstrate use of appropriate resolution and digital file formats.

§127.180. Fashion Design I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications. Recommended corequisite: Fashion Design I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the fashion industry with an emphasis on design and construction.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment;

(D) create a career portfolio to document work samples; and

(E) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in fashion, textile, and apparel projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) communicate with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, and industry programs for fashion, textiles, and apparel projects.

(6) The student understands fashion, textile, and apparel systems. The student is expected to:

(A) analyze the history of the fashion, textiles, and apparel field; and

(B) compare fashion history relative to current fashions trends.

(7) The student applies safety regulations. The student is expected to implement personal and workplace safety rules and procedures.

(8) The student applies leadership characteristics in classroom and professional settings. The student is expected to:

(A) employ leadership skills;

(B) apply characteristics of effective working relationships;

(C) participate in groups; and

(D) employ mentoring skills.

(9) The student applies ethical decision making with laws regarding use of technology in fashion, textiles, and apparel. The student is expected to:

(A) exhibit ethical conduct such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) identify and apply copyright laws; and

(C) analyze fashion industry influences on society.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student analyzes the nature of fashion. The student is expected to:

(A) explain the value of fashion;

(B) identify the spectrum of the fashion industry;

(C) identify prominent fashion publications;

(D) evaluate the fashion cycle; and

(E) use appropriate terminology.

(12) The student evaluates factors influencing the apparel industry. The student is expected to:

(A) describe the interrelationship of the U.S. and international economies;

(B) identify and discuss labor laws of the United States and other countries;

(C) recognize procedures within the apparel industry that protect the environment; and

(D) describe technological advancements influencing the apparel industry.

(13) The student analyzes factors that impact consumer purchasing of fashion and apparel accessories. The student is expected to:

(A) describe social, cultural, and life cycle influences;

(B) explain how fashion trends are determined;

(C) analyze the influence of advertising on consumer apparel choices; and

(D) determine apparel management techniques for individuals with special needs.

(14) The student selects proper care and maintenance practices for apparel. The student is expected to:

(A) interpret labeling information to determine care procedures for apparel products;

(B) evaluate clothing care products and equipment;

(C) determine proper equipment and services related to care, maintenance, and storage of apparel;

(D) identify proper safety procedures when using care products and equipment; and

(E) analyze the impact of clothing care requirements on clothing selection and the clothing budget.

(15) The student applies skills related to commercial care of clothing. The student is expected to:

(A) identify procedures to receive, mark, and identify laundry or dry cleaning;

(B) identify appropriate laundry and dry cleaning procedures;

(C) identify safety and sanitation procedures while laundering, pressing, or dry cleaning;

(D) describe commercial laundry or dry cleaning techniques; and

(E) identify pressing procedures.

(16) The student proposes ways to effectively manage the apparel dollar. The student is expected to:

(A) develop a budget for apparel and accessory costs, care, and maintenance;

(B) compare various sources for apparel and accessory purchases;

(C) analyze the impact of technology on consumer apparel purchasing options; and

(D) develop and implement ideas for recycling apparel.

(17) The student designs apparel products using principles of effective design. The student is expected to:

(A) identify basic body types;

(B) identify and apply proportion, balance, emphasis, rhythm, and harmony for specific fashion ensembles;

(C) determine clothing silhouettes, fabric selection, and design elements appropriate for specific body types;

(D) use design principles to design products for the human form, including adaptations for individuals with special needs;

(E) sketch fashion drawings using basic design tools and techniques such as fashion drawing, draping, and flat pattern methods for fitting a garment; and

(F) apply technology applications useful in the apparel design process.

(18) The student designs apparel products using elements of effective design. The student is expected to:

(A) identify and apply shape, line, form, color, and texture for specific fashion ensembles;

(B) determine clothing silhouettes, fabric selection, and design elements appropriate for specific body types; and

(C) use design elements to design products for the human form, including adaptations for individuals with special needs.

§127.181. Fashion Design I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications. Corequisite: Fashion Design I. This class must be taken concurrently with Fashion Design I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Fashion Design I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the fashion industry with an emphasis on design and construction.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a career portfolio to document work samples.

(2) The student applies academic knowledge and skills in fashion, textile, and apparel projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) communicate with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, and industry programs for fashion, textiles, and apparel projects.

(6) The student analyzes the history of the fashion, textiles, and apparel field. The student is expected to:

(A) compare fashion history relative to current fashions trends; and

(B) evaluate how historical events and attitudes influence fashion trends.

(7) The student applies safety regulations. The student is expected to implement personal and workplace safety rules and procedures.

(8) The student applies leadership characteristics in classroom and professional settings. The student is expected to:

(A) employ leadership skills;

(B) apply characteristics of effective working relationships;

(C) participate in groups; and

(D) employ mentoring skills.

(9) The student applies ethical decision making with laws regarding use of technology in fashion, textiles, and apparel. The student is expected to:

(A) exhibit ethical conduct such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) apply copyright laws; and

(C) evaluate fashion industry influences on society.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student analyzes the nature of fashion. The student is expected to:

(A) analyze prominent fashion publications; and

(B) analyze trends using the fashion cycle.

(12) The student analyzes fiber and textile characteristics. The student is expected to:

(A) identify fibers and textiles;

(B) evaluate water resistance, heat sensitivity, and colorfastness of various textiles;

(C) evaluate textile products as to suitability for varied apparel uses; and

(D) distinguish textile selvage and grain line.

(13) The student selects proper care and maintenance practices for apparel. The student is expected to:

(A) use appropriate care procedures for textile products; and

(B) use appropriate care procedures for apparel products.

(14) The student applies skills related to commercial care of clothing. The student is expected to:

(A) demonstrate safety and sanitary procedures while laundering, pressing, or dry cleaning; and

(B) demonstrate pressing procedures.

(15) The student analyzes the apparel production process from design concept to finished product. The student is expected to:

(A) identify and describe equipment needed for the apparel production process; and

(B) outline the apparel construction process.

(16) The student applies knowledge of fibers, fabrics, and design when evaluating and designing textile products. The student is expected to:

(A) identify characteristics and properties of natural and manufactured fibers;

(B) describe methods of textile production; and

(C) assess the effects of various environmental conditions on textiles.

(17) The student demonstrates effective repair and alteration techniques. The student is expected to:

(A) use appropriate measurement tools and measurement units;

(B) demonstrate appropriate use, selection, and care of equipment, tools, and notions;

(C) apply design principles and elements when altering apparel;

(D) apply safety procedures while operating equipment; and

(E) determine apparel design and alterations to accommodate individuals with special needs.

(18) The student demonstrates effective construction techniques. The student is expected to:

(A) apply principles of quality apparel construction;

(B) apply design principles and elements when designing and constructing apparel;

(C) apply appropriate construction and pressing techniques in apparel and textile construction; and

(D) describe pattern parts and terminology.

§127.182. Fashion Design II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Fashion Design I. Recommended corequisite: Fashion Design II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the fashion industry with an emphasis on design and construction.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job;

(D) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in fashion, textile, and apparel projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) communicate with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, and industry programs for fashion, textiles, and apparel projects.

(6) The student analyzes the history of the fashion, textiles, and apparel field. The student is expected to analyze fashion history relative to current fashions trends.

(7) The student applies safety regulations. The student is expected to implement personal and workplace safety rules and procedures.

(8) The student applies leadership characteristics in classroom and professional settings. The student is expected to:

(A) employ leadership skills to accomplish collective goals;

(B) establish and maintain practices for effective working relationships such as providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(C) conduct and participate in meetings using parliamentary procedure; and

(D) employ mentoring skills to inspire others.

(9) The student demonstrates ethical decision making and complies with legal practices pertaining to fashion, textiles, and apparel. The student is expected to:

(A) exhibit ethical conduct as defined by the fashion and apparel industries;

(B) apply copyright laws;

(C) model respect for intellectual property;

(D) demonstrate knowledge of acceptable use policies;

(E) summarize the rights and responsibilities of employers and employees; and

(F) analyze legal aspects of the fashion and apparel industries.

(10) The student applies advanced technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student describes how garment development and fashion have evolved from ancient times to present day. The student is expected to:

(A) evaluate significant historic fashions from early civilizations to today;

(B) describe social influences that have affected fashion;

(C) explain values communicated through clothing in specific historical periods;

(D) show the influence of historic fashions on current-year fashion; and

(E) identify prominent historical designers.

(12) The student analyzes various types of worldwide fashion production. The student is expected to:

(A) describe mass production techniques; and

(B) describe the development of haute couture.

(13) The student determines design influences on the fashion industry. The student is expected to:

(A) explain the role of leading designers in determining fashion trends;

(B) analyze international factors affecting fashion design;

(C) determine the impact of technology on the design industry; and

(D) determine the impact of design decisions on product cost.

(14) The student creates a portfolio of fashion designs. The student is expected to:

(A) demonstrate fashion figure drawing;

(B) apply design elements and principles to create fashion drawings;

(C) demonstrate the properties and characteristics of color;

(D) use computer-aided techniques to create fashion designs;

(E) select appropriate textiles to use in specific designs; and

(F) assemble portfolio components to present fashion designs.

(15) The student demonstrates basic techniques in personal fashion image analysis. The student is expected to:

(A) describe techniques used to analyze the fashion image of individual clients;

(B) analyze factors involved in fashion image consulting such as personal coloring, color harmonies, appropriate fabric textures, body proportion and silhouette, figure, facial and hair analysis, and wardrobe coordination; and

(C) develop a personal fashion image evaluation for an individual.

§127.183. Fashion Design II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Fashion Design I. Corequisite: Fashion Design II. This course must be taken concurrently with Fashion Design II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Fashion Design II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the fashion industry with an emphasis on design and construction.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job;

(D) create a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in fashion, textile, and apparel projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) communicate with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, word processors, industry programs, slide show presentation, and spreadsheet applications for fashion, textiles, and apparel projects.

(6) The student understands fashion, textile, and apparel systems. The student is expected to analyze and summarize the history and evolution of the fashion, textiles, and apparel field.

(7) The student applies safety regulations. The student is expected to implement personal and workplace safety rules and procedures.

(8) The student applies leadership characteristics in classroom and professional settings. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(C) conduct and participate in meetings using parliamentary procedure; and

(D) employ mentoring skills to inspire and teach others.

(9) The student demonstrates ethical decision making and complies with legal practices pertaining to fashion, textiles, and apparel. The student is expected to:

(A) exhibit ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property;

(D) demonstrate knowledge of acceptable use policies;

(E) summarize the rights and responsibilities of employers and employees;

(F) exhibit ethical practices as defined by the fashion and apparel industries; and

(G) analyze legal aspects of the fashion and apparel industries.

(10) The student applies advanced technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student performs operations for various roles in the fashion industry. The student is expected to:

(A) identify tasks that employees may perform;

(B) follow procedures identified for performing tasks; and

(C) apply resource management procedures when completing assigned tasks.

(12) The student determines textile suitability for specific applications and uses. The student is expected to:

(A) compare processes for dyeing, printing, and finishing used in the textile industry;

(B) explain how finishes affect the characteristics of fabrics; and

(C) recommend care procedures for various textile products.

(13) The student determines implications of textile characteristics on apparel and fashion. The student is expected to:

(A) outline the textile design process from concept to finished product;

(B) differentiate types and methods of textile production;

(C) summarize implications and methods of dyeing, printing, and finishing of textiles;

(D) determine textile and apparel labeling requirements; and

(E) determine factors affecting the cost of textile products.

(14) The student creates a portfolio of fashion designs. The student is expected to:

(A) demonstrate fashion figure drawing;

(B) apply design elements and principles to create fashion drawings;

(C) use computer-aided techniques to create fashion designs;

(D) select appropriate textiles to use in specific designs; and

(E) assemble portfolio components to present fashion designs.

(15) The student produces quality fashion products. The student is expected to:

(A) outline general procedures and equipment used in apparel design and pattern development;

(B) construct custom made garments using appropriate tools, equipment, and supplies;

(C) develop garments for proper fit;

(D) apply correct procedures used in garment fitting, pattern making, and pattern alterations;

(E) construct custom made garments; and

(F) demonstrate safety practices related to garment construction.

(16) The student demonstrates basic techniques in personal fashion image analysis. The student is expected to:

(A) describe techniques used to analyze the fashion image of individual clients;

(B) analyze factors involved in fashion image consulting such as personal coloring, color harmonies, appropriate fabric textures, body proportion and silhouette, figure, facial and hair analysis, and wardrobe coordination; and

(C) develop a personal fashion image evaluation for an individual.

§127.184. Graphic Design and Illustration I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications. Recommended corequisite: Graphic Design and Illustration I Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industries. Within this context, in addition to developing knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the industry with a focus on fundamental elements and principles of visual art and design.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking employment to find and obtain a desired job;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in art and design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for art and design projects.

(6) The student understands design systems. The student is expected to analyze and summarize the history and evolution of related fields.

(7) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(9) The student applies ethical decision making and understands and complies with laws regarding use of technology in graphic design and illustration. The student is expected to:

(A) exhibit ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and acquisition;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) analyze the impact of the advertising and visual communication design industry on society.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops an increasing understanding of graphic design and illustration. The student is expected to research art and design career opportunities and qualifications.

(12) The student researches the history and evolution of art and design. The student is expected to:

(A) explain the history of visual arts and design;

(B) understand general characteristics in artwork from a variety of cultures; and

(C) compare current visual arts technologies with historical technologies.

(13) The student conducts oral or written critiques of designs. The student is expected to:

(A) interpret, evaluate, and justify design decisions;

(B) apply a critical method of evaluation;

(C) communicate an oral or written defense; and

(D) evaluate oral or written feedback.

(14) The student demonstrates an understanding of artistic design. The student is expected to analyze and apply art elements and principles in photographic works, multimedia applications, and digital and print media.

(15) The student employs a creative design process to create original two- or three-dimensional projects. The student is expected to:

(A) create designs for defined applications;

(B) apply elements of design;

(C) apply design principles and typography;

(D) use good composition;

(E) demonstrate anatomical figure drawing;

(F) demonstrate drawing in one-point, two-point, and multi-point perspective;

(G) create a project by applying color; and

(H) apply printing concepts.

§127.185. Graphic Design and Illustration I Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Arts, Audio/Video Technology, and Communications. Corequisite: Graphic Design and Illustration I. This class must be taken concurrently with Graphic Design and Illustration I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Graphic Design and Illustration I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industries. Within this context, in addition to developing knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an understanding of the industry with a focus on fundamental elements and principles of visual art and design.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification for employment;

(B) identify and demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking employment to find and obtain a desired job;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in art and design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student understands professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student understands and employs problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing and presentation applications for art and design projects.

(6) The student understands design systems. The student is expected to analyze and summarize the history and evolution of related fields.

(7) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(9) The student applies ethical decision making and understands and complies with laws regarding use of technology in graphic design and illustration. The student is expected to:

(A) exhibit ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) apply copyright laws in relation to fair use and acquisition;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) analyze the impact of the advertising and visual communication design industry on society.

(10) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student develops an increasing understanding of graphic design and illustration. The student is expected to research art and design career opportunities and qualifications.

(12) The student researches the history and evolution of art and design. The student is expected to:

(A) explain the history of visual arts and design;

(B) understand general characteristics in artwork from a variety of cultures; and

(C) compare current visual arts technologies with historical technologies.

(13) The student conducts oral or written critiques of designs. The student is expected to:

(A) interpret, evaluate, and justify design decisions;

(B) apply a critical method of evaluation;

(C) communicate an oral or written defense; and

(D) evaluate oral or written feedback.

(14) The student demonstrates an understanding of artistic design. The student is expected to analyze and apply art elements and principles in photographic works, multimedia applications, and digital and print media.

(15) The student employs a creative design process to create original two- or three-dimensional projects. The student is expected to:

(A) create designs for defined applications;

(B) apply elements of design;

(C) apply design principles and typography;

(D) use good composition;

(E) demonstrate anatomical figure drawing;

(F) demonstrate drawing in one-point, two-point, and multi-point perspective;

(G) create a project by applying color; and

(H) apply printing concepts.

§127.186. Graphic Design and Illustration II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Graphic Design and Illustration I. Recommended corequisite: Graphic Design and Illustration II Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industries. Within this context, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the industry with a focus on mastery of content knowledge and skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies academic knowledge and skills in art and design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student understands and employs problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(4) The student applies knowledge of design systems. The student is expected to analyze and summarize the history and evolution of related fields.

(5) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(6) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills;

(B) employ teamwork and conflict-management skills;

(C) conduct and participate in meetings; and

(D) employ mentoring skills.

(7) The student applies ethical decision making and complies with laws regarding use of technology in art and design. The student is expected to:

(A) exhibit ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) identify the impact of the advertising and visual communication design industry on society.

(8) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(9) The student develops an advanced understanding of graphic design and illustration. The student is expected to:

(A) interpret, evaluate, and justify design decisions;

(B) participate in oral or written critiques of designs by applying a critical method of evaluation; and

(C) identify and apply art elements and principles to designs and illustrations.

§127.187. Graphic Design and Illustration II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Graphic Design and Illustration I. Corequisite: Graphic Design and Illustration II. This course must be taken concurrently with Graphic Design and Illustration II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Graphic Design and Illustration II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industries. Within this context, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced understanding of the industry with a focus on mastery of content knowledge and skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(E) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies academic knowledge and skills in art and design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student demonstrates professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) demonstrate active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills.

(4) The student applies technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for art and graphic design projects.

(5) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(6) The student demonstrates ethical decision making and complies with laws regarding use of technology in art and design. The student is expected to:

(A) exhibit ethical conduct;

(B) apply copyright laws;

(C) model respect for intellectual property; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies.

(7) The student applies technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(8) The student develops an advanced understanding of graphic design and illustration. The student is expected to interpret, evaluate, and justify design decisions.

(9) The student participates in oral or written critiques of designs. The student is expected to:

(A) apply a critical method of evaluation;

(B) communicate an oral or written defense; and

(C) identify and demonstrate art elements and principles in designs and illustrations.

(10) The student employs a creative design process to create original two- or three-dimensional projects. The student is expected to:

(A) create designs for defined applications;

(B) demonstrate elements of design;

(C) demonstrate design principles and typography;

(D) use appropriate composition;

(E) use anatomically appropriate figure drawing;

(F) use appropriate perspective;

(G) use the most effective color choices in projects; and

(H) use printing concepts.

§127.188. Professional Communications (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. This course satisfies a speech credit or skills graduation requirement. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Professional Communications blends written, oral, and graphic communication in a career-based environment. Careers in the global economy require individuals to be creative and have a strong background in computer and technology applications, a strong and solid academic foundation, and a proficiency in professional oral and written communication. Within this context, students will be expected to develop and expand the ability to write, read, edit, speak, listen, apply software applications, manipulate computer graphics, and conduct Internet research.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explore opportunities in training, education, and certifications for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment;

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples; and

(E) demonstrate skills in evaluating and comparing employment opportunities.

(2) The student applies English language arts in professional communications projects. The student is expected to:

(A) demonstrate use of content, technical concepts, and vocabulary;

(B) use correct grammar, punctuation, and terminology to write and edit documents;

(C) identify assumptions, purpose, outcomes, solutions, and propaganda techniques;

(D) compose and edit copy for a variety of written documents;

(E) evaluate oral and written information; and

(F) research topics for the preparation of oral and written communications.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) develop and interpret tables, charts, and figures;

(G) listen to and speak with diverse individuals; and

(H) exhibit public relations skills.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student uses technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student understands communications systems. The student is expected to:

(A) describe the nature and types of businesses;

(B) analyze and summarize the history and evolution of the various related fields of study; and

(C) analyze the economic base in order to demonstrate an understanding of the economic factors influencing the industry as a whole.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and classroom safety rules and regulations; and

(B) follow emergency procedures as needed.

(8) The student identifies and develops leadership characteristics. The student is expected to:

(A) identify leadership characteristics; and

(B) participate in student leadership and professional development activities.

(9) The student applies ethical decision making and understands and complies with laws regarding use of technology in communications. The student is expected to:

(A) exhibit ethical conduct;

(B) discuss copyright laws in relation to fair use and duplication of materials;

(C) analyze the impact of communications on society; and

(D) understand and exhibit digital citizenship.

(10) The student applies technical skills for efficiency. The student is expected to:

(A) employ planning and time-management skills to relate to professional communications; and

(B) use technology to enhance productivity.

(11) The student develops an understanding of professional communications through exploration of the Arts, Audio/Video Technology, and Communications Career Cluster. The student is expected to:

(A) develop an understanding of the evolution of the arts, audio/video technology, and communications career field, including the history, foundation elements, principles, and communicative effects;

(B) demonstrate knowledge of the communication process, including the characteristics of oral language, types and effects of nonverbal communication, effective nonverbal strategies such as a firm handshake, direct eye contact, and appropriate use of space and distance;

(C) demonstrate knowledge of the components of the listening process and specific kinds of listening such as critical, deliberative, and empathetic;

(D) identify and analyze ethical and social responsibilities of communicators;

(E) demonstrate knowledge of various communication processes in professional contexts, including using effective communication skills; analyzing standards for appropriate use of informal, standard, and technical language; making appropriate and important communication decisions based on accurate and complete information; and recognizing and analyzing appropriate channels of communication in organizations;

(F) use appropriate interpersonal communication strategies in professional contexts, including using different types of

professional communication and communication management skills and observing professional etiquette;

(G) demonstrate knowledge of the interview process, including effective communication as interviewee and interviewer, and federal employment laws regarding interviews;

(H) identify and use appropriate strategies for communicating with a variety of audiences;

(I) identify the types, purposes, dynamics, processes, effectiveness, roles of members, and leadership styles of professional groups;

(J) communicate effectively in group contexts by assuming productive roles, solving problems, managing conflicts, and building consensus in groups;

(K) research formal and informal professional presentations by analyzing the audience, occasion, purpose, and primary and secondary sources; determining specific topics for presentations; and evaluating sources using media literacy strategies such as recognizing bias, misinformation, untruths, and source credibility;

(L) develop formal and informal professional presentations using effective strategies to organize presentations, using information to support points in presentations, preparing scripts or notes, using visual or auditory aids to enhance presentations, and providing credit for information sources;

(M) conduct formal and informal professional presentations using effective verbal and nonverbal strategies to inform, persuade, or motivate an audience;

(N) use appropriate techniques to manage communication apprehension and build self-confidence;

(O) evaluate formal and informal professional presentations by participating in question-and-answer sessions following presentations, applying critical-listening strategies, and evaluating the effectiveness of presentations, including self-evaluation;

(P) participate in an informative or persuasive group discussion;

(Q) use a variety of strategies to acquire information from electronic resources;

(R) acquire electronic information in a variety of formats;

(S) use research skills and electronic communications;

(T) format digital information for appropriate and effective communication in a product by defining the purpose, identifying the intended audience, and using the principles of page design such as leading, kerning, automatic text flow into linked columns, widows, orphans, and text wrap;

(U) apply desktop publishing to create products using word processing programs, editing products, or drawing programs; design elements such as text, graphics, headlines, color, white space; typography concepts, including font size and style; and graphic design concepts such as contrast, alignment, repetition, and proximity;

(V) develop and reference technical documentation; and

(W) deliver digital products in a variety of appropriate media.

§127.189. Digital Design and Media Production (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. This course is a Level 2 course and is recommended for students in Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Digital Design and Media Production will allow students to demonstrate creative thinking, develop innovative strategies, and use communication tools in order to work effectively with others as well as independently. Students will gather information electronically, which will allow for problem solving and making informed decisions regarding media projects. Students will learn digital citizenship by researching current laws and regulations and by practicing integrity and respect. Students will demonstrate a thorough understanding of digital design principles that is transferable to other disciplines. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student employs a creative design process to create original projects as they relate to purposes and audiences. The student is expected to:

(A) create designs for defined projects such as graphics, logos, and page layouts;

(B) apply design elements and typography standards; and

(C) use visual composition principles.

(2) Communication and collaboration. The student understands professional digital media communications strategies. The student is expected to:

(A) adapt the language and design of a project for audience, purpose, situation, and intent;

(B) organize oral, written, and graphic information into formal and informal publications;

(C) interpret and communicate information to multiple audiences; and

(D) collaborate to create original projects, including seeking and responding to advice from others such as peers or experts in the creation and evaluation process.

(3) Research and information fluency. The student uses a variety of strategies to plan, obtain, evaluate, and use valid information. The student is expected to:

(A) obtain print and digital information such as graphics, audio, and video from a variety of resources while citing the sources;

(B) evaluate information for accuracy and validity; and

(C) present accurate information using techniques appropriate for the intended audience.

(4) Critical thinking, problem solving, and decision making. The student implements problem-solving methods using critical-thinking skills to plan, implement, manage, and evaluate projects; solve problems; and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) employ critical-thinking and interpersonal skills to solve problems and make decisions through planning and gathering, interpreting, and evaluating data;

(B) identify and organize the tasks for completion of a project using the most appropriate digital tools;

(C) distinguish design requirements as they relate to the purposes and audiences of a project and apply appropriate design elements;

(D) seek and respond to input from others, including peers, teachers, and outside collaborators;

(E) evaluate a process and project both independently and collaboratively and make suggested revisions; and

(F) transfer critical-thinking, problem-solving, and decision-making processes when using new technologies.

(5) Digital citizenship. The student complies with standard practices and behaviors and upholds legal and ethical responsibilities. The student is expected to:

(A) examine copyright and fair use guidelines with regard to print and digital media;

(B) model ethical and legal acquisition and use of digital resources such as licensing and established methods of citing sources;

(C) demonstrate proper digital etiquette, personal security guidelines, use of network resources, and application of the district's acceptable use policy for technology; and

(D) identify and demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, willingness to learn new knowledge and skills, and pride in quality work.

(6) Technology operations and concepts. The student uses technology concepts, systems, and operations as appropriate for a project. The student is expected to:

(A) define the purpose of a product and identify the specified audience;

(B) demonstrate appropriate project management to:

(i) create a plan for a media project such as a storyboard, stage development, and identification of equipment and resources; and

(ii) evaluate design, content delivery, purpose, and audience throughout a project's timeline and make suggested revisions until completion of the project;

(C) use hardware, software, and information appropriate to a project and its audience to:

(i) acquire readily available digital information, including text, audio, video, and graphics, citing the sources;

(ii) create digital content through the use of various devices such as video camera, digital camera, scanner, microphone, interactive whiteboard, video capture, and musical instrument;

(iii) collaborate via online tools such as blogs, discussion boards, email, and online learning communities;

(iv) make decisions regarding the selection and use of software, taking into consideration operating system platform, quality, appropriateness, effectiveness, and efficiency;

(v) delineate and make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity; and

(vi) demonstrate the ability to import and export elements from one program to another;

(D) use digital typography standards such as:

(i) one space after punctuation, the use of em- and en-dashes, and smart quotation marks;

(ii) categories of type, font, size, style, and alignment appropriate for the task;

(iii) type techniques such as drop cap, decorative letters, or embedded text frames as graphic elements;

(iv) leading and kerning, automatic text flow into linked columns, widows and orphans, and text wrap; and

(v) type measurement for inches and picas;

(E) apply design and layout principles and techniques to:

(i) incorporate the principles of design, including balance, contrast, dominant element, white space, consistency, repetition, alignment, and proximity;

(ii) apply the elements of design, including text, graphics, and white space;

(iii) apply color principles appropriate to the product in order to communicate the mood for the specific audience;

(iv) identify the parts of pages, including inside margin, outside margin, and gutter;

(v) create a master template, including page specifications and other repetitive elements; and

(vi) use style sheets, including a variety of type specifications such as typeface, style, size, alignment, indents, and tabs;

(F) demonstrate appropriate use of digital photography and editing to:

(i) use digital photography equipment to capture still-shot images that incorporate various photo composition tech-

niques, including lighting, perspective, candid versus posed, rule of thirds, and filling the frame;

(ii) transfer digital images from equipment to the computer; and

(iii) demonstrate image enhancement techniques such as feathering, layering, color enhancement, and image selection using appropriate digital manipulation software;

(G) demonstrate appropriate use of videography equipment and techniques to:

(i) use digital photography equipment to capture video that incorporates video principles such as lighting, zooming, panning, and stabilization;

(ii) transfer video from equipment to the computer;

(iii) demonstrate videographic enhancement and editing techniques such as transitions, zooming, content editing, and synchronizing audio and video using appropriate digital manipulation software; and

(iv) export video in digital formats to be used in various delivery systems such as podcasting, downloadable media, embedding, and streaming; and

(H) deploy digital media into print, web, and video products to:

(i) produce digital files in various formats such as portable document format (PDF), portable network graphics (PNG), and HyperText Markup Language (HTML);

(ii) publish integrated digital content such as video, audio, text, graphics, and motion graphics following appropriate digital etiquette standards;

(iii) publish and share projects using online methods such as social media and collaborative sites;

(iv) incorporate various digital media into a printed document such as a newsletter, poster, or report;

(v) use printing options such as tiling, color separations, and collation; and

(vi) collect and organize student-created products to build an individual portfolio.

§127.190. Digital Art and Animation (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is a Level 3 course and is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Digital Art and Animation consists of computer images and animations created with digital imaging software. Digital Art and Animation has applications in many careers, including graphic design, advertising, web design, animation, corporate communications, illustration, character development, script writing, storyboarding, directing, producing, inking, project management, editing, and the magazine, television, film, and game industries. Students in this course will produce various real-world projects and animations. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) evaluate, edit, and create scripts for animations;

(B) identify and apply color theories, including harmony rules, tints, shades, gradients, color mixing, new color creation, and the visual impacts of specific color combinations using a digital format;

(C) compare, contrast, and integrate the basic sound editing principles, including mixing and manipulating wave forms, audio tracks, and effects;

(D) compare and contrast the rules of composition such as the rule of thirds or the golden section/rectangle with respect to harmony and balance;

(E) evaluate the fundamental concepts of a digital art and design such as composition, perspective, angles, lighting, repetition, proximity, white space, balance, and contrast;

(F) analyze digital art designs to interpret the point of interest, the prominence of the subject, and visual parallels between the structures of natural and human-made environments;

(G) distinguish among typefaces while recognizing and resolving conflicts that occur through the use of typography as a design element;

(H) use perspective, including backgrounds, light, shades and shadows, hue and saturation, and scale, to capture a focal point and create depth;

(I) use the basic principles of design such as proportion, balance, variety, emphasis, harmony, symmetry, and unity in type, color, size, line thickness, shape, and space;

(J) edit files using appropriate digital editing tools and established design principles such as consistency, repetition, alignment, proximity, white space, image file size, color use, and font size, type, and style; and

(K) identify pictorial qualities in a design such as shape and form, space and depth, or pattern and texture to create visual unity and desired effects in designs.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) use vocabulary as it relates to digital art, audio, and animation;

(B) demonstrate the use of technology to participate in self-directed and collaborative activities within the global community;

(C) participate in electronic communities;

(D) create technology specifications for tasks and rubrics for the evaluation of products;

(E) design and implement procedures to track trends, set timelines, and evaluate products;

(F) collaborate with peers in delineating technological tasks;

(G) publish and save information in a variety of ways, including print or digital formats;

(H) analyze and evaluate projects for design, content delivery, purpose, and audience; and

(I) critique original digital artwork, portfolios, and products with peers.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) distinguish between and correctly apply process color (RGB and CYMK), spot color, and black or white;

(B) research the history of digital art and animation;

(C) research career choices in digital art and animation;

(D) use the Internet to retrieve information in an electronic format;

(E) demonstrate the appropriate use of digital imaging, video integration, and sound retrieved from an electronic format;

(F) import sounds from a variety of sources; and

(G) create planning designs such as rough sketches, storyboards, and brainstorming materials.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) distinguish between and use the components of animation software programs such as cast, score, stage, and the animation manipulation interface;

(B) distinguish between and use different animation techniques such as path and cell animation, onion skinning, and tweening;

(C) create three-dimensional effects by layering images such as foreground, middle distance, and background images;

(D) apply a variety of color schemes such as monochromatic, analogous, complementary, primary/secondary triads, cool/warm colors, and split complements to digital designs;

(E) use the basic concepts of color and design theory such as working in a bitmapped and vector mode to create backgrounds, characters, and other cast members as needed for the animation;

(F) use the appropriate scripting language or program code to create an animation;

(G) use a variety of lighting techniques such as shadows and shading to create effects; and

(H) define the design attributes and requirements of products created for a variety of purposes such as posters, billboards, logos, corporate identity, advertisements, book jackets, brochures, and magazines.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) discuss copyright laws/issues and use of digital information such as attributing ideas and citing sources using established methods;

(B) define plagiarism and model respect of intellectual property;

(C) demonstrate proper digital etiquette and knowledge of acceptable use policies when using technology; and

(D) evaluate the validity and reliability of sources.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components;

(B) make decisions regarding the selection and use of software and Internet resources;

(C) make necessary adjustments regarding compatibility issues with digital file formats, importing and exporting data, and cross-platform compatibility; and

(D) read, use, and develop technical documentation.

§127.191. 3-D Modeling and Animation (One Credit)

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is a Level 3 course and is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) 3-D Modeling and Animation consists of computer images created in a virtual three-dimensional (3-D) environment. 3-D

Modeling and Animation has applications in many careers, including criminal justice, crime scene, and legal applications; construction and architecture; engineering and design; and the movie and game industries. Students in this course will produce various 3-D models of real-world objects. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) evaluate, edit, and create scripts for animations;

(B) identify and apply color theories, including harmony rules, tints, shades, gradients, color mixing, new color creation, and the visual impacts of specific color combinations using a digital format;

(C) apply texture, transparency, skinning, and contour along a 3-D object surface;

(D) compare, contrast, and integrate the basic sound editing principles, including mixing and manipulating wave forms, audio tracks, and effects;

(E) compare and contrast the rules of composition such as the rule of thirds or the golden section/rectangle with respect to harmony and balance;

(F) evaluate the fundamental concepts of 3-D modeling and design such as composition, perspective, angles, lighting, repetition, proximity, white space, balance, and contrast;

(G) analyze 3-D model objects to interpret the point of interest, the prominence of the subject, and visual parallels between the structures of natural and human-made environments;

(H) distinguish among typefaces while recognizing and resolving conflicts that occur through the use of typography as a design element;

(I) use perspective, including spot and directional light, backgrounds, ambience, shades and shadows, and hue and saturation;

(J) use the basic principles of design such as proportion, balance, variety, emphasis, harmony, symmetry, and unity in type, color, size, line thickness, shape, and space;

(K) edit files using appropriate digital editing tools and established design principles such as consistency, repetition, alignment, proximity, white space, image file size, color use, font size, type, and style; and

(L) identify pictorial qualities in a design such as shape and form, space and depth, or pattern and texture to create visual unity and desired effects in designs.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) use vocabulary as it relates to digital art, audio, and animation;

(B) demonstrate the use of technology to participate in self-directed and collaborative activities within the global community;

(C) participate in electronic communities;

(D) create technology specifications for tasks and rubrics for the evaluation of products;

(E) design and implement procedures to track trends, set timelines, and evaluate products;

(F) collaborate with peers in delineating technological tasks;

(G) publish and save information in a variety of ways, including print or digital formats;

(H) analyze and evaluate projects for design, content delivery, purpose, and audience; and

(I) critique original 3-D digital artwork, portfolios, and products with peers.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) distinguish among and correctly apply process color (RGB and CYMK), spot color, and black or white;

(B) research the history of 3-D modeling and 3-D animation;

(C) research career choices in 3-D modeling and 3-D animation;

(D) use the Internet to retrieve information in an electronic format;

(E) demonstrate the appropriate use of 3-D objects, digital imaging, video integration, and sound retrieved from an electronic format;

(F) import sounds from a variety of sources; and

(G) create planning designs such as rough sketches, storyboards, and brainstorming materials.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) distinguish between and use the components of 3-D animation software programs such as cast, score, environment, the X-Y-Z coordinate system, and the animation manipulation interface;

(B) distinguish between and use the different 3-D modeling techniques such as box modeling, transformation, and polygon primitives using extrusion and rotation;

(C) distinguish between and use the different 3-D animation techniques such as path and rendering using dynamics and physics;

(D) apply a variety of color schemes such as monochromatic, analogous, complementary, primary/secondary triads, cool/warm colors, and split complements to digital designs;

(E) use the basic concepts of color and design theory such as working with 3-D models and environments, characters, objects, and other cast members as needed for the animation;

(F) use the appropriate rendering techniques to create an animation;

(G) use a variety of lighting techniques such as shadow, shading, point, spot, directional, and ambient to create effects; and

(H) define the design attributes and requirements of a 3-D animation project.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) discuss copyright laws/issues and use of digital information such as attributing ideas and citing sources using established methods;

(B) define plagiarism and model respect of intellectual property;

(C) demonstrate proper digital etiquette and knowledge of acceptable use policies when using technology; and

(D) evaluate the validity and reliability of sources.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components;

(B) make decisions regarding the selection and use of software and Internet resources;

(C) make necessary adjustments regarding compatibility issues with digital file formats, importing and exporting data, and cross-platform compatibility; and

(D) read, use, and develop technical documentation.

§127.192. Digital Communications in the 21st Century (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. This course is a Level 1 course and is recommended for students in Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Digital Communications in the 21st Century will prepare students for the societal demands of increased civic literacy, independent working environments, global awareness, and the mastery of a base set of analysis and communication skills. Students will be expected to design and present an effective product based on well-researched issues in order to thoughtfully propose suggested solutions to authoritative stakeholders. The outcome of the process and product approach is to provide students an authentic platform to demonstrate effective application of multimedia tools within the contexts of global communication and collaborative communities and appropriately share their voices to affect change that concerns their future. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates the ability to analyze, evaluate, and adapt during the creative problem-solving process and demonstrates creative thinking in developing solutions to real-world issues using digital tools. The student is expected to:

(A) generate innovative, sustainable solutions for real-world issues such as global warming, immigration, or the global economy using emerging digital tools;

(B) gather and evaluate accurate information for feasibility and practicality as a basis for making communication decisions; and

(C) analyze the ethical and social responsibilities as a project team when communicating with peers, stakeholders, and experts.

(2) Creativity and innovation. The student uses innovative thinking to develop new ideas and processes for solving real-world issues and conveying those ideas to a global audience through a persuasive digital product. The student is expected to:

(A) examine real-world issues relating to current topics such as health care, government, business, or aerospace;

(B) develop innovative solutions to address issues;

(C) create unique methods and products conveying solutions to audiences beyond the classroom such as school officials, nonprofit organizations, higher education officials, government, or other stakeholders;

(D) demonstrate the effective use and importance of verbal and nonverbal communication skills when presenting ideas and solutions to diverse audiences; and

(E) use appropriate techniques to manage communication apprehension, build self-confidence, and gain command of information.

(3) Communication and collaboration. The student develops a process to effectively communicate with peers, experts, and other audiences about current issues and solutions to global problems. The student is expected to:

(A) demonstrate innovative uses of a wide range of emerging technologies, including online learning, mobile devices, digital content, and Web 2. 0 tools such as podcasting, wikis, and blogs;

(B) participate within appropriate electronic communities as a learner, initiator, and contributor;

(C) extend the learning environment beyond the school walls using appropriate digital tools;

(D) collaborate with a variety of field experts;

(E) prepare for, organize, and participate in an informative or persuasive group discussion with an audience; and

(F) participate appropriately in conversations by making clear requests, giving accurate directions, and asking purposeful questions.

(4) Communication and collaboration. The student uses digital tools to facilitate collaboration and communication in the design, development, and evaluation of products offering solutions to real-world issues. The student is expected to:

(A) design and organize resources to create an effective collaborative working environment that enables a group to investigate a local, state, national, or global issue;

(B) analyze and evaluate effective communication;

(C) demonstrate leadership by managing project activities such as timelines, research, product development, marketing material, and effective communication skills;

(D) demonstrate effective management of diverse peer-group dynamics such as solving problems, managing conflicts, and building consensus; and

(E) evaluate original products for accuracy, validity, and compliance with copyright laws.

(5) Research and information fluency. The student uses a variety of strategies to acquire and evaluate information relating to real-world issues. The student is expected to:

(A) locate authoritative information from primary and secondary sources such as field experts, online full-text databases, or current news databases;

(B) make decisions regarding the selection, acquisition, and use of information gathered, taking into consideration its quality, appropriateness, effectiveness, and level of interest to society; and

(C) demonstrate fluency in the use of a variety of electronic sources such as cloud computing, emerging collaboration technologies, data mining strategies, and mobile or other technologies.

(6) Research and information fluency. The student uses a variety of digital tools to synthesize information related to real-world issues in student-created materials. The student is expected to:

(A) construct real-world informational materials that inform, persuade, or recommend reform of selected issues;

(B) identify and employ a method to evaluate the design, functionality, and accuracy of the student-created materials; and

(C) use effective strategies to organize and outline presentations to support and clarify points.

(7) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to conduct research, manage products, solve problems, and make informed decisions for real-world local, state, national, and global issues. The student is expected to:

(A) identify and define authentic problems and significant questions for investigation;

(B) design and implement procedures to track trends, set timelines, and review and evaluate progress for project completion;

(C) read and use technical documentation, including appropriate help options, to complete tasks; and

(D) analyze the audience, occasion, and purpose when designing presentations.

(8) Critical thinking, problem solving, and decision making. The student creates a product presenting solutions for real-world local, state, national, and global issues. The student is expected to:

(A) create technology specifications for tasks and rubrics to evaluate products and product quality against established criteria;

(B) resolve information conflicts and validate information by comparing data;

(C) represent diverse perspectives in problem solutions; and

(D) prepare and use visual or auditory aids such as scripts, notes, or digital applications to enhance presentations.

(9) Digital citizenship. The student examines ethical and legal behavior to demonstrate leadership as a digital citizen. The student is expected to:

(A) model safe and ethical use of digital information;

(B) model respect of intellectual property when manipulating, morphing, or editing graphics, video, text, and sound;

(C) use technology applications in a positive manner that supports productivity, collaboration, and continuing education; and

(D) use professional etiquette and protocol in situations such as making introductions, offering and receiving criticism, and communicating with digital tools.

(10) Digital citizenship. The student demonstrates ethical and legal behavior in the creation of student products. The student is expected to:

(A) use collaborative tools and strategies; and

(B) use digital tools to correctly document sources such as in bibliographies or works cited.

(11) Technology operations and concepts. The student makes decisions regarding the selection, acquisition, and use of digital tools in a multimedia classroom/lab, taking into consideration the quality, appropriateness, effectiveness, and efficiency of the tools. The student is expected to:

(A) determine the most appropriate file type based on universally recognized file formats such as portable document format (PDF), text format (TXT), rich text format (RTF), and Joint Photographic Experts Group format (JPEG);

(B) use compression schemes for photo, animation, video, and graphics; and

(C) distinguish among appropriate color, sound, and design principles such as consistency, repetition, alignment, proximity, and ratio of text to white space.

(12) Technology operations and concepts. The student demonstrates knowledge through various cloud and network technologies such as web-based interactive presentations, document sharing, and online scholarly databases. The student is expected to:

(A) use necessary vocabulary related to digital tools;

(B) retrieve and discriminate between authoritative and non-authoritative data sources; and

(C) adopt, adapt, and transfer prior knowledge to multiple situations when retrieving, manipulating, and creating original digital projects.

§127.193. Web Game Development (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Web Design. This course is a Level 3 course and is recommended for students in Grades 11 and 12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.

(3) Web Game Development will allow students to demonstrate creative thinking, develop innovative strategies, and use digital and communication tools necessary to develop fully functional online games. Web Game Development has career applications for many aspects of the game industry, including programming, art principles, graphics, web design, storyboarding and scripting, and business and marketing. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) research, evaluate, and demonstrate appropriate design of a web-based gaming site;

(B) illustrate ideas for web artwork from direct observations, experiences, and imagination;

(C) create original designs for web applications; and

(D) demonstrate the effective use of art media to create original web designs.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) understand and evaluate the use and appropriateness of webinars;

(B) examine, discuss, and summarize interactive online learning environments;

(C) distinguish between distance learning, virtual learning, and online learning;

(D) define and evaluate Voice over Internet Protocol (VoIP);

(E) identify and apply end-user, peer, self-, and professional evaluations; and

(F) work collaboratively to create functioning programs and gaming products.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) research, evaluate, and create web forms for database processing;

(B) identify the various programming languages and differentiate among the available web programming languages;

(C) research, evaluate, and summarize content management systems (CMS);

(D) differentiate between Common Gateway Interface (CGI) and computer-generated imagery (CGI);

(E) discuss, analyze, and summarize streaming media/content and game broadcasting;

(F) define and evaluate instant messaging (IM) within a game environment;

(G) analyze and discuss the history of gaming;

(H) discuss, analyze, compare, and contrast game types such as action, action-adventure, adventure, construction and management simulation, life simulation, massively multiplayer online role-playing (MMORPG), music, party, puzzle, role-playing, sports, strategy, trivia, and vehicle simulation;

(I) discuss, analyze, compare, and contrast gaming hardware, including console, personal computer, mobile, and web;

(J) compare and contrast web standards versus browser-specific languages;

(K) research, evaluate, and summarize e-commerce;

(L) investigate career opportunities in programming, gaming, art, design, business, and marketing;

(M) research the characteristics of existing gaming websites to determine local, state, national, and global trends;

(N) compare and contrast historical and contemporary styles of art as applied to website development;

(O) compare and contrast the use of the art elements of color, texture, form, line, space, and value and the art principles of emphasis, pattern, rhythm, balance, proportion, and unity in personal web game artwork and the web game artwork of others, using vocabulary accurately;

(P) describe general characteristics in artwork from a variety of cultures that influence web game design;

(Q) research and evaluate emerging technologies; and

(R) research and evaluate augmented reality (the supplementing of reality with computer-generated imagery) such as heads-up display and virtual digital projectors.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) select an appropriate web programming language based on given criteria;

(B) develop requirements for a database and determine the appropriate means to insert, delete, and modify records;

(C) develop Structured Query Language (SQL) statements to retrieve, insert, modify, and delete records in a database;

(D) design and create a flow diagram to plan a database, program, and game;

(E) define and identify proper use of gaming graphics, including skins, textures, environment appearance, environment mapping, raster graphics, and vector graphics;

(F) plan an animation that includes the movement of characters, camera movements, camera angles, user point of view, mechanics of motion, backgrounds, settings, ambient objects, and environments;

(G) compare and contrast two-dimensional (2-D) and three-dimensional (3-D) animation;

(H) develop and create a gaming storyboard and script that shows the overall development of a storyline;

(I) identify and implement graphic and game design elements, including color, environment, time to completion, difficulty, story complexity, character development, device control, backstory, delivery, and online player(s);

(J) design and create decision trees for a game's artificial intelligence engine;

(K) compare and contrast available audio formats for optimal delivery;

(L) identify the similarities and differences among platforms, including the application of coding on a personal computer, mobile device, and gaming console;

(M) research and identify existing online game development tools;

(N) evaluate and determine network requirements for the delivery of online games to end users; and

(O) create visual solutions by elaborating on direct observation, experiences, and imagination as they apply to original web design.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) explain game ratings and why games fit into certain ratings;

(B) assess games and game ratings in terms of their impact on societal interactions;

(C) model the ethical and legal acquisition of digital information following copyright laws, fair-use guidelines, and the student code of conduct;

(D) define and practice the ethical and legal acquisition, sharing, and use of files taking into consideration their primary ownership and copyright;

(E) examine original web game artwork to comply with appropriate behavioral, communication, and privacy guidelines, including ethics, online bullying and harassment, personal security, appropriate audience language, ethical use of files/file sharing, technical documentation, and online communities;

(F) interpret, evaluate, and justify artistic decisions in the creation of original art for web game design; and

(G) analyze original web game artwork and digital portfolios created by peers and others to form precise conclusions about formal qualities, historical and cultural contexts, intents, and meanings.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) create a website that includes:

(i) an interactive database with elements such as SQL statements, Extensible Markup Language (XML), and Open Database Connectivity (ODBC);

(ii) JavaScript; and

(iii) server-side processing, including Common Gateway Interface (CGI); bitmap and vector graphics; database creation, modification, and deletion; creation and maintenance of user accounts; user authentication; and documentation;

(B) create a fully functional online game that includes:

(i) multiple game levels with increasing difficulty;

(ii) high-score ranking;

(iii) physics, including center of mass, collision detection, lighting, shading, perspective, anatomy, motion blur, lens flare, and reflections;

(iv) art principles, including color theory, texture, balance, lighting, shading, skinning, and drawing;

(v) graphics resolution, including pixel depth and compression;

(vi) database creation, modification, and deletion;

(vii) creation and maintenance of user accounts;

(viii) user authentication;

(ix) artificial intelligence;

(x) game-level saving;

(xi) mathematical functions;

(xii) varying camera angles;

(xiii) VoIP for online web games; and

(xiv) documentation; and

(C) create a digital portfolio.

§127.224. Practicum in Animation (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: Animation II and Animation II Lab. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of the arts, audio/video technology, and communications industry. Building upon the concepts taught in Animation II and its corequisite Animation II Lab, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an increasing understanding of the industry with a focus on applying pre-production, production, and post-production animation products in a professional environment. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in production projects. The student is expected to:

(A) apply English language arts knowledge and skills by consistently demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a variety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by consistently demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student implements advanced professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) formulate, analyze, and organize oral and written information;

(C) formulate, analyze, interpret, and communicate information, data, and observations;

(D) create and deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills, including data gathering and interpretation independently and in groups; and

(B) employ interpersonal skills in groups to solve problems and make decisions.

(5) The student implements advanced technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for animation projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student implements advanced knowledge of the evolution and current trends of the animation industry. The student is expected to:

(A) summarize the history and evolution of the animation industry; and

(B) analyze the current trends of the animation industry.

(7) The student applies safety regulations. The student is expected to:

(A) consistently implement personal and workplace safety rules and regulations;

(B) recognize and resolve potential safety concerns; and

(C) follow emergency procedures.

(8) The student applies leadership characteristics to student organizations and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student implements ethical decision making and complies with laws regarding use of technology. The student is expected to:

(A) exhibit ethical conduct related to providing proper credit for ideas and privacy of sensitive content;

(B) discuss and apply copyright laws in relation to fair use and acquisition, trademark laws, and personal privacy laws and use digital information citing sources using established methods;

(C) model respect for intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(D) demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet; and

(E) analyze the impact of the animation industry on society.

(10) The student demonstrates appropriate career-building characteristics and maintains a professional portfolio. The student is expected to:

(A) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities;

(C) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, and industry professional organizations; and

(D) examine employment opportunities in entrepreneurship.

(11) The student employs effective planning and time-management skills to enhance productivity. The student is expected to:

(A) employ effective planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(12) The student implements an advanced understanding of a client-based production in all stages of production. The student is expected to:

(A) determine and meet client needs by conducting client meetings to identify specific project requirements and target demographics; and

(B) develop a production proposal for client approval that includes a production schedule, research-based production costs, and appropriate delivery and distribution options.

(13) The student engages in pre-production activities for a successful execution of the project. The student is expected to:

(A) identify cast, crew, equipment, and location requirements;

(B) develop a budget with considerations for cast, crew, equipment, and location;

(C) analyze the script and storyboard processes; and

(D) assign team roles required for production.

(14) The student engages in production activities for successful execution of the project. The student is expected to:

(A) conduct a client meeting for presenting production strategies and implement client feedback;

(B) implement a coherent sequence of production events;

(C) use necessary equipment and crew for quality productions;

(D) demonstrate teamwork and knowledge of interpersonal skills with sensitivity to diversity;

(E) demonstrate appropriate use of editing systems; and

(F) make decisions appropriate for each element of production.

(15) The student engages in post-production activities for a successful output and distribution of the project. The student is expected to:

(A) make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity;

(B) use various compression standards;

(C) research the appropriate delivery formats for the target audience;

(D) advise clients on optimal delivery options; and

(E) discuss distribution options with optimal project reach.

(16) The student practices business skills for freelance entrepreneurs. The student is expected to:

(A) implement standard freelance entrepreneur self-promotion techniques;

(B) develop proposals and standard billing and collection practices;

(C) research freelance entrepreneur start-up practices; and

(D) use technology applications common to freelance entrepreneurs.

(17) The student develops an understanding of professional employment strategies through practical experience in the arts, audio/video technology, and communications career field. The student is expected to:

(A) identify types and requirements of potential employers;

(B) use professional etiquette and protocol in situations such as making introductions, speaking on the phone, communicating via electronic devices, offering and receiving criticism, and making follow-up communications; and

(C) exhibit appropriate grooming and attire.

(18) The student develops an understanding of appropriate interview strategies in professional contexts. The student is expected to:

(A) employ appropriate verbal, nonverbal, and listening skills;

(B) use clear and appropriate communications to convey skill set to others;

(C) understand and apply federal laws regarding lawful employment interviews; and

(D) identify and use appropriate strategies for dealing with diverse individuals.

§127.225. Extended Practicum in Animation (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisites: Animation II and Animation II Lab. Corequisite: Practicum in Animation. This course must be taken concurrently with Practicum in Animation and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in animation span all aspects of the arts, audio/video technology, and communications industry. Building upon the concepts taught in Animation II and Animation II Lab, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an increasing understanding of the industry with a focus on applying pre-production, production, and post-production animation products in a professional environment. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards and employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to animation;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability with increased fluency;

(D) demonstrate technology applications skills such as effective use of social media, email, Internet, publishing tools, presentation tools, spreadsheets, or databases for animation projects with increased fluency;

(E) use appropriate vocabulary and correct grammar and punctuation to compose and edit copy for a variety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(F) employ effective planning and time-management skills with increased fluency by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) create and deliver formal and informal presentations effectively;

(D) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) demonstrate the transfer and adaptation of knowledge through the creation of original work.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to demonstrate an understanding of and consistently follow workplace safety rules and regulations.

(5) The student understands the professional, ethical, and legal responsibilities in animation. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) exhibit ethical conduct by providing proper credit for ideas and maintaining privacy of sensitive content;

(C) model respect for intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(D) practice safe, legal, and responsible use of information and technology; and

(E) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student engages in production activities for successful execution of an animation experience or project. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised animation experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) implement an appropriate coherent sequence of production events;

(D) demonstrate appropriate use of necessary equipment and crew for quality productions;

(E) demonstrate appropriate use of editing systems;

(F) monitor production schedule, research-based production costs, and delivery and distribution to ensure alignment with client needs and expectations;

(G) make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity;

(H) implement the appropriate delivery formats for the target audience;

(I) analyze distribution options to achieve optimal project reach;

(J) demonstrate growth of technical skill competencies;

(K) evaluate strengths and weaknesses in technical skill proficiency; and

(L) collect representative work samples.

§127.226. Practicum in Audio/Video Production (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: Audio/Video Production II and Audio/Video Production II Lab. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio/video production span all aspects of the audio/video communications industry. Building upon the concepts taught in Audio/Video Production II and its corequisite Audio/Video Production II Lab, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an increasing understanding of the industry with a focus on applying pre-production, production, and post-production audio and video products in a professional environment. This course may be implemented in an advanced audio/video or audio format. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate professional standards and personal qualities needed to be employable such as oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability;

(C) demonstrate skills related to seeking and applying for employment; and

(D) create a resume and cover letter/letter of interest to document information such as work experiences, licenses, certifications, and work samples.

(2) The student applies academic knowledge and skills in production projects. The student is expected to:

(A) apply English language arts knowledge and skills by consistently demonstrating use of content, technical concepts, and vocabulary; using correct grammar, punctuation, and terminology to write and edit documents; and composing and editing copy for a vari-

ety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(B) apply mathematics knowledge and skills in invoicing and time-based mathematics by consistently demonstrating knowledge of arithmetic operations and applying measurement to solve problems.

(3) The student implements advanced professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) formulate, analyze, and organize oral and written information;

(C) formulate, analyze, interpret, and communicate information, data, and observations;

(D) create and deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills, including data gathering and interpretation independently and in groups; and

(B) employ interpersonal skills in groups to solve problems and make decisions.

(5) The student implements advanced technology applications and processes. The student is expected to:

(A) use technology applications such as social media, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for audio and video production projects; and

(B) use processes such as personal information management, file management, and file sharing.

(6) The student implements advanced knowledge of the evolution and current trends of the audio and video production industries. The student is expected to:

(A) summarize the history and evolution of audio and video production industries; and

(B) analyze the current trends of audio and video production industries.

(7) The student applies safety regulations. The student is expected to:

(A) consistently implement personal and workplace safety rules and regulations;

(B) recognize and resolve potential safety concerns; and

(C) follow emergency procedures.

(8) The student implements leadership characteristics in student organizations and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student implements ethical decision making and complies with laws regarding use of technology. The student is expected to:

(A) exhibit ethical conduct related to providing proper credit for ideas and privacy of sensitive content;

(B) discuss and apply copyright laws in relation to fair use and acquisition, trademark laws, personal privacy laws, and use of digital information by citing sources using established methods;

(C) model respect for intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(D) demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet; and

(E) analyze the impact of the audio/video production industry on society.

(10) The student demonstrates appropriate career-building characteristics and maintains a professional portfolio. The student is expected to:

(A) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities;

(C) examine and employ professional networking opportunities such as career and technical student organizations, professional social media, and industry professional organizations; and

(D) examine employment opportunities in entrepreneurship.

(11) The student employs effective planning and time-management skills to enhance productivity. The student is expected to:

(A) employ effective planning and time-management skills to complete work tasks; and

(B) use technology to enhance productivity.

(12) The student implements an advanced understanding of a client-based production in all stages of production. The student is expected to:

(A) determine and meet client needs by conducting client meetings to identify specific project requirements and target demographics; and

(B) develop a production proposal for client approval that includes a production schedule, research-based production costs, and appropriate delivery and distribution options.

(13) The student engages in pre-production activities for a successful execution of the project. The student is expected to:

(A) identify cast, crew, equipment, and location requirements;

(B) develop a budget with considerations for cast, crew, equipment, and location;

(C) analyze the script and storyboard processes; and

(D) assign team roles required for production.

(14) The student engages in production activities for successful execution of the project. The student is expected to:

(A) conduct a client meeting for presenting production strategies and implement client feedback;

(B) implement a coherent sequence of production events;

(C) use necessary equipment and crew for quality productions;

(D) demonstrate teamwork and knowledge of interpersonal skills with sensitivity to diversity;

(E) demonstrate appropriate use of editing systems; and

(F) make decisions appropriate for each element of production.

(15) The student engages in post-production activities for a successful output and distribution of the project. The student is expected to:

(A) make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity;

(B) use various compression standards;

(C) research the appropriate delivery formats for the target audience;

(D) advise clients on optimal delivery options; and

(E) discuss distribution options with optimal project reach.

(16) The student practices business skills for freelance entrepreneurs. The student is expected to:

(A) implement standard freelance entrepreneur self-promotion techniques;

(B) develop proposals, standard billing, and collection practices;

(C) research freelance entrepreneur start-up practices; and

(D) use technology applications common to freelance entrepreneurs.

(17) The student develops an understanding of professional employment strategies through practical experience in the arts, audio/video technology, and communications career field. The student is expected to:

(A) identify types and requirements of potential employers;

(B) use professional etiquette and protocol in situations such as making introductions, speaking on the phone, communicating via electronic devices, offering and receiving criticism, and making follow-up communication; and

(C) exhibit appropriate grooming and attire.

(18) The student develops an understanding of appropriate interview strategies in professional contexts. The student is expected to:

(A) employ appropriate verbal, nonverbal, and listening skills;

(B) use clear and appropriate communications to convey skill set to others;

(C) understand and apply federal laws regarding lawful employment interviews; and

(D) identify and use appropriate strategies for dealing with diverse individuals.

§127.227. Extended Practicum in Audio/Video Production (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisites: Audio/Video Production II and Audio/Video Production II Lab. Corequisite: Practicum in Audio/Video Production. This course must be taken concurrently with Practicum in Audio/Video Production and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in audio/video production span all aspects of the audio/video communications industry. Building upon the concepts taught in Audio/Video Production II and Audio/Video Production II Lab, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an increasing understanding of the industry with a focus on applying pre-

production, production, and post-production audio and video products in a professional environment. This course may be implemented in an advanced audio/video or audio format. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to audio/video production;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as effective oral and written communication, leadership, teamwork, appreciation for diversity, conflict management, customer service, work ethic, and adaptability with increased fluency;

(D) demonstrate technology applications skills such as effective use of social media, email, Internet, publishing tools, presentation tools, spreadsheets, or databases for audio and video production projects with increased fluency;

(E) use appropriate vocabulary and correct grammar and punctuation to compose and edit copy for a variety of written documents such as scripts, captions, schedules, reports, manuals, proposals, and other client-based documents; and

(F) employ effective planning and time-management skills with increased fluency to complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) create and deliver formal and informal presentations effectively; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions; and

(B) demonstrate the transfer and adaptation of knowledge through the creation of original work.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow workplace safety rules and regulations; and

(B) recognize and resolve potential safety concerns.

(5) The student understands the professional, ethical, and legal responsibilities in audio/video production. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) exhibit ethical conduct by providing proper credit for ideas and maintaining privacy of sensitive content;

(C) model respect for intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(D) practice safe, legal, and responsible use of information and technology;

(E) show integrity by choosing the ethical course of action when making decisions; and

(F) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in an audio/video production experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised audio/video production experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate an advanced understanding of a client-based production in all stages of production;

(D) engage in pre-production activities such as identifying cast, crew, equipment, and location requirements; developing a budget; and analyzing script and storyboard processes for successful execution of a project;

(E) engage in production activities for successful execution of the project, including making decisions appropriate for each element of a production;

(F) engage in post-production activities such as making necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity, and researching the appropriate delivery formats for the target audience for a successful output and distribution of a project;

(G) demonstrate growth of technical skill competencies;

(H) evaluate strengths and weaknesses in technical skill proficiency; and

(I) collect representative work samples.

§127.228. Practicum in Printing and Imaging Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Prerequisites: Printing and Imaging Technology II and Printing and Imaging Technology II Lab. Students shall be awarded two credits for successful completion

of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the printing industry with a focus on finishing and bindery operations and customer-based projects. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification to prepare for employment;

(B) identify and demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment; and

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills.

(2) The student applies academic knowledge and skills in printing and imaging projects. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student implements advanced communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) present information formally and informally;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student implements advanced technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects.

(6) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations; and

(B) follow emergency procedures.

(7) The student implements leadership characteristics in student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(8) The student implements ethical decision making and complies with laws regarding use of technology in printing. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) apply copyright laws in relation to fair use and duplication of materials;

(C) model respect for intellectual property;

(D) demonstrate proper etiquette and knowledge of acceptable use policies; and

(E) understand Creative Commons laws, including all licensing.

(9) The student implements career-building characteristics. The student is expected to:

(A) maintain, update, and present a portfolio with information such as work experiences, licenses, certifications, and work samples;

(B) demonstrate skills in evaluating and comparing employment opportunities; and

(C) examine employment opportunities in entrepreneurship.

(10) The student implements technical skills for efficiency. The student is expected to employ planning and time-management skills and tools to enhance results and complete work tasks.

(11) The student implements an advanced technical understanding of professional printing and imaging. The student is expected to:

(A) understand printing systems and their uses;

(B) manage the printing process;

(C) prepare customer documents;

(D) use appropriate printing processes;

(E) use binding processes, including cutting, folding, and trimming;

(F) calculate paper counts from a stock sheet;

(G) demonstrate folding a variety of print pieces, adapting equipment as needed;

(H) demonstrate saddle stitch, perfect bind, and flat stitching in various printed materials;

(I) demonstrate padding press operations;

(J) use appropriate embossing, foil stamping, die cutting, and laminating samples;

(K) print appropriate paper labels, ink jet labels, and bulk forms;

(L) demonstrate knowledge of postal regulations related to packages, contents, sizes, and destinations; and

(M) meet customer needs with regard to labeling, packaging, and shipping according to regulatory standards.

§127.229. Extended Practicum in Printing and Imaging Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisites: Printing and Imaging Technology II and Printing and Imaging Technology II Lab. Corequisite: Practicum in Printing and Imaging Technology. This course must be taken concurrently with Practicum in Printing and Imaging Technology and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in printing span all aspects of the industry, including prepress, press, and finishing and bindery operations. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the printing industry with a focus on finishing and bindery operations and customer-based projects. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to printing and imaging technology;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment with increased fluency;

(D) demonstrate use of personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for printing and imaging projects with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) present information formally and informally effectively;

(C) apply active listening skills to obtain and clarify information; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to demonstrate an understanding of and consistently follow workplace safety rules and regulations.

(5) The student understands the professional, ethical, and legal responsibilities in printing and imaging technology. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) exhibit ethical conduct by maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(C) apply copyright laws in relation to fair use and duplication of materials in a consistent manner;

(D) apply Creative Commons laws, including all licensing; and

(E) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student implements an advanced technical understanding of professional printing and imaging. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised printing and imaging technology experience;

(B) practice use of various printing systems;

(C) demonstrate use of appropriate printing processes with increased fluency;

(D) demonstrate use of binding processes such as cutting, folding, and trimming with increased fluency;

(E) demonstrate folding of a variety of print pieces by adapting equipment as needed;

(F) use appropriate embossing, foil stamping, die cutting, and laminating samples with increased fluency;

(G) meet customer needs for labeling, packaging, and shipping according to regulatory standards;

(H) develop advanced technical knowledge and skills related to the student's occupational objective;

(I) demonstrate growth of technical skill competencies;

(J) evaluate strengths and weaknesses in technical skill proficiency; and

(K) collect representative work samples.

§127.230. Practicum in Commercial Photography (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Prerequisites: Commercial Photography I and Commercial Photography I Lab along with teacher recommendation. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the commercial photography industry with a focus on producing, promoting, and presenting professional quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in training, education, or certification for employment;

(B) demonstrate positive work behaviors and personal qualities needed to be employable; and

(C) demonstrate skills related to seeking, applying for, and obtaining a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills.

(2) The student applies academic knowledge and skills in commercial photography. The student is expected to:

(A) apply English language arts knowledge and skills in accordance with industry standards to a variety of written documents; and

(B) apply mathematics knowledge and skills in accordance with industry standards to solve a problem.

(3) The student applies professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) present information formally and informally;

(E) apply active listening skills to obtain and clarify information;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student understands and examines problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student is expected to use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects.

(6) The student applies knowledge of commercial photography systems. The student is expected to analyze and summarize the history and evolution of the commercial photography field.

(7) The student applies safety regulations. The student is expected to:

(A) implement personal and workplace safety rules and regulations in a photography studio and lab; and

(B) follow emergency procedures.

(8) The student applies leadership characteristics to student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology in commercial photography. The student is expected to:

(A) demonstrate an understanding of ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and duplication of images;

(C) model respect for intellectual property when manipulating, morphing, and editing digital images; and

(D) demonstrate proper etiquette and knowledge of acceptable use policies, including Creative Commons laws and licensing.

(10) The student develops career-building characteristics. The student is expected to:

(A) maintain and update portfolio to document information such as work experiences, licenses, certifications, and work samples; and

(B) demonstrate skills in evaluating and comparing employment opportunities.

(11) The student is expected to employ planning and time-management skills to complete work tasks such as creating quotes and budgeting. The student is expected to:

(A) employ planning and time-management skills to complete work tasks; and

(B) demonstrate skills in budgeting and creating quotes for freelance or contract projects.

(12) The student develops an increased understanding of commercial photography. The student is expected to:

(A) create photographs for defined purposes;

(B) apply the elements and principles of art to a variety of commercial photography projects;

(C) demonstrate the principles of commercial photography such as working with clients, interpreting client instructions, developing production schedules, and delivering products in a competitive market;

(D) demonstrate the use of appropriate cameras and lenses;

(E) apply appropriate photographic composition and layout principles;

(F) demonstrate appropriate digital black and white and color photography;

(G) apply effective photographic lighting techniques, including three point, studio, portraiture, and product;

(H) produce professional quality photographs;

(I) use the most appropriate types of photographic paper for projects;

(J) use the most appropriate solutions for mounting, matting, or framing photographs;

(K) demonstrate use of appropriate, current, and industry-standard production processes to produce photographs;

(L) evaluate photographs using principles of art, commercial photography standards, and critical-thinking skills; and

(M) demonstrate use of appropriate resolution and digital file formats.

§127.231. Extended Practicum in Commercial Photography (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisites: Commercial Photography I and Commercial Photography I Lab along with teacher recommendation. Corequisite: Practicum in Commercial Photography. This course must be taken concurrently with Practicum in Commercial Photography and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in commercial photography span all aspects of the industry from setting up a shot to delivering products in a competitive market. In addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the commercial photography industry with a focus on producing, promoting, and presenting professional quality photographs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to commercial photography;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate positive work behaviors and personal qualities needed to be employable with increased fluency;

(D) demonstrate use of personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for commercial photography projects with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) present information formally and informally effectively;

(D) apply active listening skills to obtain and clarify information; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to demonstrate understanding of and consistently follow workplace safety rules and regulations.

(5) The student understands the professional, ethical, and legal responsibilities in commercial photography. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) practice ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a commercial photography experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised commercial photography experience;

(B) demonstrate the use of appropriate cameras and lenses with increased proficiency;

(C) apply appropriate photographic composition and layout principles with increased fluency;

(D) apply effective photographic lighting techniques such as three point, studio, portraiture, and product with increased fluency;

(E) produce professional-quality photographs;

(F) demonstrate use of the most appropriate types of photographic paper for projects;

(G) demonstrate use of the most appropriate solutions for mounting, matting, or framing photographs;

(H) demonstrate use of appropriate, current, and industry-standard production processes to produce photographs;

(I) demonstrate use of appropriate resolution and digital file formats;

(J) demonstrate growth of technical skill competencies;

(K) evaluate strengths and weaknesses in technical skill proficiency; and

(L) collect representative work samples.

§127.232. Practicum in Fashion Design (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is for students in Grades 11 and 12. Prerequisite: Fashion Design II and Fashion Design II Lab. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the business aspects of fashion, with emphasis on promotion and retailing. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or certification to prepare for employment;

(B) identify and demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(E) demonstrate skills in evaluating and comparing employment opportunities; and

(F) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in fashion, textile, and apparel projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student implements advanced professional communications strategies. The student is expected to:

(A) adapt language for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information, data, and observations;

(D) deliver formal and informal presentations;

(E) apply active listening skills to obtain and clarify information;

(F) communicate with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups; and

(B) employ interpersonal skills in groups to solve problems.

(5) The student implements advanced technology applications. The student is expected to use personal information management, email, Internet, and industry programs for fashion, textiles, and apparel projects.

(6) The student implements advanced knowledge of fashion, textile, and apparel systems. The student evaluates the history of

the fashion, textiles, and apparel field. The student is expected to compare fashion history relative to current fashions trends.

(7) The student applies safety regulations. The student is expected to implement personal and workplace safety rules and procedures.

(8) The student implements leadership characteristics in classroom and professional settings. The student is expected to:

(A) employ leadership skills to accomplish collective goals;

(B) employ practices for effective working relationships such as providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(C) conduct and participate in meetings using parliamentary procedure; and

(D) employ mentoring skills to inspire others.

(9) The student applies ethical decision making and complies with legal practices related to fashion, textiles, and apparel. The student is expected to:

(A) exhibit ethical conduct; and

(B) apply copyright laws.

(10) The student implements technical skills for efficiency. The student is expected to employ planning and time-management skills to complete work tasks.

(11) The student describes fundamentals of fashion buying. The student is expected to:

(A) explain processes for retail buying;

(B) identify wholesale market resources;

(C) compare various apparel markets;

(D) analyze how timing and pricing of fashion apparel and accessories are determined;

(E) analyze the price of a fashion product;

(F) describe various types of retail outlets;

(G) describe how offshore sourcing impacts fashion retailing; and

(H) compose a scenario plan for retail pricing, sales, inventory, and purchasing.

(12) The student describes the relationship between marketing and the fashion industry. The student is expected to:

(A) explain the marketing concept;

(B) relate marketing functions to the fashion industry;

(C) explain how each component of the marketing mix contributes to successful fashion marketing;

(D) explain the importance of target markets;

(E) describe advantages and disadvantages of market segmentation and mass marketing;

(F) research trends and emerging technologies affecting fashion marketing;

(G) determine examples of niche marketing;

(H) describe cultural and societal influences on the fashion market; and

(I) describe how international marketing has affected the fashion industry.

(13) The student develops, implements, and evaluates a promotional plan. The student is expected to:

(A) identify components of the promotional mix such as advertising, visual merchandising, and personal selling;

(B) demonstrate visual merchandising techniques for fashion goods, services, or ideas;

(C) analyze a promotional plan for effectiveness;

(D) describe deceptive practices in fashion promotion; and

(E) employ ethical practices in promotional activities.

(14) The student applies marketing techniques when assisting with promotional activities. The student is expected to:

(A) describe various types of business promotion strategies;

(B) classify types of customers and their motives for buying textile and apparel products;

(C) describe roles of public relations and publicity in product promotion;

(D) explain the use of promotional activities to market textile and apparel products and services;

(E) plan special fashion events such as fashion shows, trunk shows, retail shows, and educational events;

(F) create and develop a fashion show theme;

(G) develop a scale drawing to illustrate fashion show sets and staging;

(H) describe all fashion show responsibilities; and

(I) write press releases to publicize promotional activities.

(15) The student creates product displays using the principles of design. The student is expected to:

(A) identify components used in developing displays;

(B) determine ways in which design elements and principles are used in the creation of displays;

(C) describe types and uses of interior and exterior displays; and

(D) create window or other displays of fashion and apparel products.

(16) The student demonstrates effective customer service. The student is expected to:

(A) determine factors that promote quality customer relations;

(B) evaluate the impact of cultural diversity on customer relations;

(C) exhibit skills needed for effective customer service;

(D) create solutions to specific customer issues; and

(E) examine the role of selling fashion products in retail.

(17) The student identifies wholesale settings. The student is expected to:

(A) analyze motives for consumer fashion purchases;

(B) describe qualities of an effective salesperson;

(C) apply appropriate fashion vocabulary in selling situations; and

(D) demonstrate effective sales techniques from customer approach to closure.

(18) The student summarizes important business procedures in fashion retailing. The student is expected to:

(A) explain methods a business uses to control risks such as surveillance, safety training, and loss control;

(B) explain the use of inventory information such as preparing financial reports and making buying decisions;

(C) demonstrate cash and credit transaction methods;

(D) analyze data used to make accurate forecasts;

(E) demonstrate knowledge of the fashion buying process such as preparing a buying plan, completing purchase orders, and processing invoices;

(F) examine operational costs such as markup, markdown, cash flow, and other factors affecting profit; and

(G) demonstrate procedures for reporting and handling accidents, safety, and security incidents.

§127.233. Extended Practicum in Fashion Design (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisite: Fashion Design II and Fashion Design II Lab. Corequisite: Practicum in Fashion Design. This course must be taken concurrently with Practicum in Fashion Design and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster focuses on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in fashion span all aspects of the textile and apparel industries. Within this context, in addition to developing advanced technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop an advanced technical understanding of the business aspects of fashion, with emphasis on promotion and retailing. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to fashion design;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment with increased fluency;

(D) demonstrate use of personal information management, email, Internet, and industry programs for fashion, textiles, and apparel projects with increased fluency; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) apply active listening skills to obtain and clarify information;

(D) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate procedures for reporting and handling accidents, safety, and security incidents.

(5) The student understands the professional, ethical, and legal responsibilities in fashion design. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) practice ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(C) employ ethical practices in promotional activities; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a fashion design experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised fashion design experience;

(B) compose a scenario plan for retail pricing, sales, inventory, and purchasing;

(C) plan special fashion events such as fashion shows, trunk shows, retail shows, and educational events;

(D) create product displays using the principles of design;

(E) implement aspects of the fashion buying process such as preparing a buying plan, completing purchase orders, and processing invoices;

(F) demonstrate growth of technical skill competencies;

(G) evaluate strengths and weaknesses in technical skill proficiency; and

(H) collect representative work samples.

§127.234. Practicum in Graphic Design and Illustration (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Prerequisites: Graphic Design and Illustration II and Graphic Design and Illustration II Lab. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industry. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop a technical understanding of the industry with a focus on skill proficiency. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and participate in training, education, or preparation for certification to prepare for employment;

(B) identify and demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment;

(C) demonstrate skills related to seeking and applying for employment to find and obtain a desired job, including identifying job opportunities, developing a resume and letter of application, completing a job application, and demonstrating effective interview skills;

(D) maintain a career portfolio to document information such as work experiences, licenses, certifications, and work samples;

(E) demonstrate skills in evaluating and comparing employment opportunities; and

(F) examine employment opportunities in entrepreneurship.

(2) The student applies academic knowledge and skills in art and design projects. The student is expected to:

(A) apply English language arts knowledge by demonstrating skills such as correct use of content, technical concepts, vocabulary, grammar, punctuation, and terminology to write and edit a variety of documents; and

(B) apply mathematics knowledge and skills such as using whole numbers, decimals, fractions, and knowledge of arithmetic operations.

(3) The student implements advanced professional communications strategies. The student is expected to:

(A) adapt language such as structure and style for audience, purpose, situation, and intent;

(B) organize oral and written information;

(C) interpret and communicate information;

(D) deliver formal and informal presentations;

(E) apply active listening skills;

(F) listen to and speak with diverse individuals; and

(G) exhibit public relations skills to increase internal and external customer/client satisfaction.

(4) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills, including data gathering and interpretation, independently and in groups to solve problems and make decisions; and

(B) employ interpersonal skills in groups to solve problems and make decisions.

(5) The student implements advanced technology applications. The student is expected to use personal information management, email, Internet, writing and publishing, and presentation applications for graphic design and illustration projects.

(6) The student implements advanced knowledge of design systems. The student is expected to analyze and summarize the history and evolution of the commercial art and design field.

(7) The student applies cyber safety procedures. The student is expected to implement personal and professional safety rules and regulations.

(8) The student implements leadership characteristics in student leadership and professional development activities. The student is expected to:

(A) employ leadership skills to accomplish goals and objectives by analyzing the various roles of leaders within organizations, exhibiting problem-solving and management traits, describing effective leadership styles, and participating in civic and community leadership and teamwork opportunities to enhance skills;

(B) employ teamwork and conflict-management skills to achieve collective goals;

(C) establish and maintain effective working relationships by providing constructive praise and criticism, demonstrating sensitivity to and value for diversity, and managing stress and controlling emotions;

(D) prepare for meetings by developing goals and objectives to achieve within a scheduled time and producing agendas;

(E) conduct and participate in meetings to accomplish work tasks by achieving goals and objectives within a scheduled time; producing meeting minutes, including decisions and next steps; and using parliamentary procedures, as needed; and

(F) employ mentoring skills to inspire and teach others.

(9) The student applies ethical decision making and complies with laws regarding use of technology. The student is expected to:

(A) exhibit ethical conduct related to interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(B) discuss and apply copyright laws in relation to fair use and acquisition and use of digital information using established methods to cite sources;

(C) model respect of intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(D) demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet; and

(E) analyze and identify the impact of the advertising and visual communication design industry on society.

(10) The student applies effective planning and time-management skills. The student is expected to employ tools to enhance results and complete work tasks.

(11) The student uses advanced graphic design and illustration methods and skills. The student is expected to:

(A) interpret, evaluate, and justify design decisions;

(B) conduct verbal or written critiques of design projects; and

(C) identify and apply art elements and principles to designs and illustrations.

(12) The student employs a creative design process to create professional quality, two- or three-dimensional projects. The student is expected to:

(A) create designs for defined applications;

(B) use appropriate elements of design;

(C) use appropriate design principles and typography;

(D) use appropriate composition;

(E) use anatomically appropriate figure drawing;

(F) use appropriate perspective;

(G) use the most effective color choices in projects; and

(H) use appropriate printing concepts.

§127.235. Extended Practicum in Graphic Design and Illustration (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Arts, Audio/Video Technology, and Communications Career Cluster. Prerequisites: Graphic Design and Illustration II and Graphic Design and Illustration II Lab. Corequisite: Practicum in Graphic Design and Illustration. This course must be taken concurrently with Practicum in Graphic Design and Illustration and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Arts, Audio/Video Technology, and Communications Career Cluster is focused on careers in designing, producing, exhibiting, performing, writing, and publishing multimedia content, including visual and performing arts and design, journalism, and entertainment services.

(3) Careers in graphic design and illustration span all aspects of the advertising and visual communications industry. Within this context, in addition to developing technical knowledge and skills needed for success in the Arts, Audio/Video Technology, and Communications Career Cluster, students will be expected to develop a tech-

nical understanding of the industry with a focus on skill proficiency. Instruction may be delivered through lab-based classroom experiences or career preparation opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to graphic design or illustration;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, self-worth, positive attitude, integrity, and commitment with increased fluency;

(D) demonstrate use of personal information management, email, Internet, writing and publishing, and presentation applications for graphic design and illustration projects with increased fluency; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information;

(C) apply active listening skills to obtain and clarify information; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to demonstrate understanding of and consistently follow workplace safety rules and regulations.

(5) The student understands the professional, ethical, and legal responsibilities in graphic design and illustration. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) practice safe, responsible, and legal behavior while using technology tools and resources;

(C) practice ethical conduct when interacting with others such as maintaining client confidentiality and privacy of sensitive content and providing proper credit for ideas;

(D) apply copyright laws in relation to fair use and acquisition and use of digital information using established methods to cite sources;

(E) practice respect for intellectual property when manipulating, morphing, and editing graphics, video, text, and sound;

(F) demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet; and

(G) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a graphic design and illustration experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised graphic design and illustration experience;

(B) interpret, evaluate, and justify design decisions;

(C) identify and apply art elements and principles to designs and illustrations with increased fluency;

(D) employ a creative design process to create professional-quality, two- or three-dimensional projects;

(E) demonstrate growth of technical skill competencies;

(F) evaluate strengths and weaknesses in technical skill proficiency; and

(G) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500570
Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER F. BUSINESS, MARKETING, AND FINANCE

19 TAC §§127.241 - 127.260, 127.264 - 127.266, 127.268, 127.294 - 127.300

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students

should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.241. Principles of Business, Marketing, and Finance (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-11. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) In Principles of Business, Marketing, and Finance, students gain knowledge and skills in economies and private enterprise systems, the impact of global business, the marketing of goods and services, advertising, and product pricing. Students analyze the sales process and financial management principles. This course allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in business, marketing, and finance.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student describes the characteristics of business. The student is expected to:

(A) explain the principles of supply and demand;

(B) differentiate between goods and services;

(C) identify the types of business;

(D) compare the different forms of ownership;

(E) examine the organizational structure and functions of business;

(F) interpret the nature of balance sheets and income statements; and

(G) identify business cycles.

(3) The student defines ethics in business. The student is expected to:

(A) distinguish between ethical and unethical business practices; and

(B) contrast ethical, moral, and legal choices that relate to the decision-making process in business situations.

(4) The student differentiates between the types of economic systems with emphasis on the private enterprise system and the U.S. economy. The student is expected to:

(A) compare and contrast the types of economic systems, including traditional, centrally planned, market, and mixed economies;

(B) summarize the characteristics of the private enterprise system; and

(C) identify factors affecting business profits, revenues, and expenses.

(5) The student relates to the impact of international business on the U.S. economy. The student is expected to:

(A) explain the role of business in a global society;

(B) compare domestic and world trade; and

(C) explain the impact of imports and exports on the U.S. economy.

(6) The student identifies the role and impact of government, the legal system, and organized labor in business. The student is expected to:

(A) differentiate among the roles of government in business;

(B) describe types of activities performed by governments in business;

(C) ascertain the role of the legal system in business; and

(D) explain the role of organized labor in society.

(7) The student classifies types of businesses that market goods and services. The student is expected to:

(A) explain the importance of different marketing strategies for goods versus services;

(B) define business and industry terms such as producers, raw-goods producers, manufacturers, builders, trade industries, retailers, wholesalers, and service businesses;

(C) identify types of retailers;

(D) explain the role of retailers in a private enterprise system;

(E) identify examples of wholesalers; and

(F) describe the role of wholesalers in a private enterprise system.

(8) The student analyzes cost and profit relationships in finance. The student is expected to:

(A) explain the concept of productivity;

(B) analyze the impact of specialization and division of labor on productivity; and

(C) explain the concept of organized labor and business.

(9) The student understands the fundamental principles of money. The student is expected to:

(A) evaluate forms of financial exchange, including cash, credit, debit, and electronic funds transfer;

(B) identify types of currency, including paper money, coins, banknotes, government bonds, and treasury notes;

(C) list functions of money such as medium of exchange, unit of measure, and store of value;

(D) summarize the purposes and importance of credit; and

(E) explain legal responsibilities associated with financial exchanges.

(10) The student demonstrates an understanding of personal financial management. The student is expected to:

(A) explain the importance of providing accurate information;

(B) calculate gross and net pay;

(C) simulate opening and maintaining various types of bank accounts;

(D) reconcile bank statements;

(E) compare the advantages and disadvantages of different types of banking services;

(F) examine investment growth by developing a personal investment plan; and

(G) prepare an individual income tax return.

(11) The student explains the importance of marketing as well as the functions of marketing. The student is expected to:

(A) define marketing;

(B) understand how marketing is related to other functions of business;

(C) explain the marketing concept; and

(D) describe marketing functions and its related activities.

(12) The student understands the scope of market identification. The student is expected to:

(A) explain the concept of market and market identification;

(B) identify market segments;

(C) explain the difference in market segmentation and mass marketing;

(D) define and explain the importance of target markets; and

(E) identify a target market for a product or service using market segmentation.

(13) The student understands the importance of an effective marketing mix. The student is expected to:

(A) explain the concept of marketing strategies;

(B) define each component of the marketing mix;

(C) identify examples of an effective marketing mix;

(D) create an effective marketing mix for a product or service; and

(E) explain the role of participation as a key element of marketing.

(14) The student identifies career opportunities within the Business Management and Administration career cluster, the Finance career cluster, and the Marketing career cluster and formulates a career plan. The student is expected to:

(A) analyze individual goals and interests;

(B) determine individual talents, abilities, and skills; and

(C) develop an individual career plan.

§127.242. Touch System Data Entry (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is recommended for students in Grades 9 and 10. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) In Touch System Data Entry, students apply technical skills to address business applications of emerging technologies. Students enhance reading, writing, computing, communication, and reasoning skills and apply them to the business environment. Students will need to apply touch system data entry for production of business documents.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student applies the proper keyboarding technique to input data when using the computer. The student is expected to:

(A) demonstrate correct posture and position while conducting data entry;

(B) display proper care and operation of equipment used;

(C) apply the correct touch-system techniques for operating alphabetic keys;

(D) demonstrate the correct touch-system techniques for operating numeric and symbol keys;

(E) use the correct touch-system techniques for operating the ten-key numeric pad; and

(F) correctly use the command and function keys.

(3) The student applies correct techniques for the touch-system of operating the keyboard to develop speed and accuracy. The student is expected to:

(A) demonstrate improvement in speed and accuracy;

(B) develop the ability to proofread and edit writing for proper voice, tense, and syntax, assuring that it conforms to standard English, when appropriate;

(C) use the backspace key to correct errors;

(D) compose a variety of business documents under timed situations; and

(E) apply speed and accuracy in production of documents.

(4) The student formats and prints documents such as personal and business letters, short reports, outlines, and compositions. The student is expected to:

(A) demonstrate the ability to work from printed, rough-draft, statistical, handwritten, and unarranged material;

(B) demonstrate the ability to compose at the keyboard;

(C) demonstrate the ability to proofread;

(D) identify the parts of a personal and business letter;

(E) format personal and business letters and envelopes;

(F) format all pages of a report, including a title page, reference page, and bibliography;

(G) format an outline; and

(H) demonstrate mastery of basic grammar, including using punctuation marks, numbers and symbols, and capitalization correctly.

(5) The student prepares business documents using effective communication. The student is expected to:

(A) interpret and follow directions to produce documents;

(B) demonstrate proficiency in business English, spelling, and proofreading;

(C) identify and apply correct format for business correspondence and documents; and

(D) demonstrate concepts and processes to employ the appropriate steps in document production.

(6) The student improves level of proficiency in producing complex business documents. The student is expected to:

(A) refine work habits; and

(B) improve techniques, speed, and accuracy in document production.

(7) The student solves problems using document processing skills. The student is expected to:

(A) identify criteria for selection and evaluation of word-processing software;

(B) analyze proper placement, format, and priority of completion;

(C) produce business correspondence such as letters, memos, emails, press releases, announcements, tables, reports, legal documents, and business forms; and

(D) prepare and distribute personalized correspondence using electronic mail.

(8) The student develops the technology and social skills necessary to work in an office environment. The student is expected to:

(A) create and present a visual and oral report using text and graphics;

(B) relate the social ramifications of computer applications to privacy, values, and ethics;

(C) enhance overall office productivity by responsible use of computer systems;

(D) develop human-relation skills for working in a team environment; and

(E) participate in student leadership activities.

§127.243. Business Law (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Business Law is designed for students to analyze various aspects of the legal environment, including ethics, the judicial system, contracts, personal property, sales, negotiable instruments, agency and employment, business organization, risk management, and real property.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student defines ethics in business. The student is expected to:

(A) distinguish between ethical and unethical business practices; and

(B) contrast ethical, moral, and legal choices that relate to the decision-making process in business situations.

(3) The student identifies the different types of law, courts, and regulations in the judicial system. The student is expected to:

(A) identify the concepts of civil and criminal law;

(B) explain the different types of courts and traditional court procedures;

(C) differentiate between business torts and crimes; and

(D) comprehend the rationale for governmental regulations of business activities.

(4) The student identifies the principles of contracts in business. The student is expected to:

(A) explain the classes of contracts;

(B) cite methods of offer and acceptance;

(C) explain the different capacities to contract;

(D) examine the concepts of consideration;

(E) describe defective agreements;

(F) describe illegal agreements; and

(G) research contemporary cases dealing with contract law using appropriate online technology.

(5) The student explains personal property. The student is expected to:

(A) contrast real property with personal property;

(B) analyze the nature of personal property;

(C) recognize the different types of bailments and obligations and rights under each type; and

(D) research cases dealing with personal property using appropriate online technology.

(6) The student identifies the concept of sales in the context of business law. The student is expected to:

(A) identify the nature of goods and services;

(B) explain the formalities of sale;

(C) characterize the transfer of title and risks in sales contracts;

(D) identify and explain the types and categories of warranties, product liability, and consumer protection; and

(E) research cases dealing with contract sales using appropriate online technology.

(7) The student researches negotiable instruments. The student is expected to:

(A) explain the nature of negotiable instruments;

(B) identify the essentials of negotiability;

(C) explain promissory notes and drafts;

(D) distinguish between negotiation and discharge;

(E) assess the liabilities of the holders in due course;

(F) identify the defenses in dealing with negotiable instruments; and

(G) research cases dealing with negotiable instruments using appropriate online technology.

(8) The student analyzes the concepts of agency and employment. The student is expected to:

(A) summarize the nature and creation of an agency;

(B) explain the operation and termination of an agency;

(C) recognize the nature of employer and employee relations;

(D) explain employee rights;

(E) identify the tenets of labor legislation; and

(F) research cases dealing with employment law using appropriate online technology.

(9) The student identifies the different types of business organization. The student is expected to:

(A) explain a sole proprietorship;

(B) explain the creation and operation of a partnership;

(C) discuss the nature and creation of a corporation;

(D) depict the ownership of a corporation; and

(E) describe the management and dissolution of a corporation.

(10) The student explains risk-management instruments. The student is expected to:

(A) identify the principles of insurance;

(B) review the types of insurance;

(C) recognize security devices such as fidelity bonds and securities;

(D) discuss the appropriateness and categories of bankruptcy; and

(E) research contemporary cases dealing with risk-bearing devices using appropriate online technology.

(11) The student describes the legal contexts of real property. The student is expected to:

(A) explain the nature of real property;

(B) establish the proper methods for the transfer of real property;

(C) describe the different types of real estate mortgages;

(D) review contemporary landlord-tenant law;

(E) explain wills, inheritances, and trusts; and

(F) research cases dealing with real estate law using appropriate online technology.

(12) The student knows how to use self-development techniques and interpersonal skills to accomplish legal tasks and solve cases. The student is expected to:

(A) identify and practice effective interpersonal skills involving situations with coworkers, supervisors, and clients;

(B) identify and practice effective team-building skills involving situations with coworkers, supervisors, and clients; and

(C) participate in leadership and career development activities.

§127.244. Business English (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is recommended for students in Grade 12. Prerequisite: English III Recommended Prerequisite: Touch Systems Data Entry. This course satisfies the high school advanced English graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) In Business English, students enhance communication and research skills by applying them to the business environment, in addition to exchanging information and producing properly formatted business documents using emerging technology.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student prepares for effective communication skills. The student is expected to:

(A) organize ideas logically and sequentially;

(B) locate and interpret written information;

(C) distinguish communicated fact from opinion by identifying key words;

(D) interpret visual materials such as charts, graphs, pictures, and maps and translate the information into textual form;

(E) employ precise language to communicate ideas clearly and concisely; and

(F) organize ideas in writing in a coherent, logical progression.

(3) The student employs appropriate research techniques to produce effective business communication. The student is expected to:

(A) incorporate information from printed copies and electronic resources and references;

(B) locate and paraphrase secondary sources;

(C) document secondary sources;

(D) design, conduct, and analyze the results of a survey;

(E) conduct interviews to obtain resource materials; and

(F) create a business project incorporating data imported from various sources.

(4) The student exchanges information via telecommunications such as email, images, social media, and other online information services with appropriate supervision. The student is expected to:

(A) evaluate which telecommunications methods are most appropriate to a given situation; and

(B) apply appropriate business ethics and correct etiquette when using telecommunications.

(5) The student illustrates proficiency in interpersonal communication. The student is expected to:

(A) develop professional vocabulary skills;

(B) execute effective oral presentations;

(C) deliver an effective business presentation such as sales, reports, and proposals;

(D) apply effective communication techniques when using the telephone and different forms of technology;

(E) demonstrate the ability to listen by writing summaries of presentations and oral conversations;

(F) display active listening through oral feedback;

(G) follow oral and written directions;

(H) demonstrate the ability to give oral instructions for completing a simple task; and

(I) apply proper business interviewing techniques in various situations such as one-on-one, group, and committee interviews.

(6) The student develops communication skills necessary to address a changing business environment. The student is expected to:

(A) describe the communication process;

(B) identify barriers to effective communication;

(C) assess the ethical and legal implications of messages;

(D) discern appropriate channels for transmitting messages;

(E) interpret nonverbal communication in various activities;

(F) illustrate the impact of nonverbal communication on the total communication process;

(G) identify ways to improve communication in organizations; and

(H) discuss potential communication problems in multicultural business environments.

(7) The student produces business documents using current and emerging technology. The student is expected to:

(A) format business documents;

(B) demonstrate basic writing skills through assigned tasks;

(C) compose positive, negative, and persuasive messages;

(D) compose business letters and memos using the appropriate organizational strategies;

(E) produce a business report containing text and graphics; and

(F) develop a business newsletter.

(8) The student documents technical knowledge and skills. The student is expected to:

(A) prepare a professional electronic portfolio that includes information such as:

(i) attainment of technical skill competencies;

(ii) recognitions, awards, and scholarships;

(iii) extended learning experiences such as community service and active participation in career and technical student organizations;

(iv) sample letter of application;

(v) resume;

(vi) samples of work; and

(vii) teacher recommendations; and

(B) present the portfolio to interested stakeholders.

(9) The student understands how to collect and use information in procedural texts and documents. The student is expected to:

(A) draw conclusions about how the patterns of organization and hierarchic structures support the understandability of text;

(B) evaluate the structures of text such as format or headers for their clarity and organizational coherence; and

(C) evaluate the structures of text for the effectiveness of their graphic representations.

(10) The student uses comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. The student applies the knowledge and skills in paragraphs (2)-(9) of this subsection with greater depth in increasingly more complex texts. The student is expected to:

(A) evaluate how messages presented in media reflect social and cultural views in ways different from traditional texts;

(B) evaluate the interactions of different techniques used in multi-layered media such as layout, pictures, typeface in print media, images, text, or sound in electronic journalism;

(C) evaluate how one issue or event is represented across various media to understand the notions of bias, audience, and purpose; and

(D) evaluate changes in formality and tone across various media for different audiences and purposes.

(11) The student uses elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. The student is expected to:

(A) plan a first draft by selecting the correct genre for conveying the intended meaning to multiple audiences; determining appropriate topics through a range of strategies such as discussion, background reading, personal interests, or interviews; and developing a thesis or controlling idea;

(B) structure ideas in persuasive ways such as using outlines, note taking, graphic organizers, or lists to develop drafts in timed and open-ended situations;

(C) revise drafts to clarify meaning, consistency of tone, and logical organization;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise a final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(12) The student writes expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. The student is expected to:

(A) write an analytical essay of sufficient length that includes effective introductory, concluding, and supporting paragraphs that incorporate relevant perspectives and evidence;

(B) write procedural and work-related documents such as resumes, proposals, college applications, or operation manuals that include a clearly stated purpose combined with a well-supported viewpoint on the topic; appropriate formatting structures such as headings, graphics, or white space; and accurate technical information; and

(C) produce a multimedia presentation such as a documentary, class newspaper, docudrama, infomercial, or visual or textual parody that includes graphics, images, and sound and appeals to a specific audience.

(13) The student understands the function of and uses the conventions of academic language when speaking and writing. The student continues to apply the knowledge and skills in paragraphs (2)-(12) with greater complexity. The student is expected to:

(A) understand and use adjectival, noun, or adverbial clauses and phrases; and

(B) use a variety of correctly structured sentences such as compound, complex, or compound-complex.

(14) The student writes legibly and uses appropriate capitalization and punctuation conventions in compositions. The student is expected to correctly and consistently use conventions of punctuation and capitalization.

(15) The student spells correctly. The student is expected to spell correctly, including using various resources to determine and check correct spellings.

(16) The student organizes and presents ideas and information according to the purpose of the research and the audience. The student is expected to:

(A) synthesize research into an extended written or oral presentation;

(B) provide an analysis that supports and develops personal opinions, as opposed to simply restating existing information;

(C) use a variety of formats and rhetorical strategies to argue for the thesis;

(D) develop an argument that incorporates the complexities of and discrepancies in information from multiple sources and perspectives while anticipating and refuting counter-arguments;

(E) document sources and format written materials using a style manual such as *Modern Language Association*; and

(F) produce a document of sufficient length and complexity to address the topic.

(17) The student makes oral presentations. The student is expected to use proper conventions of language and presentation.

(18) The student works productively with others in teams. The student is expected to offer ideas or judgments that are purposeful in moving the team toward goals, ask relevant and insightful questions, tolerate a range of positions and ambiguity in decision making, and evaluate the work of the group based on agreed-upon criteria.

§127.245. Foundations of Business Communication and Technologies (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended prerequisite: Touch Systems Data Entry. Recommended corequisite: Business Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) In Foundations of Business Communication and Technologies, students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and make a successful transition to the workforce and postsecondary education. Students apply technical skills to address business applications of emerging technologies, create word-processing documents, develop a spreadsheet, formulate a database, and make an electronic presentation using appropriate software.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student coordinates information management and business management to aid in business planning. The student is expected to:

(A) explain the strategic role of information systems and information communication technology within an organization;

(B) determine risks and rewards of developing a strategic role for information systems and information communication technology; and

(C) integrate information systems planning with business planning.

(3) The student enhances usability of systems operations to support business strategies and operations. The student is expected to:

(A) identify the management information requirements and business needs of an organization; and

(B) explain issues involved in designing and developing systems for different environments.

(4) The student analyzes available software packages for use in business settings. The student is expected to:

(A) determine equipment and supplies needed;

(B) establish equipment and supplies maintenance systems;

(C) schedule equipment maintenance;

(D) use equipment and supplies maintenance procedures; and

(E) use critical-thinking skills to troubleshoot equipment and software issues.

(5) The student uses the computer's operating system to execute work responsibilities. The student is expected to:

(A) move files in the computer operating system;

(B) create directories; and

(C) save files in various formats such as plain text, PDF, rich text format, and older versions of word-processing software.

(6) The student applies word-processing technology. The student is expected to:

(A) identify customary styles of business documents;

(B) improve touch-system skills using the keyboard and keypad to input data;

(C) use hardware and software needed to produce documents to address different computer applications;

(D) demonstrate writing techniques by generating ideas and gathering information relevant to the topic and purpose while maintaining accurate records of outside sources;

(E) produce business documents, including business letters, resumes, research papers, and newsletters;

(F) edit a variety of written documents;

(G) insert and edit objects such as tables, graphics, hyperlinks, headers, and footers into a document;

(H) prepare and distribute personalized correspondence using mail merge; and

(I) use online word-processing technologies to create, edit, and share documents.

(7) The student identifies database software to create databases that facilitate business decision making. The student is expected to:

(A) explain the principles of data analysis;

(B) explain the nature of tools that can be used to access information in the database system;

(C) choose appropriate software;

(D) define fields and type of data;

(E) create database structure;

(F) define relationships of tables;

(G) analyze company data requirements; and

(H) design a database to meet business requirements.

(8) The student applies data entry techniques to enter information in databases. The student is expected to:

(A) access information in the database system;

(B) build data in a data warehouse;

(C) enter and edit data into database tables and database forms for easy data entry; and

(D) import and export databases.

(9) The student uses commands to retrieve data and create reports from databases. The student is expected to:

(A) retrieve data from tables and queries;

(B) formulate queries; and

(C) create and print reports.

(10) The student applies data mining methods to acquire pertinent information for business decision making. The student is expected to:

(A) discuss the nature of data mining;

(B) describe data mining tools;

(C) demonstrate basic data mining techniques; and

(D) interpret data mining findings.

(11) The student applies spreadsheet technology. The student is expected to:

(A) perform mathematical processes, including percentages and decimals, order of operations principle, estimation, and prediction of patterns of data;

(B) formulate and produce solutions to a variety of business problems such as budgets, payroll, inventory, invoices, balance sheets, profit-loss statements, and conversion of foreign currencies;

(C) create charts, graphs, and infographics using spreadsheet data; and

(D) use online spreadsheet technologies to create, edit, and share documents.

(12) The student applies presentation management technology. The student is expected to:

(A) identify the guidelines for using graphics, fonts, and special effects in presentations;

(B) analyze the effectiveness of multimedia presentations;

(C) determine the appropriate technology to create and deliver an effective presentation;

(D) save documents in various formats such as template, video, and PDF to share or transport electronically;

(E) deliver an effective presentation; and

(F) use online presentation management technologies to create, edit, transport, and share documents.

(13) The student applies desktop publishing technology. The student is expected to:

(A) identify technologies available for desktop publishing;

(B) identify customary standards and styles of desktop publishing; and

(C) create desktop publications importing text and graphics.

(14) The student uses a variety of software applications. The student is expected to integrate multiple learned software applications to efficiently accomplish workplace tasks.

§127.246. Business Communication and Technologies (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Foundations of Business Communication and Technologies. Recommended Prerequisite: Touch System Data Entry. Recommended corequisite: Business Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) In Business Communication and Technologies, students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and make a successful transition to the workforce or postsecondary education. Students apply technical skills to address business applications of emerging technologies, create complex word-processing documents, develop sophisticated spreadsheets using charts and graphs, and make an electronic presentation using appropriate multimedia software.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those that contain the phrase "such as" are intended as possible illustrative samples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student demonstrates project management processes to conduct a business project using emerging technologies. The student is expected to:

(A) initiate a project;

(B) plan a project;

(C) execute a project;

(D) monitor and control a project; and

(E) close a business project.

(3) The student demonstrates the use of the concepts, strategies, and systems for obtaining and conveying ideas and information to enhance communication in a diverse workplace. The student is expected to:

(A) employ verbal and active listening skills when obtaining and conveying information;

(B) record information needed to present a report on a given topic and use items such as tables of contents, indexes, tabs, footnotes, endnotes, captions, and/or building blocks;

(C) write business correspondence using advanced word processing features such as templates and forms; mail merge, including letters, labels, and envelopes; and document protection and security that convey information effectively using correct grammar, spelling, punctuation, and capitalization;

(D) use online word processing technologies to create, edit, and share documents;

(E) communicate with relevant parties such as coworkers and customers by interpreting verbal and nonverbal behaviors;

(F) apply strategies for communicating about issues in dealing with a diverse workforce such as sexual harassment and cultural differences; and

(G) demonstrate the ability to communicate and resolve conflicts within a diverse workforce.

(4) The student creates, evaluates, and uses information resources to accomplish specific occupational tasks. The student is expected to:

(A) create and interpret items such as tables, charts, infographics, and figures to accomplish specific occupational tasks;

(B) use resources such as informational texts, Internet websites, and technical materials to review and apply information sources for occupational tasks;

(C) evaluate the reliability of information from sources such as informational texts, Internet websites, and technical materials and resources; and

(D) reference sources of information.

(5) The student develops and delivers formal and informal presentations using appropriate media to engage and inform audiences. The student is expected to:

(A) prepare oral presentations to provide information for specific purposes and audiences;

(B) identify support materials that will enhance an oral presentation;

(C) prepare support materials that will enhance an oral presentation;

(D) deliver an oral presentation that sustains listeners' attention;

(E) align presentation strategies to the intended audience;

(F) implement multimedia strategies for presentations; and

(G) use online presentation management technologies to create, edit, transport, and share documents.

(6) The student demonstrates public relations skills to increase internal and external customer satisfaction. The student is expected to communicate effectively when developing positive customer relationships.

(7) The student designs solutions to mathematical business problems using advanced spreadsheet technologies. The student is expected to:

(A) recognize and apply spreadsheet items such as lookup tables, what-if and built-in functions, macros, and advanced charts, graphs, and functions; and

(B) create and interpret financial statements such as comparisons and projections, predictions and forecasts, trend analyses, and charts and graphs.

(8) The student follows procedures of advanced data management. The student is expected to:

(A) design a database to solve business problems; and

(B) use advanced functions of database management such as updating queries, creating formulas, using built-in formulas, and creating custom format reports.

(9) The student documents technical knowledge and skills. The student is expected to:

(A) prepare a professional electronic portfolio that includes information such as:

(i) attainment of technical skill competencies;

(ii) licensures or certifications;

(iii) recognitions, awards, and scholarships;

(iv) extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;

(v) sample letter of application;

(vi) abstract of key points of accomplishments;

(vii) resume;

(viii) samples of work; and

(ix) evaluation from a teacher; and

(B) present the portfolio to interested stakeholders.

§127.247. Business Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing and evaluating business functions essential to efficient and productive business operations.

(3) Business Management is designed to familiarize students with the concepts related to business management as well as the functions of management, including planning, organizing, staffing, leading, and controlling. Students will also demonstrate interpersonal and project-management skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student demonstrates an understanding of the management concept. The student is expected to:

(A) define the term management;

(B) explain management functions, including planning, organizing, staffing, leading, and controlling;

(C) define the management pyramid;

(D) define the role of management;

(E) explain the history and evolution of management;

(F) identify the external and internal environmental factors that influence management;

(G) define ethical workplace behavior;

(H) summarize how to make ethical decisions;

(I) define social responsibility;

(J) explain how socially responsible management policies are initiated and implemented; and

(K) research contemporary cases dealing with ethics and social responsibility using appropriate online technology.

(3) The student recognizes the importance of planning in an organization. The student is expected to:

(A) define the term planning;

(B) explain the necessity of proper planning;

(C) define types of planning such as marketing, financial, and organizational;

(D) identify steps of the management decision-making process, including:

(i) identifying the problem or opportunity;

(ii) gathering relevant information or data;

(iii) determining alternative courses of action;

(iv) evaluating each alternative;

(v) computing an optimal decision;

(vi) implementing the chosen course of action; and

(vii) evaluating the decision feedback and determining if any changes are necessary;

(E) determine competitive advantage;

(F) establish organizational strategy;

(G) determine innovative strategies;

(H) identify the need for change;

(I) define global management; and

(J) explain how the organization will function in a global environment.

(4) The student recognizes the importance of organizations. The student is expected to:

(A) explain how to design an adaptive organization;

(B) define the concepts, methods, and types of departmentalization;

(C) define the chain of command;

(D) explain line authority;

(E) define staff authority;

(F) explain the advantages and disadvantages of different types of organizations, including line, line and staff, and matrix;

(G) define delegation in a management context;

(H) compare and contrast centralized and decentralized organizations;

(I) identify the concept of teams and teamwork; and

(J) define span of control or span of management.

(5) The student explains the role of staffing within an organization. The student is expected to:

(A) describe ethics in human resource issues;

(B) explain or define the major federal employment laws;

(C) define adverse impact and employment discrimination;

(D) identify sexual harassment in the workplace;

(E) explain the methods of recruiting potential employees;

(F) define the selection process for new employees;

(G) explain the types of training needed for newly hired employees;

(H) define professional development in terms of current employees;

(I) explain employee compensation in a competitive environment;

(J) define the potential need for downsizing;

(K) rationalize the costs of employee turnover and what can be done to reduce turnover rate;

(L) explain the need and benefits of a diverse workforce; and

(M) research contemporary cases addressing recruitment, downsizing, and diversity using appropriate online resources.

(6) The student demonstrates the qualities of leadership. The student is expected to:

(A) define motivation;

(B) distinguish between extrinsic and intrinsic rewards;

(C) explain how to address real or perceived inequities in the workplace;

(D) define the Expectancy Theory;

(E) explain how rewards and goals affect motivation;

(F) compare a leader to a manager;

(G) explain the roles of a leader;

(H) explain the traits of an effective leader;

(I) define the different styles of leadership, including autocratic, democratic, and free rein;

(J) explain when each style of leadership is appropriate;

(K) define the management communication process;

(L) explain the concept of employee perception;

(M) analyze the communication process;

(N) compare and contrast formal and informal communication; and

(O) explain how to improve communication within an organization.

(7) The student understands the necessity of the control process. The student is expected to:

(A) examine the control process;

(B) illustrate the five primary control methods;

(C) explain the importance of quality control;

(D) define the strategic importance of management information;

(E) develop the importance of gathering and sharing information;

(F) explain the importance of managing for productivity and growth;

(G) define the quality-related characteristics for products;

(H) explain International Standards Organization (ISO) standards, including ISO 9000 and ISO 14000;

(I) define the quality-related characteristics for services;

(J) explain the Baldridge National Quality Award;

(K) explain the Deming Award;

(L) research and critique recent winners of the Baldridge awards using appropriate online technology;

(M) research and critique recent winners of the Deming award using appropriate online technology;

(N) define Total Quality Management;

(O) explain service operations;

(P) develop a service quality standards instrument such as a customer satisfaction survey or SERVQUAL survey;

(Q) analyze manufacturing operations;

(R) define inventory in the management context; and

(S) explain the fiscal importance of controlling inventory.

(8) The student knows self-development techniques and interpersonal skills to accomplish management objectives. The student is expected to:

(A) recognize personal biases and stereotypes;

(B) identify and practice effective interpersonal skills involving situations with coworkers, supervisors, and subordinates;

(C) identify and practice effective team-building skills involving situations with coworkers, supervisors, and subordinates;

(D) participate in leadership activities;

(E) participate in career development activities;

(F) assess personal strengths and weaknesses; and

(G) develop personal traits and behaviors to foster career advancement.

(9) The student demonstrates project-management skills to improve workflow and minimize costs. The student is expected to:

(A) initiate a project, which includes identifying resources needed for a project;

(B) develop a project plan;

(C) execute a project;

(D) monitor and control a project; and

(E) close a project.

§127.248. Global Business (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Global Business is designed for students to analyze global trade theories, international monetary systems, trade policies, politics, and laws relating to global business as well as cultural issues, logistics, and international human resource management.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student analyzes the theories of global trade and investments. The student is expected to:

(A) define global business;

(B) explain the advantages of specialization;

(C) identify the concept of comparative advantage; and

(D) distinguish between portfolio investment and direct investment.

(3) The student analyzes the role of the international monetary system in the economy. The student is expected to:

(A) describe the role of the International Monetary Fund;

(B) argue for and against floating exchange rates;

(C) argue for and against fixed exchange rates;

(D) explain the impact of the common European currency;

(E) calculate foreign exchange rates; and

(F) research cases dealing with global exchange using appropriate online technology.

(4) The student identifies the importance of international financial markets. The student is expected to:

(A) explain how a foreign exchange market functions;

(B) identify the economic factors that influence exchange rates and explain how these factors work; and

(C) differentiate between alternative strategies of global banking.

(5) The student examines various levels of economic integration among foreign countries. The student is expected to:

(A) identify the different levels of economic integration;

(B) explain the various arguments surrounding economic integration; and

(C) describe the organization of the European community.

(6) The student identifies the importance of different trade and trade investment policies. The student is expected to:

(A) understand the role of foreign aid in global trade and investment;

(B) explain the goals of the General Agreement on Tariffs and Trade and the North American Free Trade Agreement;

(C) identify the major ways in which imports are being restricted and describe reasons for controlling exports; and

(D) research cases and issues on global trade using appropriate online technology.

(7) The student analyzes the implications of politics and laws that control and regulate global business. The student is expected to:

(A) describe the reasoning behind the regulation of global business behavior;

(B) analyze the Foreign Corrupt Practices Act; and

(C) discuss the role of international law in the conduct of global business.

(8) The student researches the business elements of cultural challenges and diversity. The student is expected to:

(A) explain the role of culture in global business;

(B) identify various elements of culture; and

(C) suggest ways for managers to understand and deal with cultural diversity.

(9) The student demonstrates the process in implementing a global operation. The student is expected to:

(A) describe the rise of global linkages in global business;

(B) describe the position of the United States in global trade;

(C) list advantages and problem areas for U.S. firms wanting to enter global business;

(D) research current cases on imports, exports, and balance of trade using appropriate online technology;

(E) relate effects of copyrights and trademarks and intellectual property rights on global business;

(F) identify advertising media used in foreign markets such as newspaper, radio, television, Internet, and magazine;

(G) define fair trade; and

(H) describe benefits of fair trade domestically and internationally.

(10) The student analyzes the cost effect when using global logistics for a mode of transportation. The student is expected to:

(A) define global logistics;

(B) distinguish between materials management and physical distribution;

(C) list the factors that influence the selection of particular transportation modes;

(D) describe the usefulness of free trade zones;

(E) research free trade zones locally and statewide using appropriate online technology; and

(F) relate the effects of geography, time zones, work days, resources, and natural harbors on global business.

(11) The student identifies different strategies for exporting in the global market. The student is expected to:

(A) discuss the procedure by which a foreign target market is selected;

(B) determine the pricing strategy for export items;

(C) identify various data-based analytical techniques available for estimating market potential; and

(D) evaluate the reasons behind the need to standardize or to adapt the marketing mix.

(12) The student identifies the functional changes in process with global human resource management. The student is expected to:

(A) explain the objectives of human resource management in a global firm;

(B) describe how the human resources function changes as a firm goes global;

(C) identify sources of recruitment for staffing positions abroad; and

(D) describe differences and similarities of training employees in different countries.

(13) The student analyzes employability skills to obtain successful employment with a company. The student is expected to:

(A) assess personal global marketability;

(B) identify appropriate employment opportunities abroad;

(C) evaluate global employment options such as salaries, benefits, and prerequisites; and

(D) generate an orientation manual for people preparing to live and work in a foreign country.

(14) The student knows how to use self-development techniques and interpersonal skills to accomplish human resources objectives. The student is expected to:

(A) identify and practice effective interpersonal and team-building skills involving situations with coworkers, supervisors, and subordinates; and

(B) participate in leadership and career development activities.

§127.249. Virtual Business (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Touch System Data Entry. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Virtual Business is designed for students to start a virtual business by creating a web presence, conducting online and off-line marketing, examining contracts appropriate for an online business, and demonstrating project-management skills. Students will also demonstrate bookkeeping skills for a virtual business, maintain business records, and understand legal issues associated with a virtual business.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student analyzes an overview of starting and growing a virtual business office. The student is expected to:

(A) identify the nature, history, and duties of a virtual business office;

(B) list benefits afforded to virtual business clients;

(C) assess personality characteristics to determine suitability for being a self-employed virtual business office employee;

(D) inventory skills, interests, strengths, and weaknesses to determine appropriate services to offer;

(E) prepare a business plan, including the following sections: executive summary, mission statement, long- and short-term goals, marketing plan, financial plan, and organizational plan; and

(F) examine global business considerations.

(3) The student demonstrates online and off-line marketing, including establishing a web presence. The student is expected to:

(A) create and design a website for a virtual business office;

(B) describe details of setting up a virtual business office;

(C) determine appropriate marketing of a virtual business office;

(D) describe steps to successfully market a virtual business office; and

(E) participate in leadership and career development activities.

(4) The student develops contracts appropriate for virtual business office services provided. The student is expected to:

(A) research details of setting up a virtual business office;

(B) determine particulars of communicating with clients locally and remotely; and

(C) set appropriate fees for virtual business office services provided.

(5) The student establishes pricing, billing, and collections procedures. The student is expected to:

(A) research pricing and billing practices of a virtual business office;

(B) research appropriate recordkeeping and tax issues;

(C) apply fundamental bookkeeping skills for a virtual business office;

(D) define appropriate bookkeeping terminology such as accounts payable, accounts receivable, income, expense, asset, liability, profit, balance sheet, and income statement; and

(E) prepare appropriate bookkeeping statements, including basic balance sheet and income statement.

(6) The student describes legal and tax issues related to running a virtual business office. The student is expected to:

(A) determine local licensing requirements required for a virtual business office;

(B) set up a virtual business office;

(C) research support resources for a virtual business; and

(D) describe the advantages and disadvantages of the various forms of legal construction of a virtual business office.

(7) The student maintains business records to facilitate management. The student is expected to:

(A) describe the nature of business records needs for a virtual business office; and

(B) maintain customer records.

(8) The student acquires information to analyze business decision making. The student is expected to:

(A) monitor internal records for business information; and

(B) conduct an environment scan to obtain business information and interpret statistical findings.

(9) The student demonstrates project-management skills to improve workflow and minimize costs. The student is expected to:

(A) initiate a project, which includes identifying resources needed for a project;

(B) develop a project plan;

(C) execute a project;

(D) monitor and control a project, including coordinating work with that of team members; and

(E) close a project.

§127.250. Human Resources Management (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Human Resources Management is designed to familiarize students with the concepts related to human resource management, including legal requirements, recruitment and employee selection methods, and employee development and evaluation. Students will also become familiar with compensation and benefits programs as well as workplace safety, employee-management relations, and global impacts on human resources.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student demonstrates an understanding of the traditional human resources functions. The student is expected to:

(A) define the term human resources;

(B) classify the basic human resources functions such as recruiting, selecting, training, developing, and compensating;

(C) explain contemporary issues facing human resources managers such as globalization, diversity, new technologies, knowledge workers, and changing trends in the workplace;

(D) explain strategies used by contemporary human resources management such as proactive, reactive, downsizing, outsourcing, offshoring, and employee leasing to deal with change;

(E) illustrate how the changing demographic trends in the workplace impact diversity in human resources management;

(F) categorize the basic responsibilities of a human resources manager, including advice and counsel, service, policy formulation and implementation, and employee advocacy;

(G) explain the basic competencies required of an effective human resources manager, including business mastery, human resources mastery, and personal credibility; and

(H) define the need and proper steps for strategic planning in human resources such as mission, vision, and values; environmental analysis; internal analysis; strategy formulation; strategy implementation; and evaluation and assessment.

(3) The student understands and explains how to meet human resources requirements. The student is expected to:

(A) analyze the major Equal Employment Opportunity laws;

(B) discuss federal laws and executive orders that influence human resources management;

(C) explain the importance of establishing and implementing strong policies and procedures for dealing with sexual harassment;

(D) examine the contemporary social and political issues facing human resources such as sexual orientation, immigration reform and control, and Uniform Guidelines on Employee Selection Procedures;

(E) explain the proper procedures to comply with Equal Employment Opportunity Commission rules and regulations;

(F) analyze the contemporary concepts of job analysis, employee involvement, and flexible work schedules;

(G) create a job description; and

(H) research current cases dealing with equal employment using appropriate online technology.

(4) The student demonstrates the proper methods and sources of recruitment. The student is expected to:

(A) evaluate the proper methods of recruiting externally;

(B) explain the proper methods of recruiting internally;

(C) hypothesize how to develop a diverse pool of talent for employment consideration; and

(D) explain the application of Equal Employment Opportunity Commission guidelines to the recruitment process.

(5) The student demonstrates the proper methods of employee selection. The student is expected to:

(A) explain how to match an applicant to a job using job analysis and a job description;

(B) explain the different types of commonly used preemployment tests such as polygraph tests, honesty and integrity testing, graphology, physical examination, and drug testing;

(C) clarify the relevant factors that should be considered in conducting a criminal background check; and

(D) demonstrate the proper methods of conducting preemployment interviews.

(6) The student describes the need for training. The student is expected to:

(A) analyze the information necessary prior to the implementation of any job-related training, including task analysis and person analysis;

(B) design a training program;

(C) explain how to implement a training program;

(D) evaluate a training program;

(E) illustrate the necessity for new employee orientation and the topics that should be covered;

(F) explain the concept of on-the-job training and other forms of skills training; and

(G) understand the need for training newly hired employees in proper Equal Employment Opportunity Commission rules and procedures, including training on sexual harassment.

(7) The student describes the need to develop and evaluate employees. The student is expected to:

(A) explain why employees often need additional training such as learning new skills and technologies and complying with new laws and regulations;

(B) construct an employee appraisal program that complies with all applicable laws; and

(C) explain who should evaluate employees, including supervisors and managers, peers, customers or clients, and subordinates.

(8) The student describes how to implement a compensation program. The student is expected to:

(A) interpret the basis of compensation and how it meets with organizational objectives;

(B) explain the factors that influence the pay and benefits system;

(C) summarize pay for performance, commission, and piece-rate systems;

(D) explain how to perform a wage and salary survey;

(E) interpret competence-based pay;

(F) understand the major federal regulations that influence employee compensation, including Davis-Bacon Act, Walsh-Healy Act, and Fair Labor Standards Act;

(G) identify some of the contemporary issues regarding compensation, including equal pay, wage-rate compression, comparable worth, low salary budgets, and employee stock ownership plans;

(H) explain pay for performance incentives such as bonuses, merit pay, profit sharing, recognition, and stock options;

(I) explain the ethical and public relations issues regarding executive compensation; and

(J) research contemporary cases dealing with executive compensation using appropriate online technology.

(9) The student masters the intricacies of creating and implementing a benefits plan. The student is expected to:

(A) explain the federally mandated benefits, including Federal Insurance Contributions Act Tax, Federal Unemployment Tax Act, workers' compensation, Consolidated Omnibus Budget Reconciliation Act, Family and Medical Leave Act, and Older Workers Benefit Protection Act;

(B) summarize the major discretionary benefits such as healthcare, payment for time not worked, holidays, vacation, sick leave, personal days off, supplemental unemployment benefits, life insurance, long-term care insurance, retirement, pension plans, and thrift plans; and

(C) explain the ancillary services sometimes offered to employees such as employee assistance plans, personal counseling, child and elder care, credit unions, cafeterias, employee discounts, legal services, and recreation and health clubs.

(10) The student discusses the importance of workplace safety and health rules and regulations. The student is expected to:

(A) interpret the Occupational Safety and Health Act;

(B) explain the right-to-know laws;

(C) construct a program promoting safety awareness;

(D) explain the necessity of enforcing workplace safety rules;

(E) explain the processes for recording and investigating workplace accidents;

(F) demonstrate what can be done to prevent or address workplace violence;

(G) explain what can be done to address employee stresses in the workplace; and

(H) research contemporary cases addressing workplace violence using appropriate online technology.

(11) The student discusses employee-management relations. The student is expected to:

(A) explain employee rights versus employer responsibilities;

(B) describe how to implement disciplinary policies and procedures;

(C) identify the proper methods of discharging employees;

(D) define the concept of Alternative Dispute Resolution;

(E) summarize the major federal labor relations laws, including Railway Labor Act, Norris-LaGuardia Act, Wagner Act, and Landrum-Griffin Act;

(F) describe the reasons why employees unionize;

(G) explain what employers can and cannot do during the unionization process;

(H) explain the structure and functions of a union;

(I) discuss the major union organizations such as AFL-CIO, national unions, local unions, and international unions;

(J) summarize the collective bargaining process and the issues typically negotiated such as wages, hours, and working conditions;

(K) explain a typical grievance procedure;

(L) define grievance arbitration;

(M) explain the contemporary challenges facing labor organizations and unions, including foreign competition, technological change, decline in union membership, and employers' focus on maintaining good working conditions to maintain non-union status; and

(N) research contemporary cases on labor relations using appropriate online technology.

(12) The student analyzes the future global considerations impacting human resources. The student is expected to:

(A) explain international human resource issues;

(B) identify the issues associated with recruiting and selecting employees internationally;

(C) discuss how to deal with compensation issues in a host country environment;

(D) identify the problems and solutions for addressing international employee evaluations and appraisals; and

(E) explain the international organized labor environment.

(13) The student knows self-development techniques and interpersonal skills to accomplish human resources objectives. The student is expected to:

(A) identify and practice effective interpersonal and team-building skills involving situations with coworkers, supervisors, and subordinates; and

(B) participate in leadership and career development activities.

§127.251. Financial Mathematics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Algebra I. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) Financial Mathematics is a course about personal money management. Students will apply critical-thinking skills to analyze personal financial decisions based on current and projected economic factors.

(4) Financial Mathematics will integrate career and postsecondary education planning into financial decision making.

(5) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as

symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of appropriate communication with customers, employers, and coworkers through verbal, nonverbal, or digital means;

(B) demonstrate an understanding of the use of business etiquette;

(C) demonstrate an understanding of appropriate customer service such as building customer relationships and resolving customer complaints; and

(D) demonstrate an understanding of ethical and legal issues in business.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student applies mathematical process standards to demonstrate an understanding of employment earnings. The student is expected to:

(A) identify sources of income, including wages and salaries, interest, rent, dividends, and capital gains;

(B) compare common employee benefits such as health insurance, sick leave, and retirement plans;

(C) differentiate among and calculate gross, net, and taxable income;

(D) analyze and interpret payroll deductions, including federal taxes, state taxes, and city taxes, using current tax rates;

(E) examine and evaluate the reasons for federal income taxation, Social Security taxation, and Medicare taxation, including earnings limitations as applicable;

(F) calculate net pay;

(G) compare and contrast between independent contractor earnings and employee earnings, including tax requirements, tax forms (W-2, W-4, 1099, and Form 941), and benefit requirements;

(H) calculate the various earnings as affected by the laws related to minimum wage, overtime, income from tips, exempt and non-exempt status, and contract and employee status;

(I) calculate the impact of paying with after-tax dollars versus pre-tax dollars for items such as medicine, services, and investments;

(J) analyze and interpret total compensation, including payroll, Federal Insurance Contribution Act (FICA) tax, employer cost of benefits, employers' matching costs for FICA and Medicare, and employer match in savings plans, to explain how compensation is more than what is reflected in a paycheck;

(K) compare total compensation as a self-employed or independent contractor with total compensation as an employee; and

(L) analyze how economic and other conditions can affect income and career opportunities and the need for lifelong training and education.

(4) The student applies mathematical process standards to demonstrate an understanding of the various federal taxes. The student is expected to:

(A) calculate federal income taxes owed or refunded, including the completion of a 1040EZ and 1040, using current rates;

(B) calculate capital gains tax using current rates;

(C) calculate self-employment or independent contractor taxes using current rates;

(D) define and locate sources for current rates for estate and inheritance taxes;

(E) analyze gift and estate taxes using current rates;

(F) calculate tax on interest income and use regression methods available through technology to analyze data and interpret the results by tax bracket;

(G) calculate personal exemptions;

(H) calculate itemized deductions and compare to standard deductions;

(I) calculate deductible charitable contributions;

(J) understand filing status as it applies to X, Y, and Z tax schedules;

(K) compare marginal tax rates to effective income tax rates and the misuse of these terms in advertising;

(L) describe the relationships among education tax credit, student loan interest, dependency and filing status, and income tax liability; and

(M) research and locate options for tax return preparation such as software programs and tax preparation providers.

(5) The student applies mathematical process standards to demonstrate an understanding of the various financial institutions and accounts. The student is expected to:

(A) demonstrate an understanding of various forms of financial exchange, including cash, checks, credit cards, debit cards, and electronic funds transfers;

(B) identify and explain the advantages and disadvantages of interest-bearing accounts such as savings accounts, checking accounts, certificates of deposits, and money market accounts;

(C) calculate the time value of money, with or without technology, using exponential and rational functions that include graphs, tables, and algebraic methods related to simple and compound interest;

(D) analyze various representations of exponential functions with respect to compound interest situations and use the rule of 72 to determine the number of years it will take for savings to double in value;

(E) analyze a bank statement for accuracy;

(F) compare financial services offered in the community; and

(G) identify the sources of funds such as savings, earnings, or debt to be used to purchase consumable and nonconsumable goods.

(6) The student applies mathematical process standards to demonstrate an understanding of the various types of credit. The student is expected to:

(A) determine the advantages and disadvantages of credit cards such as cashback rewards, balance transfer, foreign currency, interest rates charged, late payment fees, credit score, and bonus incentives;

(B) calculate the cost of using credit cards, including various financial fees;

(C) analyze and compare graphically, with or without technology, the differences in the cost of borrowing such as using a bank loan, a credit union loan, a student loan, and an easy-access loan such as a pay-day loan and an auto title loan;

(D) analyze the risks for each type of loan;

(E) evaluate the process for a bank loan or a credit union loan;

(F) collect and organize data, make and interpret scatterplots, interpret the results, and make critical judgments about loan balances when equal monthly payments are made;

(G) analyze credit scores and explain the meanings of the scores;

(H) explain ways a negative credit report can affect a consumer's financial options; and

(I) analyze a personal credit report.

(7) The student applies mathematical process standards to demonstrate an understanding of the cost of housing by comparing home purchases and renting. The student is expected to:

(A) analyze data of mortgage payments with various additional principal payments involving exponential functions using tables, graphs, or algebraic methods;

(B) create an amortization table using technology to collect and organize data to make decisions and critical judgments about varying the down payment, period of loan, special principal payment, and interest rate for a home loan;

(C) compare options for saving for a down payment on a home;

(D) determine costs associated with home ownership, including property taxes; mortgage insurance; homeowner's insurance, including property damage, liability, and flood and earthquake insurances; and closing costs;

(E) analyze and interpret mortgage tax deductions;

(F) determine other costs associated with home ownership, including cost of maintenance, repairs, utilities, and association fees;

(G) determine the appropriate savings needed to maintain home payments in the event of a financial emergency;

(H) demonstrate an understanding of the consequences to individuals in times of recession and falling home prices such as during the mortgage crisis of 2007-2008 and identify how the financial and personal impact could have been reduced;

(I) compare the cost of homeownership versus renting, identifying benefits and drawbacks to both homeownership and renting such as the mortgage-related income tax deductions;

(J) use the multiple listing service to identify and compare housing properties;

(K) analyze and explain a typical apartment lease such as terms, deposit, occupancy, parking, and cancellation contract policy; and

(L) compare options for coverage for renter's insurance.

(8) The student applies mathematical process standards to demonstrate an understanding of the difference between a vehicle purchase and a vehicle lease and costs associated with each. The student is expected to:

(A) create an amortization table using technology to collect and organize data to make decisions and critical judgments about varying the down payment, period of loan, special principal payment, and interest rates for a vehicle loan;

(B) determine the costs associated with owning and leasing a vehicle, including insurance, maintenance, repairs, and fuel;

(C) compare the total cost of buying and owning a vehicle to leasing a vehicle;

(D) compare the total cost of purchase and maintenance of several possible vehicles;

(E) identify and understand the costs and benefits of maintenance contracts and vehicle warranties;

(F) calculate the funding needed to maintain vehicle payments in the event of a financial emergency; and

(G) research various options for a driver's education course and the benefits of the course and the impact of a moving violation on insurance rates.

(9) The student applies mathematical process standards to demonstrate an understanding of investment options. The student is expected to:

(A) identify the factors involved in the various methods of buying and selling stocks and mutual funds, including load and no-load funds, by evaluating the stock dividend yield, price-earnings ratio, return on investment, earnings per share, and net asset value;

(B) calculate the cost of buying and selling bonds and analyze the investment return from bond yield and bond interest payment;

(C) compare differences among investments, including stocks, bonds, mutual funds, Exchange Traded Funds, and real estate; and

(D) compare the risk and return for a diversified and non-diversified investment portfolio in a student-created portfolio.

(10) The student applies mathematical process standards to demonstrate an understanding of various types of insurance, including life, health, disability, and income insurances, and special protection. The student is expected to:

(A) analyze the costs and benefits of term and permanent (whole) life insurance such as the cost of premiums, dividends, accumulation of cash value, tax treatment of death benefits, and protection from creditors of death benefits and cash values;

(B) estimate the amount of life insurance needed using a needs approach or an earnings multiple approach;

(C) estimate the cost of healthcare coverage, including the cost of health insurance premiums, co-payments, deductibles, and out-of-pocket expenses;

(D) explain the need for disability income insurance and research the cost;

(E) compare the benefits to the costs of special protection coverages such as cancer, pet, vacation, burial, international travel, and purchase protection;

(F) demonstrate an understanding of the actuarial process used to set premiums; and

(G) demonstrate an understanding of insurance company and agent selection and professional designations within the insurance profession.

(11) The student applies mathematical process standards to demonstrate an understanding of retirement plans. The student is expected to:

(A) compare tax advantage retirement plans, including Individual Retirement Accounts (IRAs), Roth IRAs, 401(k) plans, and 403(b) plans, and determine an appropriate investment for retirement;

(B) calculate and graph the exponential function showing the benefits of starting early to invest with continuous contributions;

(C) calculate tax treatment penalty for early withdrawal; and

(D) calculate, using technology, the amount that must be saved annually to achieve financial independence by a desired age.

(12) The student applies mathematical process standards to demonstrate an understanding of a fixed pension, a variable pension, social security, and an annuity. The student is expected to identify an annuity and calculate and display graphically the future value of an annuity.

(13) The student applies mathematical process standards to demonstrate an understanding of wills and trusts for the distribution of assets at death. The student is expected to identify how wills and trusts support the distribution of assets after death.

(14) The student applies mathematical process standards to demonstrate an understanding of charitable giving. The student is expected to demonstrate an understanding of the value and benefits of charitable giving.

(15) The student applies mathematical process standards to demonstrate an understanding of the budgeting process. The student is expected to:

(A) create a comprehensive balanced personal budget, including fixed and variable expenses, college savings, emergency savings, and retirement savings;

(B) identify free resources to assist with maintaining a budget; and

(C) compare different standards of living in the United States, including poverty, minimum wage, living wage, and desired standards of living.

(16) The student applies mathematical process standards to demonstrate an understanding of identity theft. The student is expected to:

(A) define and explain types of identity theft;

(B) create a plan for prevention of identity theft; and

(C) identify suitable methods for reporting identity theft.

(17) The student applies mathematical process standards to demonstrate an understanding for a postsecondary plan. The student is expected to:

(A) understand educational, military, and current job opportunities;

(B) research and align interests and skills with potential careers and postsecondary education to assure a life strategy that will produce employment the student enjoys with a desired standard of living;

(C) calculate the total funding required to complete a desired postsecondary education program;

(D) identify different resources for acquiring funding for education after high school such as personal savings, employment, Free Application for Federal Student Aid (FAFSA), Texas Application for Federal Student Aid, Expected Family Contribution, Pell Grants, work-study programs, student loans, Individual Development Accounts, scholarships such as the Preliminary SAT/National Merit Scholarship Qualifying Test (PSAT/NMSQT®), and internships to reduce the projected cost of education;

(E) identify benefits and potential savings for students investing in themselves such as taking Advanced Placement and dual credit classes;

(F) graph and compare compensation earnings of potential careers and the cost of postsecondary education; and

(G) calculate the Return on Investment from completing a desired postsecondary education program, taking into considera-

tion anticipated earnings for a selected degree and the cost of attending a specific postsecondary program.

§127.252. Money Matters (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) In Money Matters, students will investigate money management from a personal financial perceptive. Students will apply critical-thinking skills to analyze financial options based on current and projected economic factors. Students will gain knowledge and skills necessary to establish short-term and long-term financial goals. Students will examine various methods of achieving short-term and long-term financial goals through various methods such as investing, tax planning, asset allocating, risk management, retirement planning, and estate planning.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of appropriate communication with customers, employers, and coworkers through verbal, nonverbal, and digital means;

(B) demonstrate an understanding of the use of business etiquette;

(C) demonstrate an understanding of appropriate customer service such as building customer relationships and resolving customer complaints; and

(D) demonstrate an understanding of ethical and legal issues in business.

(2) The student uses career planning concepts, tools, and strategies to explore, obtain, and develop a financial plan. The student is expected to:

(A) discuss the nature and benefits of financial planning; and

(B) discuss the role of ethics and personal responsibility in financial planning.

(3) The student demonstrates an understanding of a postsecondary plan. The student is expected to:

(A) understand educational, military, and current job opportunities; and

(B) create a postsecondary plan that includes topics such as application requirements; testing requirements; certification requirements; associated deadlines; associated costs, including living expenses; job prospects and opportunities; beginning earnings; expected future earnings; and resumes and cover letters.

(4) The student demonstrates an understanding of the fundamental principles of money. The student is expected to:

(A) explain forms of financial exchange, including cash, credit cards, debit cards, and electronic funds transfer;

(B) compare and contrast various types of currency, including paper money, coins, banknotes, government bonds, and treasury notes;

(C) identify functions of money, including medium of exchange, unit of measure, and store of value;

(D) describe sources of income, including wages and salaries, interest, rent, dividends, capital gains, and transfer payments;

(E) explain the time value of money; and

(F) discuss the purposes and importance of credit.

(5) The student examines economic systems. The student is expected to:

(A) explain sole proprietorships, partnerships, and corporations;

(B) identify factors affecting profit, revenue, and expenses; and

(C) understand the rights and responsibilities of consumers within various economic systems.

(6) The student examines personal financial activities and the role of government. The student is expected to:

(A) analyze the importance and purpose of taxes;

(B) analyze monetary policy and fiscal policy;

(C) analyze the supply and demand for money; and

(D) analyze the role of the Federal Reserve System.

(7) The student discusses economic indicators impacting personal financial decision making. The student is expected to:

(A) analyze the measure of consumer spending as an economic indicator;

(B) analyze the impact of a nation's unemployment rates;

(C) analyze the concept of Gross Domestic Product;

(D) analyze the economic impact of inflation on personal financial decision making;

(E) analyze unemployment and inflation tradeoffs;

(F) analyze the economic impact of interest rate fluctuations; and

(G) analyze the impact of business cycles on personal financial decision making.

(8) The student analyzes the impact of international activities on personal financial decision making. The student is expected to:

(A) examine international current events as related to personal financial decision making;

(B) examine currency exchange rates; and

(C) examine domestic and international labor issues as related to personal financial decision making.

(9) The student examines how personal financial decisions are used to achieve financial goals. The student is expected to:

(A) develop a budget based on personal financial goals;

(B) explain the benefits of saving and investing;

(C) examine tax liabilities, including as they relate to the completion of a W-4;

(D) analyze a pay stub;

(E) interpret and reconcile bank statements;

(F) maintain financial records;

(G) evaluate credit scores;

(H) use identify theft protection measures; and

(I) prepare personal income tax forms by completing a 1040EZ with a W-2 form and using current tax tables.

(10) The student understands the purposes of financial service providers. The student is expected to:

(A) describe types of financial service providers, including banks and credit unions;

(B) evaluate financial service providers based on selection criteria such as location, interest rates, and benefits;

(C) analyze financing needed for long-term personal assets, including home purchases and payments and auto purchases, leases, and payments;

(D) explain loan evaluation criteria used by lending institutions;

(E) summarize the components of a loan application package;

(F) calculate a home loan payment schedule;

(G) calculate an automobile loan payment schedule; and

(H) understand the risks of using a payday loan and title loan.

(11) The student identifies various investment strategies. The student is expected to:

(A) evaluate different types of investments such as stocks, bonds, and property;

(B) evaluate investment goals and objectives as they relate to risk tolerance;

(C) investigate the opportunities and costs of postsecondary education;

(D) investigate long-term needs and financial goals, including retirement; and

(E) investigate the factors that affect the value of investments.

(12) The student identifies methods to manage personal risk. The student is expected to:

(A) understand the concept of insurance;

(B) explore the reasons for obtaining personal insurance, including health, disability, life, cancer, and long-term care insurance;

(C) explore the reasons for obtaining property insurance coverage, including homeowner's, personal liability, renter's, flood, earthquake, and auto insurance; and

(D) understand the insurance claim settlement process.

§127.253. Securities and Investments (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) In Securities and Investments, students will understand the laws and regulations to manage business operations and transactions in the securities industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of appropriate communication with customers, employers, and coworkers through verbal, nonverbal, and digital means;

(B) demonstrate an understanding of the use of business etiquette;

(C) demonstrate an understanding of appropriate customer service such as building customer relationships and resolving customer complaints; and

(D) demonstrate an understanding of ethical and legal issues in business.

(2) The student describes laws and regulations in order to manage personal and business operations and transactions in the securities and investments industry. The student is expected to:

(A) explain regulation of the securities and investments industry, including the role of the Securities and Exchange Commission;

(B) understand the legal and ethical considerations in buying and selling securities; and

(C) understand the state regulation of the securities and investments industry.

(3) The student describes investment analysis and selection processes. The student is expected to:

(A) describe types of investment objectives;

(B) consider the nature of investment risk;

(C) analyze diversification strategies;

(D) understand factors to consider when selecting investments;

(E) analyze information that can be obtained from financial statements and annual reports;

(F) examine a mutual fund prospectus;

(G) interpret analysis used in making investment decisions;

(H) discuss strategies for selecting investments;

(I) identify performance measurements for venture capital; and

(J) describe investment analysis and selection theory such as the Modern Portfolio Theory, the Capital Asset Pricing Model, and the Arbitrage Pricing Theory.

(4) The student identifies investments. The student is expected to:

(A) interpret financial ratios significant to investors, including price earnings ratio;

(B) calculate stock-related values such as the value of a constant growth stock, the expected value of future dividends, and the expected rate of return;

(C) calculate bond-related values such as the price of a bond given its yield to maturity, the coupon interest payment for a bond, and the effects of interest rates on the price of a bond;

(D) calculate bond present value and future value; and

(E) select investments based on financial analysis such as financial ratios.

(5) The student understands security and investment operations. The student is expected to:

(A) examine security and investment operational activities;

(B) discuss the operations of a securities and investment office;

(C) examine the buy and sell functions of a brokerage firm; and

(D) discuss and calculate commissions.

(6) The student explores security and investment licensing and certification programs. The student is expected to:

(A) explore educational requirements;

(B) compare and contrast the Series 6 and Series 7 licensing exams required to sell securities and other financial products; and

(C) explain professional designations in the securities and investments industry such as Certified Fund Specialist, Charted Financial Analyst, Board Certified in Asset Allocation, Board Certified in Securities, Certified Senior Consultant, and Certified Financial Planner.

(7) The student understands investments and their relationships to the economy. The student is expected to:

(A) evaluate the environments in which security and investment services are offered, including securities sales agents, securities and investments firms, and securities markets;

(B) evaluate causes of stock price fluctuations;

(C) evaluate the relationship between bond prices and yields;

(D) evaluate the role of investment banking in the primary marketplace; and

(E) evaluate margin accounts, short sales, market timing, and international strategies.

(8) The student demonstrates an understanding of securities and investments products. The student is expected to evaluate securities and investments products such as stocks, dividends, stock splits, options strategies, hedge funds, futures, bonds, mutual funds, venture capital, real estate, retirement investment plans, and education savings and the advantages and disadvantages from an issuer and investor perspective.

(9) The student demonstrates an understanding of a postsecondary plan. The student is expected to:

(A) understand educational, military, and current job opportunities; and

(B) create a postsecondary plan that includes topics such as application requirements; testing requirements; certification requirements; associated deadlines; associated costs, including living expenses; job prospects and opportunities; beginning earnings; expected future earnings; and resumes and cover letters.

§127.254. Insurance Operations (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) In Insurance Operations, students will understand the laws and regulations in order to manage business operations and transactions in the insurance industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of appropriate communication with customers, employers, and coworkers through verbal, nonverbal, or digital means;

(B) demonstrate an understanding of the use of business etiquette;

(C) demonstrate an understanding of appropriate customer service such as building customer relationships and resolving customer complaints; and

(D) demonstrate an understanding of ethical and legal issues.

(2) The student has an understanding of the insurance industry. The student is expected to:

(A) examine the insurance industry;

(B) evaluate components of automobile insurance coverage;

(C) evaluate components of homeowner's insurance and renter's insurance, including a personal umbrella liability policy;

(D) evaluate the purpose of flood insurance and earthquake insurance;

(E) evaluate the purpose of commercial property insurance;

(F) evaluate the purpose of commercial liability insurance;

(G) evaluate the purpose of title insurance;

(H) evaluate the purpose of health insurance, long-term care insurance, and cancer insurance;

(I) compare and contrast Medicare and Medicaid;

(J) investigate the purpose of unemployment insurance;

(K) evaluate the purpose of workers' compensation insurance;

(L) evaluate the purpose of disability insurance;

(M) compare and contrast the purpose of life insurance, including term, whole, and group;

(N) summarize the role of life insurance in investment and estate planning;

(O) compare and contrast the methods that insurance companies use to generate income, including collection of premiums and investing activities;

(P) evaluate the use of state risk pool programs; and

(Q) summarize trends in the insurance industry such as hacker insurance, pet insurance, travel insurance, and identity theft insurance.

(3) The student explores careers in insurance. The student is expected to:

(A) explore education, licensing, and certification requirements; and

(B) understand the role and responsibilities of insurance professionals such as agents, underwriters, actuaries, claims personnel, and investigators.

(4) The student examines regulations that ensure compliance adherence to insurance industry regulations. The student is expected to:

(A) evaluate the ethical and social responsibilities in the field of insurance;

(B) summarize federal and state regulations governing the insurance industry;

(C) assess the significance of the Consolidated Omnibus Budget Reconciliation Act (COBRA);

(D) assess the Health Insurance Portability and Accountability Act (HIPAA), including Title I and Title II; and

(E) assess the Patient Protection and Affordable Care Act (PPACA).

(5) The student explains legal concepts pertinent to the insurance industry. The student is expected to:

(A) examine legal principles that pertain to insurance such as indemnity, insurable interest, subrogation, and utmost good faith; and

(B) evaluate insurance contracts.

(6) The student identifies the components used in the insurance industry for approval and denial decisions. The student is expected to:

(A) explain the importance of actuarial science in the insurance industry;

(B) examine the nature of credit-based insurance scores; and

(C) examine the underwriting process.

(7) The student has an understanding of insurance fraud. The student is expected to:

(A) examine various types of insurance fraud;

(B) investigate various methods for detecting insurance fraud; and

(C) investigate and research a current event about insurance fraud to create a grammatically correct, written report with citations for presentation.

(8) The student demonstrates an understanding of the claims process. The student is expected to examine the claims process, including the role of the agent and the adjustor.

(9) The student identifies different insurance providers and rates. The student is expected to:

(A) compare and contrast insurance company ratings; and

(B) compare and contrast insurance premiums according to gender, geographic area, and age.

(10) The student demonstrates an understanding of identity theft. The student is expected to create a plan for prevention of identity theft and for the reporting of identify theft.

(11) The student demonstrates an understanding of a postsecondary plan. The student is expected to:

(A) understand educational, military, and current job opportunities; and

(B) create a postsecondary plan that includes topics such as application requirements; testing requirements; certification requirements; associated deadlines; associated costs, including living expenses; job prospects and opportunities; beginning earnings; expected future earnings; and resumes and cover letters.

§127.255. Banking and Financial Services (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) Banking services are primarily concerned with accepting deposits, lending funds, and extending credit. Banking services include cash management, short-term investments, mortgages and other loans, credit cards, and bill payment. Banking services are delivered via a number of different institutions, from commercial banks (the largest group) and other traditional means (savings and loans associations, credit unions, and local banks) to newer ventures through insurance companies, brokerage houses, and the Internet.

(4) In Banking and Financial Services, students will develop knowledge and skills in the economic, financial, technological, international, social, and ethical aspects of banking to become competent employees and entrepreneurs. Students will incorporate a broad base of knowledge that includes the operations, sales, and management of banking institutions to gain a complete understanding of how banks function within society.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective oral and written communication skills;

(B) perform numerical and arithmetic applications;

(C) demonstrate an understanding of integrity and strong work ethic;

(D) demonstrate attention to detail in completed assignments; and

(E) demonstrate effective problem solving.

(2) The student evaluates the role of banking in the modern economy. The student is expected to:

(A) outline the evolution of money and banking in the U.S. economy;

(B) explain the operation of the Federal Reserve Bank and its role in the economy;

(C) outline and analyze the history and the impact of the use of the gold or silver standard in monetary policy;

(D) compare and contrast the types of financial institutions such as commercial banks, savings and loan associations, credit unions, investment banks, financial services companies, and mortgage companies;

(E) discuss the role of the World Bank Group in international financial assistance; and

(F) explain the nature of government agencies that provide financing to businesses such as the Export-Import Bank of the United States and the Small Business Administration.

(3) The student acquires knowledge of banking processes and services. The student is expected to:

(A) describe the nature of banking processes;

(B) describe the types of banking services;

(C) discuss retail bank products and services;

(D) explain business bank products and services;

(E) describe basic teller performance standards;

(F) discuss the nature of loan products; and

(G) discuss trust services available to customers.

(4) The student describes the roles and responsibilities in banking services, including educational requirements. The student is expected to:

(A) explain the role and responsibilities of administrative careers in banking services; and

(B) describe the role and responsibilities of executive and managerial careers in banking services.

(5) The student determines client needs and wants and responds through planned, personalized communication to influence purchase decisions and enhance future business opportunities in banking services. The student is expected to:

(A) describe the importance of selling in the banking industry, including cross-selling and relationship selling;

(B) explain the process of opening a new account; and

(C) describe loan terms for a client.

(6) The student simulates the day-to-day activities within a banking organization in order to ensure secure operations. The student is expected to:

(A) describe bank loss prevention measures such as procedures for the secure handling of cash and checks; detecting and reporting counterfeit currency; developing business continuity plans; and preventing crimes to which a bank could fall victim such as fraud, robbery, and phishing;

(B) discuss the role of the Federal Reserve System in banking operations and cash-handling procedures;

(C) simulate daily cash processing activities such as processing damaged and mutilated currency and coin, ordering and depositing currency, depositing checks, handling differences in cash received and deposited, and transporting cash;

(D) analyze the underwriting of loan applications to determine credit worthiness of customers, including credit analysis, and factors affecting loan pricing and structuring; and

(E) discuss the nature of problem loan management.

(7) The student describes laws and regulations used to manage business operations and transactions in the banking services industry. The student is expected to:

(A) explain the elements of a compliance program;

(B) discuss functional areas of a compliance audit;

(C) analyze a compliance plan;

(D) discuss federal regulations of lending and operations functions in banking services, including the ethical and social aspects of those regulations;

(E) discuss e-compliance issues in banking services; and

(F) discuss the responsibilities of regulatory agencies that oversee the banking industry.

(8) The student investigates ways to create and maintain positive, ongoing relationships with banking customers in order to enhance the organization's image. The student is expected to:

(A) explain ways to cultivate positive relationships with customers to enhance company image;

(B) discuss the importance of meeting and exceeding customer expectations; and

(C) describe the relationships that institutions providing banking services have with their communities.

(9) The student maintains, monitors, controls, and plans the use of financial resources to enhance banking performance. The student is expected to:

(A) describe the manner in which banks generate profit and explain measures they take to ensure profitability; and

(B) use financial formulas commonly used in banking to aid in the growth and stability of banking services, including key ratios and banking calculations such as interest and annual percentage rate, capital adequacy, asset quality, management administration, earnings, liquidity, and sensitivity to market risk.

§127.256. Accounting I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) Accounting encompasses careers that record, classify, summarize, analyze, and communicate a business's financial information/business transactions for use in management decision making. Accounting includes such activities as bookkeeping, systems design, analysis, and interpretation of accounting information.

(4) In Accounting I, students will investigate the field of accounting, including how it is impacted by industry standards as well as economic, financial, technological, international, social, legal, and ethical factors. Students will reflect on this knowledge as they engage in the process of recording, classifying, summarizing, analyzing, and communicating accounting information. Students will formulate and interpret financial information for use in management decision making.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective oral and written communication skills;

(B) perform numerical and arithmetic applications;

(C) demonstrate an understanding of integrity and strong work ethic;

(D) demonstrate attention to detail in completed assignments; and

(E) demonstrate effective problem solving.

(2) The student communicates an understanding of the accounting industry. The student is expected to:

(A) describe the purpose of accounting and financial reporting;

(B) discuss its impact on industry; and

(C) describe Generally Accepted Accounting Principles (GAAP).

(3) The student uses career planning concepts, tools, and strategies to explore accounting careers. The student is expected to:

(A) discuss the significance of responsibility in accounting such as ethical and social responsibility;

(B) explore careers in accounting, including education requirements, roles, and responsibilities of certified public accountants, general ledger accountants, management accountants, auditors, government accountants, international accountants, forensic accountants, and senior management in accounting; and

(C) identify accounting licensing and certification programs, including professional designations for accountants such as certified public accountant and certified management accountant.

(4) The student uses equations, graphical representations, accounting tools, strategies, and automated systems in real-world situations to maintain, monitor, control, and plan the use of financial resources. The student will complete an accounting cycle for a service business. The student is expected to:

(A) illustrate the accounting cycle;

(B) analyze the effects of transactions on the accounting equation and use T accounts to analyze transactions;

(C) prepare a chart of accounts;

(D) journalize transactions in a general journal;

(E) post journal entries to general ledger accounts;

(F) prepare work sheets;

(G) prepare a trial balance;

(H) journalize and post adjusting and closing entries;

(I) prepare a post-closing trial balance; and

(J) prepare financial statements, including income statements, balance sheets, statements of stockholders' equity, and changes in owners' equity.

(5) The student analyzes cash controls. The student is expected to:

(A) explain cash control procedures such as bank account access, dual control, timely account reconciliations, and security of check stock;

(B) prove cash and reconcile bank statements;

(C) journalize and post entries to establish and replenish petty cash;

(D) journalize and post entries related to banking activities; and

(E) explain the benefits of electronic funds transfer.

(6) The student performs accounting functions for a merchandising business. The student is expected to explain the nature of special journals and recording transactions in special journals.

(7) The student performs accounts payable functions. The student is expected to:

(A) maintain a vendor file;

(B) analyze purchase transactions;

(C) post to an accounts payable subsidiary ledger;

(D) process invoices for payment;

(E) prepare a schedule of accounts payable; and

(F) analyze the impact of accounts payable on the balance sheet and cash flow statements.

(8) The student performs accounts receivable functions. The student is expected to:

(A) explain the nature of accounts receivable;

(B) maintain a customer file for accounts receivable;

(C) analyze sales transactions;

(D) post to an accounts receivable subsidiary ledger;

(E) process sales orders, returns, and allowances;

(F) process customer payments;

(G) process uncollectible accounts;

(H) prepare a schedule of accounts receivable;

(I) determine uncollectible accounts receivable; and

(J) analyze the impact of accounts receivable on the balance sheet and cash flow statements.

(9) The student investigates merchandise inventory to determine the impact on a company's financial position. The student is expected to:

(A) discuss the importance of merchandise inventory to a corporation, including the benefits of determining the most efficient inventory levels;

(B) explain the difference between periodic and perpetual methods of calculating inventory quantities, including the use of inventory records, stock records, and point-of-sale terminals;

(C) calculate the cost of inventory, including the First In, First Out (FIFO) method, Last In, First Out (LIFO) method, weighted average method, and the Gross Profit method of estimating inventory; and

(D) analyze the results of valuing inventory under the FIFO method, LIFO method, weighted average method, and the Gross Profit method of estimating inventory to determine the effect on Net Income and Gross Profit.

(10) The student completes payroll procedures to calculate, record, and distribute payroll earnings and analyzes the impact of these expenses on a company's financial position. The student is expected to:

(A) interpret time cards to calculate hours worked;

(B) maintain employee earnings records and registers;

(C) calculate employee earnings, including gross earnings, withholdings, and net pay;

(D) journalize salary expenses;

(E) calculate employer payroll taxes;

(F) journalize payroll tax expenses;

(G) discuss payroll tax expense forms and reports; and

(H) analyze the impact of salary expenses and payroll tax expense on total expenses and net income.

(11) The student performs specialized accounting functions for a corporation and completes an accounting cycle. The student is expected to:

(A) analyze the articles of incorporation needed to start a corporation;

(B) journalize the issuance of stock;

(C) compute dividends payable on stock;

(D) complete a work sheet for a corporation, including calculating adjustments for depreciation, merchandise inventory, and federal taxes;

(E) prepare financial statements for a corporation, including a balance sheet, an income statement, a statement of stockholders' equity, and a statement of changes in retained earnings;

(F) understand that internal accounting controls exist to ensure the proper recording of financial transactions; and

(G) identify and perform tax accounting functions such as recordkeeping procedures and the nature of corporate tax accounting.

(12) The student describes laws and regulations in order to manage business operations and transactions in accounting. The student is expected to:

(A) describe regulation of accounting;

(B) identify and analyze historical events that led to the regulation of accounting such as the fall of Enron; WorldCom; Tyco International, Ltd.; Adelphia Communications; and Arthur Andersen;

(C) describe the impact of the Sarbanes-Oxley Act of 2002 on internal controls and financial reporting;

(D) describe the role of the Securities and Exchange Commission in regulating the accounting industry;

(E) discuss state regulation of the accounting industry; and

(F) identify and research a case study involving a historically significant compliance or regulatory issue that led to the formation of regulatory agencies or laws, including:

(i) formulating questions to analyze the issue;

(ii) gathering relevant sources;

(iii) evaluating the validity and reliability of those sources; and

(iv) determining which laws and regulations apply.

(13) The student accesses, processes, maintains, evaluates, and disseminates financial information to assist business decision making. The student is expected to:

(A) use accounting technology, including discussing the use of data mining and integrating technology into accounting;

(B) engage in an accounting simulation covering an accounting cycle; and

(C) create a clear and coherent oral presentation that analyzes the results of an accounting simulation covering an accounting cycle and includes the use of correct grammar, spelling, punctuation, and citation of resource materials.

§127.257. Accounting II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Accounting I. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) Accounting encompasses careers that record, classify, summarize, analyze, and communicate a business's financial information/business transactions for use in management decision making. Accounting includes such activities as bookkeeping, systems design, analysis, and interpretation of accounting information.

(4) In Accounting II, students will continue the investigation of the field of accounting, including how it is impacted by industry standards as well as economic, financial, technological, international, social, legal, and ethical factors. Students will reflect on this knowledge as they engage in various managerial, financial, and operational accounting activities. Students will formulate, interpret, and communicate financial information for use in management decision making. Students will use equations, graphical representations, accounting tools, spreadsheet software, and accounting systems in real-world situations to maintain, monitor, control, and plan the use of financial resources.

(5) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective oral and written communication skills;

(B) perform numerical and arithmetic applications;

(C) demonstrate an understanding of integrity and strong work ethic;

(D) demonstrate attention to detail in completed assignments; and

(E) demonstrate effective problem solving.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student performs accounting functions specific to a corporation. The student is expected to:

(A) analyze articles of incorporation;

(B) communicate methods used to account for the issuance of stock;

(C) compute the number of shares of common stock to be issued on the conversion of convertible preferred stock;

(D) compute dividends payable on stock;

(E) describe internal accounting controls that exist to ensure the proper recording of financial transactions;

(F) produce financial statements, including work sheets, income statements, statements of stockholders' equity, balance sheets, cash flow statements, and statements of changes in retained earnings;

(G) discuss the nature of consolidated financial statements;

(H) discuss the nature of corporate tax accounting; and

(I) perform accounting functions specific to corporate tax accounting, including calculating corporate taxes and target profits and preparing corporate tax returns.

(4) The student discusses and performs accounting functions in a financial statement analysis. The student is expected to:

(A) explain the nature of annual reports;

(B) discuss the use of financial ratios in accounting and explain how this data impacts business decisions;

(C) determine business liquidity, including current ratio, quick ratio, and cash ratio;

(D) calculate business profitability, including gross profit margin, operating profit margin, net profit margin, cash flow margin, return on assets, return on investment, and return on equity, and analyze the relationships between these ratios;

(E) compute business efficiency ratios, including inventory turnover ratio, accounts receivable turnover ratio, accounts payable turnover ratio, average payment period, and average collection period;

(F) determine business operating ratio;

(G) calculate business capital structure ratios, including debt-to-equity ratio and debt service coverage;

(H) compare financial ratios to industry benchmarks and past performance to identify key areas that need to be evaluated and improved; and

(I) formulate and present recommendations based on financial ratio comparisons using spreadsheet software, graphs, and charts that identify business strategies and solutions needed to improve financial performance.

(5) The student describes and employs managerial accounting concepts. The student is expected to:

(A) explain the nature of managerial cost accounting, including costs and cost drivers;

(B) conduct cost-volume-profit analysis, including the use of linear regression data to determine the relationship between production and costs;

(C) identify cost accounting systems such as job order costing, process costing, activity-based costing, and project costing;

(D) calculate the cost of goods sold;

(E) compute overhead rates;

(F) apply overhead to jobs;

(G) describe the nature of cost accounting decision making;

(H) discuss the nature of cost accounting budgets;

(I) explain and create a variance analysis;

(J) discuss the nature of cost allocation;

(K) compute variable costs and contribution margins for a product;

(L) determine relevant costs in make-or-buy and accept-or-reject decisions;

(M) evaluate make-or-buy and accept-or-reject decisions to identify the best solutions for a business;

(N) prepare written recommendations that identify make-or-buy and accept-or-reject solutions using empirical data to support and justify conclusions;

(O) perform cost allocation functions; and

(P) prepare cost of production reports.

(6) The student maintains, monitors, controls, and plans the use of financial resources to ensure business stability. The student is expected to:

(A) describe fundamental financial concepts involved in the management of corporate finances, including the nature of depreciation and cash flows;

(B) analyze the need for efficient capital markets in corporate finance;

(C) explore the capital budgeting process;

(D) perform calculations necessary for capital budget decision making, including:

(i) calculating the initial investment associated with a proposed capital expenditure;

(ii) determining operating cash inflows; and

(iii) determining terminal cash flow;

(E) conduct cash-flow analysis to select an acceptable capital expenditure, including:

(i) interpreting the nature of relevant cash flow-analysis;

(ii) explaining the nature of the payback period;

(iii) calculating the payback period;

(iv) explaining the relationship between the internal rate of return and net present value;

(v) calculating the net present value and future value; and

(vi) calculating the internal rate of return;

(F) explain the role of financial planning in corporate finance, including the financial planning process, short-term operating, and long-term strategic planning;

(G) conduct cash planning, including:

(i) explaining the use of cash budgets;

(ii) coping with uncertainty in cash budgets;

(iii) preparing a cash budget; and

(iv) evaluating a cash budget;

(H) conduct profit planning, including pro forma income statements and balance sheets;

(I) define and describe the nature of short-term financial management;

(J) explain the role of valuation in making appropriate financial decisions for a company, including:

(i) discussing the role of project valuation in capital allocation decisions;

(ii) comparing methods for valuing flexibility; and

(iii) discussing the valuation implications in business finance;

(K) use capital market securities to secure financing for a company, including:

(i) analyzing models and methods to determine the best financing option for a company;

(ii) analyzing the nature of corporate bonds;

(iii) analyzing and determining the cost of long-term debt;

(iv) describing the issuance of stock from a corporation;

(v) comparing and contrasting preferred stock and common stock;

(vi) calculating the cost of preferred stock and common stock; and

(vii) computing leverage and debt to equity ratios;

(L) explain the role of dividends in corporate finance, including forms of dividends and reinvestment plans;

(M) describe the effect of a firm's dividend decisions on its external financing requirements;

(N) illustrate the residual theory of dividends;

(O) describe the impact of dividends on the value of the firm;

(P) explain the nature of a dividend policy;

(Q) explain factors to consider when deciding on the form of dividend distribution; and

(R) analyze ownership change transactions, including:

(i) comparing mergers and acquisitions;

(ii) explaining the nature of hostile takeovers;

(iii) discussing issues that arise from mergers and acquisitions;

(iv) explaining methods for evaluating potential merger/acquisition targets;

(v) evaluating potential merger and acquisition targets; and

(vi) analyzing the nature of restructurings.

(7) The student describes laws and regulations in order to manage business operations and transactions in accounting. The student is expected to:

(A) describe and discuss regulation of accounting, including:

(i) the impact of the Sarbanes-Oxley Act of 2002 on accounting;

(ii) the role of the Securities and Exchange Commission in regulating the accounting industry;

(iii) the state regulation of the accounting industry; and

(iv) the impact of International Financial Reporting Standards (IFRS) versus Generally Accepted Accounting Principles (GAAP); and

(B) identify and research a case study involving a fraud, compliance, or regulatory issue or possible scenario, including:

(i) formulating questions to analyze the issue;

(ii) gathering relevant sources;

(iii) evaluating the validity and reliability of those sources;

(iv) identifying and communicating which laws and regulations apply;

(v) gathering data that supports evidence of fraud or non-compliance with regulations; and

(vi) creating a clear and coherent presentation, including the use of correct grammar, spelling, punctuation, and citation of resource materials.

(8) The student accesses, processes, maintains, evaluates, and disseminates financial information to assist business decision making. The student is expected to:

(A) use technology to acquire information such as the use of data mining and automated financial programs into accounting; and

(B) create a clear and coherent oral and written presentation that includes the use of correct grammar, spelling, punctuation, and citation of resource materials on a current topic in accounting using concepts learned in this course.

§127.258. Financial Analysis (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Accounting I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) In Financial Analysis, students will apply knowledge and technical skills in the economic, financial, technological, international, social, and ethical aspects of business to become competent consumers, employees, and entrepreneurs. Students will develop analytical skills by actively evaluating financial results of multiple businesses, interpreting results for stakeholders, and presenting strategic recommendations for performance improvement.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective oral and written communication skills;

(B) perform numerical and arithmetic applications;

(C) demonstrate an understanding of integrity and strong work ethic;

(D) demonstrate attention to detail in completed assignments; and

(E) demonstrate effective problem solving.

(2) The student analyzes accounting systems to examine their contribution to the fiscal stability of businesses. The student is expected to:

(A) describe the nature and scope of accounting; and

(B) examine accounting procedures for tracking money flow and determining financial status through the preparation of financial statements.

(3) The student explores the use of financial resources. The student is expected to describe tools, strategies, and systems used to maintain, monitor, control, and plan the use of financial resources.

(4) The student demonstrates mathematics knowledge and skills required when interpreting business operation documents. The student is expected to apply data to solve a problem; construct charts, tables, and graphs; and analyze data.

(5) The student analyzes financial resources to ensure business solvency. The student is expected to:

(A) describe the nature of budgets;

(B) determine relationships among total revenue, marginal revenue, output, and profit;

(C) calculate financial ratios;

(D) interpret financial statements;

(E) describe types of financial statement analyses such as ratio analysis and trend analysis; and

(F) identify problems and issues with financial statements.

(6) The student calculates business ratios to evaluate company performance. The student is expected to:

(A) discuss the use of financial ratios in business finance;

(B) use multiple ratios to evaluate company performance, including income, profitability, operating performance, liquidity, working capital, bankruptcy prediction, long-term analysis, coverage, debt, cash flow indicator, and investment valuation; and

(C) discuss the use of benchmarks in analyzing ratios.

(7) The student analyzes a financial statement. The student is expected to:

(A) discuss the analysis of a company's financial situation using its financial statements;

(B) describe external forces affecting a company's value;

(C) explain how value is created for a company;

(D) understand and interpret financial statement notes; and

(E) evaluate results from the aspect of management, creditors, and investors.

(8) The student examines the nature and scope of risk management in finance. The student is expected to:

(A) discuss the nature of risk control such as internal and external controls;

(B) explain ways to assess risk;

(C) describe the importance of auditing risk control;

(D) discuss risk-control systems;

(E) describe the use of technology in risk management;

(F) discuss legal considerations affecting risk management;

(G) discuss the relationship between risk and business objectives; and

(H) evaluate a risk-management program.

(9) The student develops an understanding and working knowledge of annual reports. The student is expected to:

(A) discuss the objective of an annual report;

(B) identify the components of an annual report;

(C) identify laws and regulations that are applied to annual reports; and

(D) create an annual report.

(10) The student explores the role of ethics in finance. The student is expected to:

(A) explain the nature of business ethics;

(B) discuss the role of ethics in finance; and

(C) analyze the activities of Enron Corporation that led to the company's downfall.

(11) The student employs critical-thinking skills independently and in teams to solve problems and make decisions. The student is expected to:

(A) identify common tasks that require employees to use problem-solving skills;

(B) analyze elements of a financial problem to develop creative solutions;

(C) create and evaluate ideas, proposals, and solutions to financial problems;

(D) analyze financial information to determine its value to the problem-solving task; and

(E) identify and evaluate alternative financial solutions using a variety of problem-solving and critical-thinking skills.

(12) The student performs a case study analysis of a specific company to apply the concepts learned in the course and present the findings. The student is expected to:

(A) summarize the company's background;

(B) analyze the company's history, development, and growth;

(C) identify the company's strengths and weaknesses, internally;

(D) describe the external environment;

(E) evaluate the strengths, weaknesses, opportunities, and threats (SWOT) analysis;

(F) examine the corporate and business level strategy;

(G) investigate the structure and control systems; and

(H) formulate recommendations.

§127.259. Statistics and Business Decision Making (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Algebra II. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Finance Career Cluster focuses on planning, services for financial and investment planning, banking, insurance, and business financial management.

(3) Statistics and Business Decision Making is an introduction to statistics and the application of statistics to business decision making. Students will use statistics to make business decisions. Students will determine the appropriateness of methods used to collect data to ensure conclusions are valid.

(4) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of appropriate communication with customers, employers, and coworkers through verbal, nonverbal, or digital means;

(B) demonstrate an understanding of the use of business etiquette;

(C) demonstrate an understanding of appropriate customer service such as building customer relationships and resolving customer complaints; and

(D) demonstrate an understanding of ethical and legal issues in business.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student uses career planning concepts, tools, and strategies to explore a career in the area of risk management. The student is expected to:

(A) compare and contrast the fundamentals of risk management, including the reasons for and benefits of risk management;

(B) discuss the role of ethics and responsibility in risk management; and

(C) compare and contrast roles, responsibilities, licensing, and certification programs of careers related to managing and analyzing personal and corporate financial portfolios such as financial planners, financial managers, financial analysts, controllers, risk managers, cash managers, treasurers, and chief financial officers.

(4) The student understands and demonstrates the use of statistics in business areas, including accounting, economics, finance, management, and marketing. The student is expected to:

(A) evaluate the use of statistics in accounting such as forecasting consumption, earnings, cash flows, book value, and allowance for doubtful accounts;

(B) evaluate how statistics are used in economics such as reports for labor market, trade balance, Gross Domestic Product, unemployment, and consumer spending;

(C) evaluate how statistics are used in finance such as the use by financial intermediaries or in the evaluation of investments, securities, derivatives, futures, or options;

(D) evaluate how statistics are used in management such as in the evaluation of production efficiency, production quantity, quality control, workforce trends, staffing issues, and employee satisfaction; and

(E) evaluate how statistics are used in marketing such as reports for projected market share, advertising effectiveness, sales effectiveness, brand loyalty, spending habits, and customer satisfaction.

(5) The student understands and demonstrates the ethical and responsible use of statistics in business. The student is expected to evaluate how statistics are used in accounting, economics, finance, management, and marketing.

(6) The student evaluates risk-management strategies and techniques in corporate finance to maximize profit and minimize loss. The student is expected to:

(A) manage risk to protect business stability;

(B) analyze the relationship between risk management and operations; and

(C) evaluate various risk-management strategies and techniques, including the use of insurance, stock, derivatives, and options.

(7) The student evaluates financial information using statistical analysis to assist business decision making using appropriate software. The student is expected to:

(A) communicate the value of statistical information in a variety of business disciplines and environments;

(B) assess statistical information portrayed in areas such as advertising, investments and securities, human resource management, and economics;

(C) generate a spreadsheet to collect, collate, organize, and analyze quantitative data; and

(D) use spreadsheets and graphical techniques to present data in a manner that is understood by and meaningful to colleagues and clients.

(8) The student understands and demonstrates the defining and collecting of data. The student is expected to:

(A) define the types of variables and the measurement scales of variables;

(B) understand the collecting of data and its source;

(C) understand populations and samples;

(D) understand sampling methods; and

(E) understand and define survey error types.

(9) The student will understand and demonstrate the organization and visualization of data. The student is expected to organize and visualize categorical data and numerical data.

(10) The student understands and demonstrates the use of descriptive measures. The student is expected to:

(A) understand and calculate the central tendency of the data set using mean, median, and mode;

(B) understand and determine the variation of the data set using range, sample variance, sample standard deviation, population variance, population standard deviation, coefficient of the variation, and Z score; and

(C) understand and demonstrate the measure of shape of the data set using skewness, symmetry, and kurtosis.

(11) The student understands and demonstrates the use of probability. The student is expected to:

(A) define event, compound event, complement of an event, sample space, marginal probability, conditional probability, independence, multiplication rule, multiplication rule for independent events, probability of an event, impendence, and Bayes' Theorem; and

(B) define and calculate simple probability, compound probability, marginal probability, general addition rule, marginal probability using the multiplication rule, and probability with Bayes' Theorem.

(12) The student understands and demonstrates the use of probability distribution for discrete variables. The student is expected to understand and demonstrate the use of the uniform distribution, the binomial distribution, and the Poisson distribution.

(13) The student understands and demonstrates the use of probability distribution for continuous variables. The student is expected to understand and demonstrate the use of the normal distribution, uniform distribution, and exponential distribution.

(14) The student understands and demonstrates the use of sampling distribution, sampling distribution of the mean, and the central limit theorem. The student is expected to:

(A) calculate the population mean and population standard deviation;

(B) calculate standard error of the mean; and

(C) calculate the Z- and X-bar for the sampling distribution of the mean.

(15) The student understands and demonstrates the use and construction of confidence intervals. The student is expected to:

(A) construct a confidence interval for the mean for a known and unknown population standard deviation; and

(B) evaluate ethical issues associated with confidence intervals.

(16) The student understands and demonstrates hypothesis testing for one sample tests and two sample tests. The student is expected to:

(A) understand and demonstrate the use of hypothesis testing, null hypothesis, and alternative hypothesis;

(B) create a null hypothesis and alternative hypothesis;

(C) understand and demonstrate the use of Type I error and Type II error;

(D) calculate the level of significance and calculate beta risk;

(E) understand and demonstrate the use of the complements of Type I error and Type II error by calculating the confidence coefficient and the power of a statistical test;

(F) understand and calculate Z test for the mean;

(G) understand and demonstrate a one-tail test hypothesis and its associated critical values and p-value; and

(H) understand and demonstrate a two-tail test hypothesis and its associated critical values and p-value.

(17) The student understands analysis of variance. The student is expected to understand and demonstrate the analysis of more than two populations.

(18) The student understands and demonstrates the use of chi-square test. The student is expected to use a chi-square test.

(19) The student understands and demonstrates the use of nonparametric test. The student is expected to use nonparametric tests such as the Wilcoxon Sum test.

(20) The student understands simple linear regression. The student is expected to:

(A) understand and demonstrate the use of various types of regression models;

(B) create the regression equation; and

(C) make predictions based on regression models.

(21) The student understands an introduction to multivariable regression: The student is expected to use a multivariable regression model.

(22) The student understands time series analysis and forecasting. The student is expected to:

(A) understand times series models;

(B) understand trend component;

(C) understand seasonal component; and

(D) understand cyclical component.

(23) The student demonstrates an understanding of a postsecondary plan. The student is expected to:

(A) understand educational, military, and current job opportunities; and

(B) create a postsecondary plan that includes topics such as application requirements; testing requirements; certification requirements; associated deadlines; associated costs, including living expenses; job prospects and opportunities; beginning earnings; expected future earnings; and resumes and cover letters.

§127.260. Advertising (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Advertising is designed as a comprehensive introduction to the principles and practices of advertising. Students will gain knowledge of techniques used in current advertising, including print, broadcast, and digital media. The course explores the social, cultural, ethical, and legal issues of advertising, historical influences, strategies, media decision processes as well as integrated marketing communications, and careers in advertising and sales promotion. The course provides an overview of how communication tools can be used to reach target audiences and increase consumer knowledge.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results; and

(G) demonstrate leadership skills, teamwork, and communication skills by participating in career and technical education courses.

(2) The student knows the importance of marketing as well as the functions of marketing. The student is expected to:

(A) recognize marketing functions and how they relate to advertising;

(B) explain how each component of the marketing mix contributes to successful advertising;

(C) identify the importance of target markets; and

(D) research trends affecting advertising marketing.

(3) The student knows the impact and value of diversity. The student is expected to:

(A) examine elements of culture and discuss the need for understanding cultural diversity; and

(B) identify how diversity affects advertising strategy.

(4) The student knows the nature and scope of advertising marketing. The student is expected to:

(A) demonstrate knowledge of the history of advertising as an industry and how it relates to today's marketplace;

(B) discuss major environmental influences that impact advertising;

(C) research the advantages and disadvantages of the types of advertising; and

(D) illustrate how international marketing affects the advertising industry.

(5) The student knows that advertising requires knowledge of demographics. The student is expected to:

(A) explain how the use of demographics has influenced the industry;

(B) differentiate between buying habits and buying preferences; and

(C) explain the impact of multiculturalism and multigenerationalism on advertising marketing activities.

(6) The student knows that a career in advertising requires knowledge of the industry. The student is expected to:

(A) research careers in the advertising industry;

(B) identify businesses related to advertising; and

(C) identify the role of professional organizations, trade associations, and labor unions in the advertising industry.

(7) The student understands the importance of selling in the advertising industry. The student is expected to:

(A) explain how selling contributes to the success of an advertising agency; and

(B) employ the steps of selling, including prospecting, pre-approach, approach, presentation, overcoming objections, close, and follow-up.

(8) The student evaluates and uses information resources to research careers in advertising and sales. The student is expected to:

(A) use multimedia resources such as the Internet to research careers in advertising and sales; and

(B) identify businesses related to advertising and sales.

(9) The student develops and delivers presentations using appropriate media to engage and inform audiences. The student is expected to:

(A) prepare oral presentations to provide information for specific purposes and audiences;

(B) identify and prepare support materials that will enhance an oral presentation; and

(C) deliver an oral presentation that sustains listener attention and interest.

(10) The student knows the marketing-information system. The student is expected to:

(A) explain characteristics and purposes of a marketing-information system;

(B) identify benefits and limitations of marketing research; and

(C) analyze data used to make accurate forecasts.

(11) The student knows pricing policies, objectives, and strategies. The student is expected to:

(A) compare and contrast pricing policies; and

(B) analyze the price of an advertising marketing product.

(12) The student knows the elements and processes of product planning. The student is expected to:

(A) describe stages of new-product planning;

(B) analyze product mix; and

(C) identify stages of the product life cycle for new or existing advertising marketing plans.

(13) The student knows that successful marketers must develop, implement, and evaluate a promotional plan. The student is expected to:

(A) identify components of the promotional mix such as advertising, visual merchandising, and personal selling;

(B) demonstrate visual merchandising techniques for advertising marketing goods, services, or ideas; and

(C) analyze a promotional plan for effectiveness.

(14) The student knows how technology affects advertising. The student is expected to:

(A) examine how social media contributes to advertising; and

(B) research the use of technology in advertising.

(15) The student understands how media planning should achieve marketing objectives. The student is expected to:

(A) compare and contrast the different forms of media; and

(B) distinguish between the four components of marketing, including paid, earned, shared, and owned (PESO).

§127.264. Fashion Marketing (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Fashion Marketing is designed to provide students with knowledge of the various business functions in the fashion industry. Students in Fashion Marketing will gain a working knowledge of promotion, textiles, merchandising, mathematics, selling, visual merchandising, and career opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) demonstrate integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in ways that use time wisely and optimize efficiency and results; and

(G) demonstrate leadership skills by participating in activities such as career and technical education student organizations.

(2) The student knows the importance and functions of marketing. The student is expected to:

(A) describe each marketing function and how it relates to the fashion industry;

(B) describe advantages and disadvantages of market segmentation and mass marketing; and

(C) research trends affecting fashion marketing.

(3) The student knows the impact and value of diversity. The student is expected to:

(A) explain elements of culture and the need for understanding cultural diversity; and

(B) identify how diversity affects fashion.

(4) The student demonstrates the use of oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) create presentations using appropriate media to inform audiences; and

(B) exhibit public relations skills to increase customer satisfaction.

(5) The student knows that distribution channel members facilitate the movement of products. The student is expected to:

(A) explain channels of distribution for fashion products; and

(B) describe activities of each channel member in the fashion industry.

(6) The student knows the marketing-information system. The student is expected to:

(A) define the purpose of marketing-information systems;

(B) identify limitations of marketing research;

(C) explain how inventory can be managed by using tools such as point-of-sale systems, just-in-time strategies, and radio frequency identification (RFID) technology; and

(D) analyze data used to make accurate retail forecasts.

(7) The student knows concepts and strategies used in determining and adjusting prices to maximize return and meet customers' perceptions of value. The student is expected to:

(A) employ pricing strategies to determine prices;

(B) develop a sample credit policy that could be a useful fashion marketing strategy; and

(C) analyze the price of a fashion product.

(8) The student knows merchandising concepts and processes used in obtaining, developing, maintaining, and improving a product or service to respond to marketing opportunities. The student is expected to:

(A) use assortment-mix strategies to create maximum mix of products at minimum cost;

(B) perform buying activities to obtain products for resale;

(C) analyze vendor performance to choose vendors and merchandise; and

(D) position products and services to acquire a desired business image.

(9) The student knows that a successful marketer must communicate information on retail products, services, images, and ideas to achieve a desired outcome. The student is expected to:

(A) demonstrate methods of advertising to communicate promotional messages to targeted audiences;

(B) use special events to increase sales;

(C) display visual merchandising techniques to increase interest in product offerings;

(D) implement display techniques to attract customers and increase sales potential; and

(E) manage promotional activities to maximize return on promotional efforts.

(10) The student knows that purchasing occurs as steps in a continuous cycle. The student is expected to:

(A) distinguish between buying for resale and buying for organizational use; and

(B) demonstrate knowledge of the fashion buying process such as preparing a buying plan, completing purchase orders, and processing invoices.

(11) The student demonstrates an understanding of concepts and actions to determine client needs and wants. The student is expected to:

(A) acquire product knowledge to communicate product benefits and to ensure appropriateness of product for the customer; and

(B) employ sales processes and techniques to enhance customer relationships and to increase the likelihood of making sales.

(12) The student knows the nature and scope of fashion. The student is expected to:

(A) explain the importance of fashion;

(B) demonstrate knowledge of fashion history and how it relates to today's fashions;

(C) distinguish among fashion terms such as fashion, style, and design;

(D) list major environmental influences on fashion demand;

(E) research fashion information;

(F) explain legislation that impacts the fashion industry; and

(G) describe how international marketing has affected the fashion industry.

(13) The student knows that a career in fashion marketing requires knowledge of the industry. The student is expected to:

(A) research careers in the fashion industry;

(B) list and describe businesses related to the fashion industry; and

(C) delineate components of softlines such as sportswear, footwear, and men's and children's fashions.

(14) The student demonstrates mathematics knowledge and skills required to pursue the full-range of postsecondary education and career opportunities. The student is expected to:

(A) apply data and measurements to solve a problem; and

(B) analyze mathematical problem statements for missing or irrelevant data.

§127.265. Social Media Marketing (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Business, Marketing, and Finance or any marketing course. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Social Media Marketing is designed to look at the rise of social media and how marketers are integrating social media tools in their overall marketing strategy. The course will investigate how the marketing community measures success in the new world of social media. Students will manage a successful social media presence for an organization, understand techniques for gaining customer and consumer buy-in to achieve marketing goals, and properly select so-

cial media platforms to engage consumers and monitor and measure the results of these efforts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities in ways that use time wisely and optimize efficiency and results; and

(G) demonstrate leadership skills by participating in career and technical student organizations.

(2) The student knows the nature and scope of social media marketing. The student is expected to:

(A) differentiate between in-bound marketing and outbound marketing;

(B) explain the nature of in-bound marketing;

(C) identify the various social media platforms and purposes;

(D) define social media marketing;

(E) identify and describe significant trends in the development of social media;

(F) understand how the development of social media has shaped online media and communications; and

(G) describe the social media marketing ecosystem and its impact on traditional marketing strategy.

(3) The student knows the legalities, ethical implications, and risks associated with social media marketing. The student is expected to:

(A) apply legal boundaries and concepts affecting social media;

(B) analyze ethical guidelines and codes of ethics to explain how or why they are important to social media organizations;

(C) identify risk factors associated with social media marketing;

(D) explain the concept of real-time marketing; and

(E) discuss the ramifications of real-time marketing.

(4) The student knows how to critically evaluate social media and digital marketing tools. The student is expected to:

(A) evaluate and understand how social media has influenced the function of marketing;

(B) evaluate and understand how social media has evolved and influenced the way people communicate;

(C) analyze and evaluate the influence of social media on individuals and how individuals influence social media; and

(D) identify potential risks, advantages, and limitations of digital marketing tools.

(5) The student knows that strategic planning is essential to the success of social media marketing. The student is expected to:

(A) define the social media marketing process;

(B) understand participation as a key element of the marketing mix;

(C) understand how to integrate social media marketing into the Integrated Marketing Plan to promote brand/company awareness; and

(D) develop a social media marketing plan.

(6) The student demonstrates how to use social media as a marketing tool. The student is expected to:

(A) analyze, evaluate, and communicate information effectively through the use of social networking platforms such as Facebook, LinkedIn, and Twitter as marketing tools;

(B) analyze, evaluate, and communicate information effectively through the use of social publishing platforms such as Instagram, Pinterest, and Tumblr as marketing tools;

(C) analyze, evaluate, and communicate information effectively through the use of social entertainment platforms such as YouTube, Flickr, and Vine as marketing tools;

(D) analyze, evaluate, and communicate information effectively through the use of social commerce platforms such as Groupon, Yelp!, and 4Square as marketing tools; and

(E) analyze, evaluate, and communicate information effectively through the use of emerging social media.

(7) The student knows how to use mobile marketing as a marketing tool. The student is expected to:

(A) understand the nature and scope of mobile marketing;

(B) identify advantages and disadvantages of mobile marketing; and

(C) demonstrate the ability to use mobile marketing tools such as Short Message Service (SMS)/Multimedia Messaging Service (MMS), Quick Response (QR) codes, mobile phone applications, and mobile optimized websites.

(8) The student measures the success of a social media marketing plan. The student is expected to:

(A) explain the role of social media in marketing research;

(B) understand the nature and scope of social media analytics; and

(C) measure the success of social media marketing strategies using analytics data.

(9) The student knows that a career in social media marketing requires knowledge of the industry. The student is expected to:

(A) research and describe careers in the field of social media marketing; and

(B) research employment trends in the field of social media marketing.

§127.266. Sports and Entertainment Marketing (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Sports and Entertainment Marketing will provide students with a thorough understanding of the marketing concepts and theories that apply to sports and entertainment. The areas this course will cover include basic marketing concepts, publicity, sponsorship, endorsements, licensing, branding, event marketing, promotions, and sports and entertainment marketing strategies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities in ways that use time wisely and optimize efficiency and results; and

(G) demonstrate leadership skills by participating in activities such as career and technical education student organizations.

(2) The student knows business concepts and explains how business satisfies economic needs. The student is expected to:

(A) categorize business activities such as production, marketing, management, or finance;

(B) analyze the interdependence each business activity has with marketing;

(C) demonstrate an understanding of the forms of business; and

(D) demonstrate an understanding of the concept of economic impact.

(3) The student knows the importance of marketing as well as the functions of marketing. The student is expected to:

(A) explain the marketing concept as it relates to sports and entertainment;

(B) describe each marketing function and how it relates to sports and entertainment;

(C) explain how each component of the marketing mix contributes to successful marketing;

(D) express the importance of target markets;

(E) describe advantages and disadvantages of market segmentation and mass marketing;

(F) explain the importance of market research and analysis;

(G) illustrate the concept of positioning; and

(H) describe how international marketing has affected the sports and entertainment industry.

(4) The student knows that distribution channel members facilitate the movement of products. The student is expected to:

(A) explain channels of distribution for sports and entertainment marketing products; and

(B) describe activities of each channel member.

(5) The student knows how sports and entertainment businesses achieve profitability. The student is expected to:

(A) evaluate sources of financial information, including budgets, balance sheets, and income statements;

(B) explain the concept and importance of revenue streams; and

(C) explain the relationship of profit and loss to sports and entertainment products.

(6) The student knows the marketing-information system. The student is expected to:

(A) use a marketing-information system to make informed business decisions; and

(B) analyze data used to make accurate forecasts and informed business decisions.

(7) The student knows pricing strategies. The student is expected to:

(A) compare and contrast pricing strategies; and

(B) analyze the price of sports and entertainment marketing products.

(8) The student knows the elements and processes of product planning. The student is expected to:

(A) describe stages of new-product planning;

(B) illustrate the product mix; and

(C) identify stages of the product life cycle for new or existing sports or entertainment marketing products.

(9) The student knows that successful marketers must develop, implement, and evaluate a promotional plan. The student is expected to:

(A) identify, create, and demonstrate elements of the promotional mix; and

(B) analyze a promotional plan for effectiveness.

(10) The student knows that various types of risks impact business activities. The student is expected to:

(A) identify business risks that are commonly associated with sports and entertainment business; and

(B) explain methods a sports and entertainment business uses to control risks.

(11) The student identifies the role of selling and emphasizes its importance in a sports and entertainment business. The student is expected to:

(A) explain how selling contributes to economic activity;

(B) describe the process of selecting and merchandising sports and entertainment products;

(C) demonstrate steps in the selling process using sports and entertainment products;

(D) explain the importance of ticket sales; and

(E) develop a ticket sales strategy for a sports and entertainment product.

(12) The student identifies the nature and scope of sports and entertainment marketing. The student is expected to:

(A) research and explain the history of sports and entertainment as an industry and how it impacts today's marketplace;

(B) identify sports and entertainment marketing terms;

(C) list major environmental influences on sports and entertainment demand;

(D) define sports marketing and entertainment marketing;

(E) explain topics, including legislation and ethics, that impact sports and entertainment marketing;

(F) research trends and emerging technologies affecting the sports and entertainment marketing industry; and

(G) explain the concept of competition for discretionary income.

(13) The student knows that a career in sports and entertainment marketing requires knowledge of demographics. The student is expected to:

(A) explore how the use of demographics has influenced the industry; and

(B) differentiate between buying habits and buying preferences.

(14) The student knows that a career in sports and entertainment marketing requires knowledge of the industry. The student is expected to:

(A) research careers in the sports and entertainment marketing industry;

(B) list and describe businesses related to sports and entertainment; and

(C) distinguish between the different roles in sports and entertainment marketing.

(15) The student identifies reasons a sports and entertainment business would use marketing. The student will be expected to:

(A) describe and simulate activities to market a sports and entertainment product;

(B) understand why sports and entertainment businesses use marketing;

(C) understand the importance of and key components of a marketing plan;

(D) explain and give examples of marketing using sports and entertainment; and

(E) explain and give examples of marketing of sports and entertainment.

(16) The student understands the impact event marketing has on the sports and entertainment industry The student is expected to:

(A) define event marketing;

(B) explain and provide examples of how event marketing attracts all three components of the event triangle (event, sponsor, and spectator); and

(C) develop an effective event marketing strategy for a sports and entertainment product.

(17) The student has an understanding of sponsorship proposals and contracts. The student is expected to:

(A) identify components and content for a sponsorship proposal;

(B) define and explain sponsorship issues;

(C) categorize costs associated with a sponsorship;

(D) identify types of sponsorship sales and relationship development;

(E) examine benefits of sponsorship opportunities; and

(F) explain laws that may affect a sponsorship agreement.

(18) The student has an understanding of endorsement contracts. The student is expected to:

(A) identify components of endorsement contracts;

(B) discuss issues related to celebrity behavior on endorsements; and

(C) research the rationale for a business to engage in endorsement contracts.

(19) The student understands the importance of branding. The student is expected to:

(A) define branding;

(B) differentiate between types of brands;

(C) identify examples of brand equity and brand extension in sports and entertainment;

(D) explain the value in building a strong brand; and

(E) determine the characteristics of a successful brand.

(20) The student understands the importance of licensing. The student is expected to:

(A) define licensing;

(B) distinguish between licensor and licensee;

(C) explain the advantages and disadvantages of licensing; and

(D) identify examples of licensing in sports and entertainment.

(21) The student knows the effect the fan experience has on the success of a sports business. The student is expected to:

(A) explain how promoting and implementing a positive fan experience impacts revenues;

(B) describe situations that impact the fan experience;

(C) describe the concept of the fan/spectator experience;

(D) define the term game operations;

(E) explain the role of game entertainment in the sports business;

(F) define game attractiveness;

(G) identify game involvement activities that enhance fan experience; and

(H) create a game operations plan to increase game attractiveness.

(22) The student understands the importance of effectively communicating information with customers, media, and fans. The student is expected to:

(A) explain why communications in sports and entertainment are important;

(B) understand issues that impact the business of sports and entertainment;

(C) define media;

(D) understand the importance of media rights;

(E) define publicity;

(F) differentiate between publicity, public relations, media relations, and community relations;

(G) create a press release;

(H) create a press kit; and

(I) simulate a press conference.

(23) The student understands the strategies of successful entertainment marketing. The student is expected to:

(A) discuss the different kinds of entertainment distribution;

(B) identify strategies to market entertainment products; and

(C) explain the promotional value of entertainment awards.

§127.268. Advanced Marketing (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: one credit from the courses in the Marketing Career Cluster. Recommended prerequisite: Practicum in Marketing. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) In Advanced Marketing, students will gain knowledge and skills that help them become proficient in one or more of the marketing functional areas. Students will illustrate appropriate management and research skills to solve problems related to marketing. This course covers technology, communication, and customer-service skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) demonstrate integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities in ways that use time wisely and optimize efficiency and results; and

(G) demonstrate leadership skills by participating in activities such as career and technical student organizations.

(2) The student develops a project on a topic related to the field of marketing and uses in-depth research to present findings. The student is expected to:

(A) identify a topic to investigate or research;

(B) consult with an expert to investigate and discover possible solutions to an issue; and

(C) present findings to an audience that includes experts in the field.

(3) The student knows the concepts of market and market identification. The student is expected to:

(A) perform a market analysis;

(B) conduct a strengths, weaknesses, opportunities, and threats (SWOT) analysis for use in the marketing planning process; and

(C) create a marketing plan.

(4) The student understands the roles of management. The student is expected to:

(A) differentiate among levels of management;

(B) compare and contrast management styles;

(C) identify effective recruitment, selection, training and development, and performance evaluation techniques;

(D) demonstrate an understanding of the process used to train and monitor employees to ensure compliance with laws, regulations, and self-regulatory measures;

(E) model techniques to use in difficult customer relations situations; and

(F) analyze factors involved in facilities design, maintenance, and improvement.

(5) The student identifies the need for professional and career development. The student is expected to:

(A) identify types of media available such as LinkedIn and industry-specific publications; and

(B) explain the role of professional organizations and networking.

(6) The student integrates listening, reading, speaking, writing, and nonverbal communication skills effectively. The student is expected to:

(A) communicate effectively in a business management setting; and

(B) understand appropriate protocol in a business meeting.

(7) The student knows the importance of emerging trends and technologies in marketing. The student is expected to:

(A) discuss trends affecting marketing; and

(B) research emerging technologies in marketing.

(8) The student knows the impact and value of diversity. The student is expected to:

(A) portray how cultural diversity affects marketing; and

(B) discover legal responsibilities regarding diversity.

(9) The student identifies international economic factors that affect marketing planning. The student is expected to:

(A) identify strategies for entering international markets;

(B) illustrate cultural, economic, and political factors to consider when engaging in international trade;

(C) distinguish between imports and exports;

(D) explain the interdependence of nations;

(E) analyze advantages and disadvantages of international trade;

(F) determine the impact of global trade on business decision making;

(G) describe the determinants of exchange rates and their effects on the domestic economy;

(H) discuss the impact of cultural and social environments on global trade; and

(I) interpret labor issues associated with global trade.

(10) The student identifies marketing research as a specific inquiry to solve a problem. The student is expected to:

(A) express the importance of marketing research;

(B) describe areas of marketing research such as advertising, product, market, and sales;

(C) explain the purpose of test marketing;

(D) identify trends affecting marketing research; and

(E) communicate benefits and limitations of marketing research.

(11) The student knows the components of the marketing research process in order to analyze demand, forecast sales, and make other decisions. The student is expected to:

(A) state the marketing research process;

(B) identify methods of collecting data;

(C) describe ways technology is used in research;

(D) design and implement a study;

(E) analyze and interpret data collected;

(F) develop a research report; and

(G) make recommendations based on the research report.

(12) The student knows the importance of branding and extended product features. The student is expected to:

(A) define branding elements;

(B) distinguish between warranties and guarantees; and

(C) design a product package, brand, and label.

(13) The student analyzes the laws and regulations that affect products. The student is expected to:

(A) differentiate among laws, regulations, and self-regulatory measures for products; and

(B) clarify how business is affected by government regulation of consumer protection.

(14) The student knows that public relations and publicity can be used to promote a business or organization. The student is expected to:

(A) prepare publicity materials;

(B) distinguish among activities that would encourage positive public relations; and

(C) analyze potential impact of publicity and offer possible strategies for dealing with the impact.

(15) The student knows that the purchasing process occurs in a continuous cycle. The student is expected to:

(A) explain the process of identifying needs;

(B) describe the process of selecting suppliers and sources;

(C) explain the negotiation process;

(D) explain how goods and services are ordered; and

(E) distinguish strategies used in evaluating purchases.

(16) The student knows that a buying plan identifies products to be offered for sale for a particular period of time. The student is expected to:

(A) describe and calculate merchandising-related discounts;

(B) interpret vendor terms and policies; and

(C) calculate the final cost of a product.

(17) The student knows the important role each employee plays in providing exceptional customer service. The student is expected to:

(A) identify employee management actions and attitudes that result in customer satisfaction;

(B) describe how customer service and follow-up are major factors for success in marketing; and

(C) demonstrate effective communication with customers to foster positive relationships that enhance company image.

(18) The student demonstrates the management of selling activities. The student is expected to:

(A) explain sales and financial quotas;

(B) identify types of information contained in sales records; and

(C) exhibit proper procedures for maintaining sales records.

(19) The student prepares for employment in a particular career field. The student is expected to:

(A) identify training, education, and certification requirements for occupational choice; and

(B) research career-related training or degree programs.

(20) The student demonstrates mathematics knowledge and skills required to pursue the full-range of postsecondary education and career opportunities. The student is expected to:

(A) demonstrate use of relational expressions such as equal to, not equal to, greater than, and less than;

(B) apply data and measurements to solve a problem;

(C) analyze mathematical problem statements for missing or irrelevant data;

(D) construct charts, tables, and graphs from functions and data; and

(E) analyze data when interpreting operational documents.

(21) The student applies ethical reasoning to a variety of workplace situations in order to make ethical decisions. The student is expected to:

(A) weigh alternative responses to workplace situations based on legal responsibilities and employer policies;

(B) weigh alternative responses to workplace situations based on personal or professional ethical responsibilities;

(C) identify and explain personal and long-term consequences of unethical or illegal behaviors; and

(D) identify the most appropriate response to workplace situations based on legal and ethical considerations.

(22) The student knows the importance of teamwork, leadership, and organizational skills. The student is expected to:

(A) specify how teams function;

(B) use teamwork to solve problems;

(C) differentiate between the roles of team leaders and team members;

(D) analyze characteristics of good leaders;

(E) identify employers' expectations and appropriate work habits;

(F) define discrimination, harassment, and inequality;

(G) demonstrate time-management techniques to develop and maintain schedules and meet deadlines;

(H) illustrate how teams measure their results; and

(I) demonstrate methods to recognize and reward team performance.

§127.294. Business Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is recommended for students in Grades 9-12 as a corequisite course for students participating in a coherent sequence of career and technical education courses in the Business Management and Administration Career Cluster. This course provides an enhancement opportunity for students to develop the additional skills necessary to pursue industry certification. Corequisite: any course in the Business Management and Administration Career Cluster. Recommended corequisite: Foundations of Business Communication and Technologies or Business Communication and Technologies. This course must be taken concurrently with a corequisite course from the Business Management and Administration Career Cluster and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with the corequisite course to allow students sufficient time to master the content of

both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Business Lab is designed to provide students an opportunity to further enhance skills of previously studied knowledge and skills and may be used as an extension of Foundations of Business Communication and Technologies or Business Communication and Technologies; it is a recommended corequisite course and may not be offered as a stand-alone course. Students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and to make a successful transition to the workforce or postsecondary education. Students apply technical skills to address business applications of emerging technologies. Students develop a foundation in the economic, financial, technological, international, social, and ethical aspects of business to become competent consumers, employees, and entrepreneurs. Students enhance reading, writing, computing, communication, and reasoning skills and apply them to the business environment. Students incorporate a broad base of knowledge that includes the legal, managerial, marketing, financial, ethical, and international dimensions of business to make appropriate business decisions.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those that contain the phrase "such as" are intended as possible illustrative samples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results; and

(G) pursue appropriate licensing, certification, and/or credentialing requirements relevant to the business field.

(2) The student develops an elevated aptitude for the essential skills listed for the recommended corequisite course(s). The student is expected to:

(A) demonstrate deeper understanding of related course requirements;

(B) develop mastery of hands-on skills at an industry accepted standard; and

(C) exhibit progress toward achieving industry recognized documentation of specific expertise in a business field or skill.

§127.295. Practicum in Business Management (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended prerequisites: Touch System Data Entry and Business Management or Business Communication and Technologies. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Practicum in Business Management is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences occur in a paid or unpaid arrangement and a variety of locations appropriate to the nature and level of experience. Students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and to make a successful transition to the workforce or postsecondary education. Students apply technical skills to address business applications of emerging technologies. Students develop a foundation in the economic, financial, technological, international, social, and ethical aspects of business to become competent consumers, employees, and entrepreneurs. Students enhance reading, writing, computing, communication, and reasoning skills and apply them to the business environment. Students incorporate a broad base of knowledge that includes the legal, managerial, marketing, financial, ethical, and international dimensions of business to make appropriate business decisions.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student identifies and implements employability skills to gain a position in a company. The student is expected to:

(A) assess personal marketability;

(B) practice job-search strategies, including:

(i) write a letter of application;

(ii) prepare a resume;

(iii) use networking techniques to identify employment opportunities; and

(iv) complete a job application;

(C) demonstrate proper interview techniques and professional dress and appearance;

(D) interview for a job, performing proper interview techniques and modeling professional dress and appearance;

(E) practice appropriate follow-up etiquette procedures, including:

(i) write a thank you note; and

(ii) write a follow-up letter after a job interview;

(F) identify skills and attributes necessary for professional advancement;

(G) evaluate and compare employment options such as salaries, benefits, and prerequisites;

(H) identify and rank tangible and intangible rewards of work; and

(I) identify employment opportunities and complete job search procedures such as job applications and W-4.

(3) The student demonstrates professional standards as required by business and industry. The student is expected to:

(A) adhere to policies and procedures;

(B) demonstrate positive work behaviors and attitudes, including punctuality, time-management, initiative, and cooperation;

(C) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(D) complete tasks with the highest standards to ensure quality products and services.

(4) The student develops and demonstrates skills for success in the workplace. The student is expected to:

(A) explain the importance of and model appropriate dress, hygiene, and demeanor for the work assignment;

(B) exhibit productive work habits and attitudes, including accepting constructive criticism; and

(C) prioritize work to fulfill responsibilities, meet deadlines, and complete tasks with the highest standards to ensure quality products and services.

(5) The student applies principles of effective interpersonal skills. The student is expected to:

(A) demonstrate professional qualities, including positive attitude, loyalty, and diplomacy;

(B) identify and demonstrate skills needed to maintain effective work relations with relevant parties such as colleagues and customers;

(C) demonstrate a respect for different workplace cultures and individuals from different cultures, genders, and backgrounds;

(D) understand rights and responsibilities concerning sexual harassment in the workplace;

(E) apply tact in handling criticism and disagreement or disappointment, accept constructive criticism, and revise personal views when valid evidence warrants;

(F) explain the concepts of integrity and confidentiality as related to the office environment; and

(G) demonstrate methods for implementing and improving customer satisfaction.

(6) The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:

(A) analyze leadership in relation to trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation;

(B) demonstrate teamwork skills through working cooperatively with others to achieve goals;

(C) demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate responsibility for shared group and individual work tasks; and

(E) establish and maintain effective working relationships by:

(i) demonstrating interpersonal skills;

(ii) using positive interpersonal skills to work cooperatively with others;

(iii) negotiating effectively to arrive at decisions; and

(iv) demonstrating sensitivity to and value for diversity.

(7) The student facilitates internal and external office communications to support work activities. The student is expected to:

(A) record messages accurately, legibly, and completely;

(B) deliver messages to the appropriate person or department;

(C) coordinate arrangements for participants;

(D) follow calling and login procedures; and

(E) troubleshoot any problems.

(8) The student abides by risk-management policies and procedures for technology to minimize loss. The student is expected to:

(A) adhere to technology safety and security policies such as acceptable use policy and web page policies;

(B) apply ergonomic techniques to technology tasks;

(C) adhere to laws pertaining to computer crime, fraud, and abuse;

(D) follow procedures used to restart and recover from situations such as system failure and virus infection;

(E) follow policies to prevent loss of data integrity; and

(F) adhere to the organization's policies for technology use.

(9) The student uses information technology tools to manage and perform work responsibilities. The student is expected to:

(A) demonstrate advanced web search skills;

(B) demonstrate advanced word-processing skills by:

(i) identifying customary styles of business documents such as memoranda, letters, emails, and reports;

(ii) inputting data using the touch system;

(iii) demonstrating basic writing techniques such as correct memorandum format, informal or formal style, and direct or indirect layout;

(iv) applying correct grammar, spelling, punctuation, and other English mechanics; and

(v) using references and preparing notations;

(C) apply advanced presentation applications;

(D) demonstrate advanced spreadsheet applications by:

(i) entering labels and values into spreadsheet cells;

(ii) formatting labels and values;

(iii) preparing tables, graphs, infographics and graphics;

(iv) developing formulas and entering appropriate functions; and

(v) verifying formulas and functions with sample values;

(E) construct advanced database applications;

(F) perform scheduling functions electronically to facilitate on-time, prompt completion of work activities by:

(i) creating a calendar or schedule;

(ii) maintaining an appointment calendar;

(iii) verifying appointments;

(iv) coordinating travel arrangements;

(v) setting up meeting arrangements; and

(vi) disseminating meeting information to appropriate persons; and

(G) enter data without error.

(10) The student manages personal finances to achieve financial goals. The student is expected to:

(A) develop a budget based on personal financial goals;

(B) interpret a pay stub;

(C) read and reconcile bank statements;

(D) maintain financial records;

(E) demonstrate the wise use of credit;

(F) validate a credit history;

(G) protect against identity theft; and

(H) prepare personal income tax forms, including the 1040E.

(11) The student establishes procedures to maintain equipment and supplies. The student is expected to:

(A) determine equipment needed;

(B) determine supplies needed;

(C) establish equipment and supplies maintenance systems;

(D) schedule equipment maintenance; and

(E) use equipment and supplies maintenance procedures.

(12) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem to develop creative and innovative solutions;

(B) critically analyze information to determine value to the problem-solving task;

(C) compare and contrast alternatives using a variety of problem-solving and critical-thinking skills; and

(D) conduct technical research to gather information necessary for decision making.

§127.296. Extended Practicum in Business Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Business Management and Administration Career Cluster. Recommended prerequisites: Touch System Data Entry and Business Management or Business Communication and Technologies. Corequisite: Practicum in Business Management. This course must be taken concurrently with Practicum in Business Management and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different as-

pects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Business Management and Administration Career Cluster focuses on careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

(3) Extended Practicum in Business Management is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences occur in a paid or unpaid arrangement and a variety of locations appropriate to the nature and level of experience. Students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and to make a successful transition to the workforce or postsecondary education. Students apply technical skills to address business applications of emerging technologies. Students develop a foundation in the economic, financial, technological, international, social, and ethical aspects of business to become competent consumers, employees, and entrepreneurs. Students enhance reading, writing, computing, communication, and reasoning skills and apply them to the business environment. Students incorporate a broad base of knowledge that includes the legal, managerial, marketing, financial, ethical, and international dimensions of business to make appropriate business decisions.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to business management;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, integrity, customer service, work ethic, and adaptability with increased fluency;

(D) complete tasks with the highest standards to ensure quality products and services;

(E) employ teamwork and conflict-management skills to achieve collective goals with increased fluency; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques with increased proficiency;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations effectively;

(D) analyze, interpret, and effectively communicate information; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills independently and in groups with increased fluency to solve problems and make decisions;

(B) apply critical-thinking strategies with increased fluency to develop solutions using appropriate technologies and resources;

(C) conduct technical research to gather information necessary for decision making; and

(D) analyze elements of a problem to develop creative and innovative solutions.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) understand and consistently follow workplace safety rules and regulations;

(B) adhere to technology safety and security policies such as acceptable use policy and web page policies; and

(C) follow policies to prevent loss of data integrity.

(5) The student understands the professional, ethical, and legal responsibilities in business management. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) describe and practice ethical and legal responsibilities associated with business management;

(C) show integrity by choosing the ethical course of action when making decisions; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a business management experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised business management experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) facilitate internal and external office communications to support work activities;

(D) demonstrate appropriate use of information technology tools to manage and perform work responsibilities;

(E) create customary styles of business documents such as memoranda, letters, emails, and reports, as appropriate;

(F) perform scheduling functions electronically to facilitate on-time, prompt completion of work activities;

(G) demonstrate growth of technical skill competencies;

(H) evaluate strengths and weaknesses in technical skill proficiency; and

(I) collect representative work samples.

§127.297. Practicum in Marketing (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended Prerequisite: Principles of Business, Marketing, and Finance. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Practicum in Marketing is a series of dynamic activities that focus on the customer to generate a profitable exchange. Students will gain knowledge and skills that help them to be proficient in one or more of the marketing functional areas associated with distribution, financing, marketing information management, pricing, product planning, promotion, purchasing, risk management, and selling skills. Students will integrate skills from academic subjects, information technology, interpersonal communication, and management training to make responsible decisions. The practicum course is a paid or unpaid experience for students participating in a coherent sequence of career and technical courses in marketing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using speaking, listening, and writing skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) demonstrate integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations;

(F) demonstrate time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities in ways that use time wisely and optimize efficiency and results; and

(G) demonstrate leadership skills by participating in activities such as career and technical education student organizations.

(2) The student knows the nature of business and shows its contribution to society. The student is expected to:

(A) distinguish ways that businesses contribute to society;

(B) explain the importance of social responsibility;

(C) describe types of business activities;

(D) explain the organizational design of businesses;

(E) discuss the global environment in which businesses operate; and

(F) depict factors that affect the business environment and how businesses can respond.

(3) The student demonstrates the importance of marketing and the functions of marketing. The student is expected to:

(A) explain the marketing concept; and

(B) describe each marketing function and how it relates to the marketing concept.

(4) The student analyzes the marketing mix, which involves a combination of the decisions about product, price, place, promotion, and people. The student is expected to:

(A) explain how each component of the marketing mix contributes to successful marketing; and

(B) illustrate the importance of marketing strategies in the marketing mix.

(5) The student knows the concepts and strategies used to determine target markets and market identification. The student is expected to:

(A) explain the importance of target markets;

(B) compare and contrast advantages and disadvantages of market segmentation and mass marketing;

(C) distinguish among geographic, demographic, psychographic, and behavioral segmentation; and

(D) explain the nature of marketing planning.

(6) The student applies mathematical concepts in marketing. The student is expected to:

(A) execute calculations involving money, time, space, materials, and data;

(B) interpret charts and graphs to make informed marketing decisions;

(C) use formulas and equations to determine price, profit, costs, and break-even point;

(D) perform mathematical operations;

(E) predict reasonable estimations;

(F) create mathematical models from real-life situations; and

(G) determine rate of change mathematically.

(7) The student knows how to use self-development techniques and interpersonal skills to accomplish marketing objectives. The student is expected to:

(A) identify and practice effective interpersonal and team-building skills involving situations with coworkers, managers, and customers;

(B) develop short- and long-term personal goals;

(C) identify and use time-management principles; and

(D) participate in leadership and career development activities.

(8) The student applies information technology as an effective marketing tool. The student is expected to:

(A) identify social media trends in marketing;

(B) identify ways that technology impacts business;

(C) apply web-search skills;

(D) demonstrate word-processing skills;

(E) use database applications; and

(F) execute spreadsheet applications.

(9) The student recognizes that careers are ever changing and require continual self-assessment, research, and preparation to develop and implement responsible decisions. The student is expected to:

(A) develop a working portfolio containing components such as resume, cover letter, thank you letter, references, letter of recommendation, and work samples;

(B) analyze personal social media accounts for potential employability; and

(C) demonstrate interview skills.

(10) The student knows the importance of emerging trends and technologies in marketing. The student is expected to:

(A) discuss trends affecting marketing; and

(B) research emerging technologies in marketing.

(11) The student knows the impact and value of diversity. The student is expected to:

(A) explain how diversity affects marketing; and

(B) probe the impact of multiculturalism and multigenerationalism on marketing activities.

(12) The student knows that marketing begins with a working knowledge of economic concepts. The student is expected to:

(A) discuss characteristics of economic goods and services;

(B) identify economic needs and wants;

(C) explain the concept of utility and cite examples of types of utility;

(D) describe the function of prices in markets; and

(E) clarify how the interaction of supply and demand affects price.

(13) The student knows that a nation's economic system is determined by what is produced, how it is produced, and how it is distributed. The student is expected to:

(A) compare and contrast how economies answer basic economic questions;

(B) explain why most economies are mixed; and

(C) determine the relationship between government and business.

(14) The student knows that private enterprise is based on independent decisions by businesses and limited government involvement. The student is expected to:

(A) determine characteristics of a private enterprise system;

(B) explain the advantages and disadvantages of private enterprise; and

(C) identify examples of competitive business situations such as price or nonprice competition.

(15) The student knows that economic factors such as gross domestic product, standard of living, consumer price index, and unemployment figures help influence a company's marketing strategies. The student is expected to:

(A) identify economic measurements used to analyze an economy;

(B) research how economic measures are used in a market economy;

(C) describe the concept of price stability as an economic measure;

(D) interpret the measure of consumer spending as an economic indicator;

(E) examine the impact of a nation's unemployment rates; and

(F) describe the economic impact of inflation on business.

(16) The student knows that changes in the economy include prosperity, recession, depression, and recovery and are collectively referred to as the business cycle. The student is expected to:

(A) explain the concept of business cycles; and

(B) describe the impact that phases of a business cycle have on the economy.

(17) The student knows that distribution systems facilitate the movement of products. The student is expected to:

(A) understand channels of distribution;

(B) identify physical distribution activities; and

(C) examine costs associated with distribution.

(18) The student knows that marketers use investment and financial services to achieve goals and objectives. The student is expected to:

(A) illustrate types of financial services; and

(B) explain the purpose of a credit contract.

(19) The student knows the concept of pricing and strategies used in determining and adjusting price. The student is expected to:

(A) state goals of pricing;

(B) identify factors affecting pricing;

(C) explain how pricing affects product, place, and promotion decisions;

(D) compare and contrast pricing policies;

(E) calculate a product's price;

(F) describe the role of business ethics in pricing; and

(G) analyze legal considerations for pricing.

(20) The student understands the promotional concepts and strategies needed to communicate information about products, services, images, and ideas to achieve a desired outcome. The student is expected to:

(A) explain the communication processes as used in promotional activities;

(B) evaluate types of promotion;

(C) understand the concept of promotional mix;

(D) define the role of promotion as a marketing function;

(E) describe the use of business ethics in promotion;

(F) explore the regulation of promotion;

(G) explain the nature of direct marketing channels;

(H) model communication channels used in sales promotion; and

(I) describe communication channels used in public relations activities.

(21) The student knows that advertising is the paid form of nonpersonal communication about an identified sponsor's products. The student is expected to:

(A) illustrate types of advertising media;

(B) differentiate between product and institutional advertising; and

(C) identify and evaluate elements of an advertisement.

(22) The student knows that business risk is the possibility of loss or failure. The student is expected to:

(A) categorize business risks; and

(B) interpret how various types of risks impact business activities.

(23) The student knows that marketers responsible for risk management follow a process to decide the best strategy to deal with each risk. The student is expected to:

(A) evaluate security precautions; and

(B) demonstrate knowledge of safety precautions in the workplace.

(24) The student knows what influences customers before they make a purchase. The student is expected to:

(A) differentiate among a feature and a benefit;

(B) compare and contrast between consumer and organizational buying behavior;

(C) determine customer needs and wants;

(D) classify buying motives; and

(E) analyze how customers and organizations apply the decision-making process.

(25) The student knows how marketers use the selling process. The student is expected to:

(A) locate product information; and

(B) illustrate the sale process.

(26) The student understands the techniques and strategies used to foster positive, ongoing relationships with customers to enhance company image. The student is expected to:

(A) explain the nature of positive customer relations;

(B) describe a customer service mindset;

(C) explain the management role in customer relations;

(D) identify a company brand promise;

(E) explore ways of reinforcing company image through employee performance; and

(F) describe the use of technology in customer relationship management.

(27) The student understands a business's responsibility to know and abide by workplace laws, trade regulations, and ethical behavior that affect business operations. The student is expected to:

(A) apply ethics to demonstrate trustworthiness;

(B) explain the nature of business ethics;

(C) describe legal issues affecting businesses;

(D) defend the nature of human resources regulations;

(E) explain the nature of workplace regulations such as Occupational Safety and Health Administration and statutes such as the Americans with Disabilities Act;

(F) discuss employment relationships;

(G) illustrate the nature of trade regulations; and

(H) describe the impact of antitrust legislation.

(28) The student applies ethical reasoning to a variety of workplace situations in order to make ethical decisions. The student is expected to:

(A) evaluate alternative responses to workplace situations based on personal or professional ethical responsibilities;

(B) identify personal and long-term workplace consequences of unethical or illegal behaviors;

(C) investigate the most appropriate response to workplace situations based on legal and ethical considerations; and

(D) demonstrate responsible behavior, honesty, integrity, and ethical work habits.

(29) The student completes required training, education, and certification to prepare for employment in a particular career field. The student is expected to:

(A) identify training, education, and certification requirements for occupational choice; and

(B) participate in career-related training or degree programs.

(30) The student knows the elements and processes of product planning. The student is expected to:

(A) explain the nature and scope of product planning;

(B) relate product-mix strategies to meet customer expectations; and

(C) define the product life cycle.

§127.298. Extended Practicum in Marketing (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Marketing Career Cluster. Recommended prerequisite: Principles of Business, Marketing, and Finance. Corequisite: Practicum in Marketing. This course must be taken concurrently with Practicum in Marketing and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Marketing Career Cluster focuses on planning, managing, and performing marketing activities to reach organizational objectives.

(3) Extended Practicum in Marketing is a series of dynamic activities that focus on the customer to generate a profitable exchange. Students will gain knowledge and skills that help them to be proficient in one or more of the marketing functional areas associated with distribution, financing, marketing information management, pricing, product planning, promotion, purchasing, risk management, and selling skills. Students will integrate skills from academic subjects, information technology, interpersonal communication, and management training to make responsible decisions.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to marketing;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, integrity, customer service, work ethic, adaptability with increased fluency;

(D) demonstrate use of personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications with increased fluency for relevant projects;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques with increased proficiency;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations effectively;

(D) analyze, interpret, and effectively communicate information; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) conduct technical research to gather information necessary for decision making; and

(C) analyze elements of a problem to develop creative and innovative solutions.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations; and

(B) adhere to technology safety and security policies such as acceptable use policy and webpage policies.

(5) The student understands the professional, ethical, and legal responsibilities in marketing. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply alternative responses to workplace situations based on personal or professional ethical responsibilities;

(C) show integrity by choosing the ethical course of action when making decisions; and

(D) comply with all applicable rules, laws, and regulations such as Occupational Safety and Health Administration and statutes such as the Americans with Disabilities Act in a consistent manner.

(6) The student participates in a marketing experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised marketing experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate use of information technology tools to manage and perform work responsibilities;

(D) apply concepts and strategies needed to communicate information about products, services, images, and ideas to achieve a desired outcome;

(E) model communication channels used in sales promotion;

(F) apply different components of the marketing mix to contribute to successful marketing;

(G) apply the elements and processes of product planning, including related product-mix strategies to meet customer expectations;

(H) identify and evaluate elements of an advertisement with increased fluency;

(I) demonstrate growth of technical skill competencies;

(J) evaluate strengths and weaknesses in technical skill proficiency; and

(K) collect representative work samples.

§127.299. Practicum in Entrepreneurship (Two Credits), Adopted 2023.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended prerequisites: Entrepreneurship I and Entrepreneurship II or successful completion of at least two courses in a career and technical education (CTE) program of study. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) This course can serve in multiple CTE programs of study, as it focuses on planning, managing, organizing, directing, and evaluating business functions essential to efficient and productive business management, finance, operations, and marketing related to the student's industry focus.

(3) Practicum in Entrepreneurship provides students the opportunity to apply classroom learning and experiences to real-world business problems and opportunities in a free enterprise system while expanding their skill sets and professional relationships as a real or simulated business owner versus the experience one would have as an employee. Students will prepare for an entrepreneurial career in their area of interest in their career cluster and build on and apply the knowledge and skills gained from courses taken in an array of career areas. Practicum experiences occur in a paid or an unpaid arrangement and a variety of locations appropriate to the nature and level of the student's need for work-based learning experience. Students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and to make a successful transition to the workforce or postsecondary education. It is recommended that students are paired with local business owners or employers in their specific industry program of study.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations, local chamber of commerce meetings, and meetings with entrepreneurs, mentors, or industry experts.

(5) Students are encouraged to transition from the idea phase to action and implementation of a business, including validation through sales in a real or simulated scenario.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) participate in a paid or an unpaid laboratory or work-based application of previously studied knowledge and skills related to entrepreneurship;

(B) demonstrate professional business skills through written and oral communication;

(C) demonstrate collaboration skills through teamwork and constructive dialogue;

(D) demonstrate professionalism by behaving in a manner appropriate for the profession and workplace;

(E) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(F) comply with all applicable rules, laws, and regulations;

(G) demonstrate time-management skills by prioritizing tasks, following schedules, and accomplishing goal-relevant activities in a way that uses time wisely and optimizes efficiency and results;

(H) identify appropriate business attire for the selected workplace; and

(I) demonstrate critical and analytical thinking skills when comparing business decisions.

(2) The student analyzes major problem areas and potential problem areas for entrepreneurs while demonstrating an understanding of leverage points and constraints. The student is expected to:

(A) assess businesses that have failed, determine factors associated with business closure, and prepare and present analysis to peers;

(B) research and analyze risks faced by entrepreneurs;

(C) evaluate entrepreneurial risk versus opportunity for a given business example;

(D) describe how entrepreneurship differs from working for an employer;

(E) analyze personal aptitude for entrepreneurship;

(F) describe how entrepreneurs must manage organizational finances;

(G) research and apply the entrepreneur's approach to risk-taking as it applies to business decision-making;

(H) explore and explain a company's competitive advantage in its field of interest;

(I) analyze the risks and rewards of business ownership by interviewing an entrepreneur in a chosen field of interest; and

(J) analyze how psychology and sociology explain factors that drive customer behavior and impact business success.

(3) The student identifies the appropriate legal structure, benefits, and drawbacks for different business types. The student is expected to:

(A) describe the different basic types of business formation, including sole proprietorship, partnership, corporation, and limited liability company;

(B) compare the benefits and drawbacks for each type of business structure such as personal liability and taxes; and

(C) research an existing business and simulate liability issues associated with its type of business structure through role-play.

(4) The student determines how to obtain funding and all associated costs needed to start a particular business. The student is expected to:

(A) describe all materials, facilities, technology, inventory, and personnel that will be needed to start and sustain the business;

(B) devise a timeline of tasks that must be completed, including the associated costs;

(C) list and describe all supplies, personnel wages and salaries, inventories, insurance, utilities, repair and maintenance, and other operating costs associated with funding the business once it is operating;

(D) document and analyze the costs associated with operating the business, using cash flow and return on investment as a means of evaluation;

(E) estimate how much money will be needed on-hand to operate the business until the break-even point;

(F) seek the advice of mentors from industry to analyze and discuss actual business situations and funding options to assist the student with a business idea;

(G) create and analyze financial statements to identify ways to improve business performance in a business model of choice; and

(H) define cash burn in relationship to a business's viability.

(5) The student examines the responsibilities businesses have to employees and the community. The student is expected to:

(A) explain the benefits of a business that contributes to the economic well-being of its employees and community;

(B) research and describe the methods in which a business can ensure economic growth and provide jobs;

(C) explore and analyze the health and safety responsibilities a business has to the community and its employees; and

(D) research and identify how businesses are making investments in community infrastructure.

(6) The student analyzes for-profit and non-profit business growth and exit strategies. The student is expected to:

(A) compare business growth strategies and identify and defend the most favorable for a potential business;

(B) describe methods that a business owner can use to obtain financial support to expand a business;

(C) identify and explain various methods an entrepreneur can use to determine how much a business is worth;

(D) analyze various paths to exit a business and the impact from startup decisions; and

(E) explain the factors an entrepreneur should consider when preparing to exit a business.

(7) The student collaborates in small groups to complete a project-based research activity to develop critical thinking and creative problem solving. The student is expected to:

(A) analyze a real-world work site and research an existing issue or problem the business is experiencing;

(B) research and report how to resolve the business problem;

(C) develop a proposal for future business opportunities; and

(D) determine how to create business relationships or alliances that would be beneficial to the business.

§127.300. Extended Practicum in Entrepreneurship (One Credit), Adopted 2023.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or an unpaid capstone experience for students participating in a coherent sequence of career and technical education (CTE) courses in the Marketing Career Cluster. Recommended prerequisites: Entrepreneurship I and Entrepreneurship II or successful completion of at least two courses in a CTE program of study. Corequisite: Practicum in Entrepreneurship. This course must be taken concurrently with Practicum in Entrepreneurship and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) This course can serve in multiple CTE programs of study, as it focuses on planning, managing, organizing, directing, and

evaluating business functions essential to efficient and productive business management, finance, operations, and marketing related to the student's industry focus.

(3) Extended Practicum in Entrepreneurship provides students the opportunity to apply classroom learning and experiences to real-world business problems and opportunities in a free enterprise system while expanding their skill sets and professional relationships as a real or simulated business owner versus the experience one would have as an employee. Students will prepare for an entrepreneurial career in their area of interest in their career cluster and build on and apply the knowledge and skills gained from courses taken in an array of career areas. Practicum experiences occur in a paid or an unpaid arrangement and a variety of locations appropriate to the nature and level of the student's need for work-based learning experience. Students implement personal and interpersonal skills to strengthen individual performance in the workplace and in society and to make a successful transition to the workforce or postsecondary education. It is recommended that students are paired with local business owners or employers in their specific industry program of study.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations, local chamber of commerce meetings, and meetings with entrepreneurs, mentors, or industry experts.

(5) Students are encouraged to transition from the idea phase to action and implementation of a business, including validation through sales in a real or simulated scenario.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or an unpaid, laboratory- or work-based application of previously studied knowledge and skills related to entrepreneurship;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to succeed as an entrepreneur such as diligence, perseverance, self-discipline, integrity, customer service, work ethic, and adaptability with increased fluency;

(D) demonstrate use of business information management tools with increased fluency for relevant projects;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques with increased proficiency;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations effectively;

(D) analyze, interpret, and effectively communicate information; and

(E) exhibit positive customer/client communication skills to maintain effective internal and external business relationships.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) conduct technical research to gather information necessary for decision making; and

(C) analyze elements of a problem to develop creative and innovative solutions.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate understanding of and consistently follow workplace safety rules and regulations; and

(B) adhere to technology safety and cybersecurity policies such as acceptable use policy and webpage policies.

(5) The student understands the ethical and legal responsibilities in entrepreneurship. The student is expected to:

(A) apply appropriate responses to workplace situations based on personal or professional ethical responsibilities;

(B) demonstrate integrity by choosing the ethical course of action when making decisions; and

(C) comply with all applicable rules, laws, and regulations for the selected industry.

(6) The student participates in an entrepreneurial experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate use of information technology tools to manage and perform work responsibilities;

(D) create customary styles of documents such as memoranda, letters, emails, and reports, as appropriate, to an industry of choice;

(E) apply the elements and processes of entrepreneurship to grow a business idea and meet customer expectations;

(F) demonstrate growth of technical skill competencies;

(G) evaluate strengths and weaknesses in technical skill proficiency; and

(H) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500571
Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER G. EDUCATION AND TRAINING

19 TAC §§127.309 - 127.315, 127.343 - 127.346

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.309. Principles of Education and Training (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Principles of Education and Training is designed to introduce learners to the various careers within the Education and Training Career Cluster. Students use self-knowledge as well as educational and career information to analyze various careers within the Education and Training Career Cluster. Students are introduced to societal influences of education and various school models. Additionally, students learn the role and responsibilities of a classroom educator. Students will develop a graduation plan that leads to a specific career choice in the student's interest area.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by the education profession and related occupations. The student is expected to:

(A) demonstrate written communication skills;

(B) perform job-appropriate numerical and arithmetic applications;

(C) practice various forms of communication such as verbal and non-verbal communication used in educational and career settings;

(D) exhibit teamwork skills;

(E) analyze the impact of current decision making on short- and long-term career plans;

(F) identify and implement problem-solving techniques;

(G) identify conflict-management skills;

(H) describe effective leadership skills;

(I) describe productive work habits such as being organized, managing time, and taking initiative;

(J) demonstrate professionalism, including appropriate attire expected of professionals in educational settings; and

(K) identify effective work ethic practices.

(2) The student identifies strategies that promote health and wellness to address the unique challenges of educators in balancing work and personal responsibilities. The student is expected to:

(A) explain common signs of stress and anxiety;

(B) describe appropriate boundaries for a healthy work-life balance;

(C) discuss the impacts of an education career on personal lifestyle such as impacts on time, earning potential, community presence and involvement, health and wellness, and family;

(D) describe appropriate boundaries for a healthy work-life balance; and

(E) discuss strategies to manage health and wellness.

(3) The student recognizes the impact of social media and web-based applications on the education process. The student is expected to:

(A) demonstrate appropriate use of social media for educational purposes; and

(B) identify web-based resources that can be used in the education process.

(4) The student investigates the range of employment opportunities in the education and training field. The student is expected to:

(A) identify and investigate career opportunities in education and training;

(B) investigate additional occupations in education and training such as professional support services, administration, county extension agent, and corporate trainer;

(C) compare transferable skills among a variety of careers in education and; and

(D) analyze results from personal assessments such as how results from career interest and ability inventories relate to skills necessary for success in education and training occupations.

(5) The student explains societal impacts on the education and training field. The student is expected to:

(A) investigate trends or issues that have influenced the development of education across the United States such as historical, societal, cultural, and political trends and issues;

(B) explain pedagogy and andragogy theory;

(C) predict the education and training job market using information from sources such as labor market information, technology, and societal or economic trends; and

(D) summarize the role of family/caregiver in education.

(6) The student describes the characteristics of different educational and training environments. The student is expected to:

(A) summarize the various roles and responsibilities of professionals in teaching and training and early learning, including demonstrating ethical behavior in educational settings;

(B) describe different types of schools in urban and rural areas and public and private schools such as academies, Montessori, charter, and magnet schools;

(C) compare teacher salary schedules among different school models such as public, private, and charter schools within rural and urban areas of the state;

(D) discuss factors, including stipends, state and school district initiatives, and level of education, that can impact earning potential; and

(E) identify various sources for information related to education careers such as requirements to become a teacher, curriculum standards, and the structures and roles of state and federal governing bodies in education.

(7) The student experiences authentic education and training opportunities. The student is expected to:

(A) observe educator duties and responsibilities through activities such as assisting, shadowing, or observing;

(B) develop and evaluate instructional materials such as visuals, teacher aids, manipulatives, lessons, and lesson plans;

(C) define lesson plan components, including objectives, direct instruction, guided practice, independent practice, and formative and summative assessments;

(D) identify and discuss methods to adapt lessons to meet student needs; and

(E) identify a personal set of beliefs related to education in preparation for developing a philosophy of education.

(8) The student identifies elements of an effective classroom environment. The student is expected to:

(A) use available classroom equipment and technology for effective instruction;

(B) analyze effective tools used in classroom management such as classroom expectations, seating charts, classroom set-up, procedures and routines, and teacher organization and preparation;

(C) explain characteristics of an effective learning environment, including universally accessible classroom design;

(D) analyze positive behavior intervention techniques, including restorative practices; and

(E) develop a differentiated lesson plan that includes scaffolding for all levels of learners.

(9) The student analyzes the education and training requirements for a career in an area of interest. The student is expected to:

(A) investigate degree plans or training alternatives for various occupations within teaching and training and early learning;

(B) develop a graduation plan that leads to a specific career choice in the area of interest;

(C) investigate and identify high school and dual enrollment opportunities related to education and training careers;

(D) investigate and identify scholarships, grants, and financial incentives related to interest areas in education and training;

(E) identify and compare technical and community college programs that align with interest areas in education and training; and

(F) identify and compare university programs and institutions that align with interest areas in education and training.

(10) The student documents technical knowledge and skills related to education and training. The student is expected to:

(A) assemble basic professional portfolio components such as basic resume, samples of work, service-learning logs, assessment results, and mock scholarship applications; and

(B) present a portfolio to interested stakeholders such as teachers, school administrators, career and technical education administrators, curriculum specialists, or human resources personnel.

(11) The student understands how classroom observations (video or in person) inform and improve instruction. The student is expected to:

(A) apply knowledge gained in the course to conduct targeted observations;

(B) record objective observations of student behavior and teacher interactions;

(C) explain how observations can influence philosophy of education and delivery of instruction; and

(D) identify qualities of an effective classroom through classroom observation.

§127.310. Human Growth and Development (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Education and Training or Principles of Human Services. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-rele-

vant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Human Growth and Development is an examination of human development across the lifespan with emphasis on research, theoretical perspectives, and common physical, cognitive, emotional, and social developmental milestones. Students use the knowledge and skills gained in this course to prepare for a career path working with children in an educational or service learning setting. The course covers material that is generally taught in a postsecondary, one-semester introductory course in developmental psychology or human development.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate written communication skills;

(B) perform job-appropriate numerical and arithmetic applications;

(C) practice various forms of communication such as verbal and non-verbal communication used in educational and career settings;

(D) exhibit teamwork skills;

(E) apply decision-making skills;

(F) implement problem-solving techniques;

(G) describe and apply conflict management skills;

(H) describe and demonstrate effective leadership skills;

(I) update a professional portfolio with portfolio components such as a resume and samples of work;

(J) demonstrate professionalism; and

(K) describe effective work ethic practices.

(2) The student understands historical, theoretical, and research perspectives of human growth and development throughout the lifespan. The student is expected to:

(A) explain the role of theories in understanding human development;

(B) describe theoretical perspectives regarding influences on human development throughout the lifespan;

(C) summarize how historical theories influence modern theories of human development;

(D) compare research methods commonly used to study human development; and

(E) compare pedagogy and andragogy.

(3) The student understands the importance of prenatal care in the development of a child. The student is expected to:

(A) describe nutritional needs prior to and during pregnancy;

(B) explain reasons for medical care and good health practices prior to and during pregnancy;

(C) outline stages of prenatal development;

(D) discuss the role of genetics in prenatal development; and

(E) identify environmental factors affecting development of the fetus.

(4) The student understands the development of children ages newborn through two years. The student is expected to:

(A) analyze the physical, emotional, social, and cognitive development of infants and toddlers;

(B) analyze various developmental theories relating to infants and toddlers;

(C) investigate the influences of the family and society on the infant and toddler;

(D) summarize strategies for optimizing the development of infants and toddlers, including those with special needs;

(E) determine techniques that promote the health and safety of infants and toddlers; and

(F) determine developmentally appropriate guidance techniques for children in the first two years of life.

(5) The student understands the development of children ages 3 through 5 years. The student is expected to:

(A) analyze the physical, emotional, social, and cognitive development of preschoolers;

(B) analyze various developmental theories relating to preschoolers;

(C) investigate the influences of the family and society on preschoolers;

(D) summarize strategies for optimizing the development of preschoolers, including those with special needs;

(E) determine techniques that promote the health and safety of preschoolers; and

(F) compare and suggest developmentally appropriate guidance techniques for preschoolers.

(6) The student understands the development of children ages 6 through 11 years. The student is expected to:

(A) analyze the physical, emotional, social, and cognitive development of children in the early to middle childhood stage of development;

(B) analyze various developmental theories relating to children in the early to middle childhood stage of development;

(C) investigate the influences of the family and society on children in the early to middle childhood stage of development;

(D) summarize strategies for optimizing the development of children in the early to middle childhood stage of development, including those with special needs;

(E) determine techniques that promote the health and safety of children in the early to middle childhood stage of development; and

(F) compare and suggest developmentally appropriate guidance techniques for children in the early to middle childhood stage of development.

(7) The student understands the development of adolescents ages 12 through 19 years. The student is expected to:

(A) analyze the biological and cognitive development of adolescents;

(B) analyze the emotional and social development of adolescents;

(C) discuss various theoretical perspectives relevant to adolescent growth and development;

(D) investigate the influences of the family and society on adolescents;

(E) summarize strategies for optimizing the development of adolescents, including those with special needs;

(F) determine techniques that promote the health and safety of adolescents; and

(G) compare and suggest developmentally appropriate guidance techniques for adolescents.

(8) The student understands the importance of care and protection of children and adolescents. The student is expected to:

(A) determine services provided by agencies that protect the rights of children and adolescents;

(B) summarize various resources focusing on the care and protection of children and adolescents;

(C) discuss the impact of changing demographics and cultural diversity on the health and welfare of children and adolescents;

(D) analyze forms, causes, effects, prevention, and treatment of child abuse;

(E) explain the impact of appropriate health care and importance of safety for children and adolescents; and

(F) discuss responsibilities of community members, legislation, and public policies related to care and protection of children and adolescents.

(9) The student understands the development of adults ages 20 through 39 years. The student is expected to:

(A) analyze various development theories relating to early adults, including biological and cognitive development;

(B) analyze various development theories relating to early adults, including emotional, moral, and psychosocial development;

(C) investigate the influences of society and culture on early adults; and

(D) discuss the importance of family, human relationships, and social interaction for early adults.

(10) The student understands the development of adults ages 40 through 65 years. The student is expected to:

(A) analyze various development theories relating to middle adults, including biological and cognitive development;

(B) analyze various development theories relating to middle adults, including emotional, moral, and psychosocial development;

(C) investigate the influences of society and culture on middle adults; and

(D) discuss the importance of family, human relationships, and social interaction for middle adults.

(11) The student understands the development of adults ages 66 years and older. The student is expected to:

(A) analyze various development theories relating to those within the stage of late adulthood, including biological and cognitive development;

(B) analyze various development theories relating to those within the stage of late adulthood, including emotional, moral, and psychosocial development;

(C) investigate the influences of society and culture on those within the stage of late adulthood; and

(D) discuss the importance of family, human relationships, and social interaction for those within the stage of late adulthood.

(12) The student explores career opportunities available in education and training and human services. The student is expected to:

(A) assess personal interests, aptitudes, and abilities as related to the various occupations within education and training and human services;

(B) evaluate employment and entrepreneurial opportunities, including education requirements in a field of interest; and

(C) identify effective methods for securing part-time or entry-level employment in positions that prepare students for careers in education and training or human services.

§127.311. Child Development (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Human Services or Principles of Education and Training. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Child Development is a course that addresses knowledge and skills related to child growth and development from prenatal through school-age children. Students use these skills to promote the well-being and healthy development of children and investigate careers related to the care and education of children.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain the value of and demonstrate collaboration within the work environment;

(C) apply productive work habits, including time management, organization, initiative, and self-direction;

(D) identify work ethics and professional skills needed in a work environment; and

(E) identify and demonstrate problem-solving, creativity, and critical-thinking skills needed within the work environment.

(2) The student analyzes roles and responsibilities of caregivers or guardians. The student is expected to:

(A) compare parenting styles and the potential influence of each style on a child's development;

(B) investigate the legal rights and responsibilities of parents;

(C) analyze positive relationship characteristics and developmentally appropriate communication skills needed for parenting; and

(D) analyze the parental responsibilities of educating children through the continuum of developmental stages.

(3) The student examines the care, protection, and safety of children. The student is expected to:

(A) analyze the effects of childhood trauma at each developmental stage;

(B) describe the counseling and therapeutic services available to children such as pharmacotherapy and cognitive-behavioral, family, trauma-focused, and play therapy;

(C) demonstrate first aid and cardiopulmonary resuscitation skills;

(D) analyze community resources relevant to the care and protection of children, including childcare services, health care services, and auxiliary service organizations;

(E) examine suggested preventative health care recommendations for children such as American Academy of Pediatrics (AAP) and Centers for Disease Control and Prevention (CDC) guidelines and recommendations for immunizations, physical exams, and oral hygiene;

(F) assess the safety of children's cribs, toys, clothing, food, and travel safety equipment; and

(G) identify current legislation and public policies affecting the care, protection, and safety of children.

(4) The student investigates components of optimal prenatal care and development. The student is expected to:

(A) identify signs and stages of pregnancy;

(B) analyze the effect of environmental and hereditary factors on conception and fetal development, including prenatal brain development;

(C) identify characteristics of, contributing factors to, and treatment of various fetal birth defects, including defects of unknown ideology;

(D) analyze nutritional needs prior to and during pregnancy;

(E) analyze appropriate medical care and good health practices prior to and during pregnancy;

(F) explain how technological advances in prenatal care can impact child development;

(G) explore careers that provide service to those receiving prenatal care; and

(H) analyze the process of labor and delivery methods.

(5) The student investigates strategies for optimizing the development of children ages birth through 12 months, including those with special needs. The student is expected to:

(A) analyze the physical, emotional, social, intellectual, and moral developmental needs of children ages birth through twelve months;

(B) investigate the impact of children ages birth through twelve months on the family such as the impact on roles, finances, responsibilities, and relationships in the family;

(C) analyze the impact of technology such as personal usage or exposure and assistive technologies on the growth and development of children ages birth through 12 months;

(D) explore careers that provide service to children ages birth through twelve months; and

(E) identify appropriate nutrition and ways to meet nutritional needs, including breast feeding and formula feeding, and considerations related to food allergies for children ages birth through twelve months.

(6) The student investigates strategies for optimizing the development of children ages 13 months through 35 months, including those with special needs. The student is expected to:

(A) analyze the physical, emotional, social, intellectual, and moral developmental needs of children ages 13 months through 35 months;

(B) create play activities such as pre-literacy, social emotional learning, mathematics, science, physical movement, outdoor play, art, and music activities that enhance the growth and development of children ages 13 months through 35 months;

(C) analyze the impact of technology such as personal usage and assistive technologies on the growth and development of children ages 13 months through 35 months;

(D) analyze appropriate nutritional guidelines that promote wellness in children ages 13 months through 35 months;

(E) explore careers that provide service to children ages 13 months through 35 months; and

(F) prepare or plan developmentally appropriate snacks or meals that meet appropriate nutritional guidelines for children ages 13 months through 35 months.

(7) The student analyzes the growth and development of children ages 3 through 5 years, including those with special needs. The student is expected to:

(A) analyze the physical, emotional, social, intellectual, and moral development needs of the children ages 3 through 5 years;

(B) describe the role of play in the development of children ages 3 through 5 years;

(C) develop activities such as physical exercise or group play activities that meet developmental needs of children ages 3 through 5 years;

(D) prepare or plan developmentally appropriate snacks or meals that meet appropriate nutritional guidelines for children ages 3 through 5 years;

(E) identify minimum standards for licensing regulations of various preschools and childcare settings such as in-home, private, public, and religious organizations;

(F) explore careers that provide service to children ages 3 through 5 years; and

(G) analyze the impact of technology on the growth and development of children ages 3 through 5 years such as personal usage, assistive technologies, and digital citizenship.

(8) The student analyzes the growth and development of children ages 6 through 11 years, including those with special needs. The student is expected to:

(A) analyze the physical, emotional, social, intellectual, and moral development needs of children ages 6 through 11 years;

(B) compare the roles of various school environments such as public, private, and home settings in the growth and development of children ages 6 through 11 years;

(C) evaluate the importance of and influences on individual and group identity such as self-concept theories, learning styles, group dynamics, cultural influences, and societal norms in relation to the growth and development of children ages 6 through 11 years;

(D) develop appropriate activities for meeting developmental needs of children ages 6 through 11 years such as physical exercise, language development, communication, listening skills, independence, conflict resolution, and self-discipline;

(E) create balanced meal plans that are developmentally appropriate for children ages 6 through 11 years, including children with special dietary needs such as food allergies and type I diabetes;

(F) explore careers that provide service to children ages 6 through 11 years;

(G) discuss legislation and public policies affecting children ages 6 through 11 years; and

(H) analyze the impact of technology on the growth and development of children ages 6 through 11 years such as personal usage, assistive technologies, and digital citizenship.

(9) The student analyzes the growth and development of children ages 12 through 19 years, including those with special needs. The student is expected to:

(A) summarize the physical, emotional, social, intellectual, and moral needs of children ages 12 through 19 years;

(B) assess the role of the various school environments such as public, private, and home environments on the growth and development of children ages 12 through 19 years;

(C) evaluate the importance of and influences on individual and group identity such as self-concept theories, group dynamics, cultural influences, and societal norms in relation to the growth and development of children ages 12 through 19 years;

(D) develop appropriate activities for meeting developmental needs of children ages 12 through 19 years such as physical, academic, professional, and social skills;

(E) create recipes for nutritious snacks or meals appropriate for preparation by children ages 12 through 19 years, including snacks or meals for individuals with special dietary needs such as food allergies or type I diabetes;

(F) explore careers that provide service to children ages 12 through 19 years;

(G) discuss legislation, child labor laws, and public policies affecting children ages 12 through 19 years;

(H) analyze the impact of technology such as personal usage, assistive technologies, digital citizenship, digital footprints, and social media on the growth and development of children ages 12 through 19 years; and

(I) propose short- and long-term career goals in child development.

§127.312. Child Guidance (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Child Development or Child Development Associate Foundations. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Child Guidance is a course that addresses the knowledge and skills related to child growth and guidance, equipping students to develop positive relationships with children and effective caregiver skills. Students use these skills to promote the well-being and healthy development of children, strengthen a culturally diverse society, and pursue careers related to the care, guidance, and education of children, including those with special needs. Instruction may be delivered through school-based laboratory training or through work-based delivery arrangements such as cooperative education, mentoring, and job shadowing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective verbal, nonverbal, written, and electronic communication skills;

(B) demonstrate effective collaboration skills within the workplace;

(C) identify characteristics of effective leaders and team members;

(D) explain the importance of time management to succeed in the workforce;

(E) apply work ethics and professionalism in a job setting; and

(F) use appropriate problem-solving and critical-thinking skills.

(2) The student practices ethical and legal responsibilities associated with providing childcare services. The student is expected to:

(A) apply ethical codes of conduct in a childcare setting;

(B) create coherent written communication between parents and childcare staff;

(C) identify regulatory and compliance guidelines for maintaining documentation in childcare settings, including educational, personnel, and public records;

(D) advocate through appropriate means for children when necessary;

(E) comply with laws and regulations related to childcare services;

(F) determine potential uses and management of technology, media, and resources to foster healthy child development; and

(G) employ safeguards to prevent misuse and abuse of technology and media with children.

(3) The student analyzes childcare options for children of various ages. The student is expected to:

(A) compare the financial considerations of childcare options;

(B) examine criteria for selecting quality childcare; and

(C) review minimum standards for licensing and regulations for center-based and home-based programs.

(4) The student analyzes responsibilities that promote health and wellness of children. The student is expected to:

(A) monitor student behavior for signs of physical illness and emotional disturbances in children;

(B) practice child guidance techniques that contribute to the health and wellness of children such as adequate rest, exercise, safety, and sanitation;

(C) apply procedures for creating safe environments for children; and

(D) create a meal plan for children, including nutritious snacks, following appropriate food guidelines.

(5) The student analyzes the effect of play in the development of children. The student is expected to:

(A) create examples of play that promote the physical, intellectual, emotional, and social development of children; and

(B) implement strategies to encourage socially appropriate constructive and creative play, including indoor and outdoor activities.

(6) The student applies appropriate guidance techniques for children of various ages and developmental levels, including those with special needs. The student is expected to:

(A) discuss the various types of guidance and their effects on children;

(B) determine and apply appropriate guidance techniques; and

(C) distinguish between guidance techniques and behavior that could be considered inappropriate, harmful, or abusive.

(7) The student will implement appropriate strategies and practices for optimizing the development of children ages birth through twelve months, including those with special needs. The student is expected to:

(A) create and implement activities for the development of sensory skills;

(B) create and implement activities for the development of language skills;

(C) create and implement activities for the development of physical and motor skills; and

(D) create and implement activities for the development of social skills.

(8) The student will implement appropriate strategies and practices for optimizing the development of children ages 13 months through 35 months, including those with special needs. The student is expected to:

(A) create and implement lesson plans for the development of physical skills;

(B) create and implement lesson plans for the development of vocabulary and language skills;

(C) create and implement lesson plans for the development of appropriate mathematics skills;

(D) create and implement lesson plans for the development of appropriate science skills; and

(E) create and implement lesson plans for the development of social and emotional skills.

(9) The student will implement appropriate strategies and practices for optimizing the development of children ages 3 through 5 years, including those with special needs. The student is expected to:

(A) create and implement lesson plans for the development of physical skills;

(B) create and implement lesson plans for the development of appropriate reading and language skills;

(C) create and implement lesson plans for the development of appropriate mathematics and problem-solving skills;

(D) create and implement lesson plans for the development of appropriate science skills; and

(E) create and implement lesson plans for the development of social and emotional skills.

(10) The student makes informed career decisions that reflect personal, family, and career goals. The student is expected to:

(A) analyze the impact of career decisions on personal and family goals;

(B) assess personal interests, aptitudes, and abilities needed in the childcare profession;

(C) develop short- and long-term career goals;

(D) evaluate employment and entrepreneurial opportunities; and

(E) evaluate educational requirements for early childhood development and services.

§127.313. Child Development Associate Foundations (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Education and Training or Principles of Human Services. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) The Child Development Associate Foundations course is a laboratory course addressing the knowledge and skills related to applying Child Development Associate Competency Standards in early childhood environments and understanding how these competencies help young children move with success from one developmental stage to the next.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student identifies professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate effective written communication;

(B) practice various forms of communication such as verbal and non-verbal communication skills used in education and career settings;

(C) apply decision-making skills;

(D) identify and exhibit characteristics of professionalism; and

(E) develop effective work ethic practices.

(2) The student understands the need for establishing a safe, healthy learning environment for young children. The student is expected to:

(A) describe a safe physical setting for an indoor classroom environment;

(B) describe a safe physical setting for an outdoor play environment;

(C) compare and contrast the learning environments for childcare settings such as preschool, infant-toddler, family childcare, and home visitor environments;

(D) identify practices that promote health and prevent illness in an early childhood classroom; and

(E) identify components of a learning environment that promotes engagement, play, exploration, and learning of all children, including children with special needs.

(3) The student recognizes the importance of advancing each child's physical and intellectual competence in the early childhood classroom through a variety of developmentally appropriate equipment, learning experiences, and teaching strategies. The student is expected to:

(A) analyze the methods for promoting physical development in young children;

(B) investigate strategies for promoting cognitive development in young children;

(C) investigate techniques for promoting language and early literacy in young children, including dual-language learners; and

(D) investigate and explain reasons for promoting creative expression and creative abilities in young children.

(4) The student analyzes social and emotional development in young children. The student is expected to:

(A) summarize the value of developing a warm, positive, supportive, and responsive relationship with each child;

(B) explain the value of helping each child learn about and take pride in the child's individual and cultural identity;

(C) research and explain the significance of helping each child function effectively in a group setting, express feelings, and acquire social skills; and

(D) identify and discuss adverse childhood experiences and their potential impact.

(5) The student discusses the need for providing positive guidance in an early childhood classroom. The student is expected to:

(A) summarize the importance of a classroom management plan;

(B) explain the importance of positively addressing challenging behaviors; and

(C) compare various positive guidance techniques.

(6) The student describes the benefits of objective observations and assessments of young children in the early childhood classroom. The student is expected to:

(A) investigate and compare various observation tools and strategies;

(B) analyze how observations impact curriculum planning and individualized teaching; and

(C) describe how objective observations are used to build productive relationships with families.

(7) The student examines the importance of positive and productive relationships with families of young children. The student is expected to:

(A) investigate and describe different family structures;

(B) describe ways to establish partnerships with families; and

(C) describe methods for effectively communicating with families.

(8) The student analyzes the components of operating an effective, professional early childhood program. The student is expected to:

(A) discuss the importance of establishing and maintaining professional relationships within an early childhood program;

(B) research various techniques for navigating disagreements or conflicts between personnel of an early childhood program;

(C) investigate the qualities of teaching with intentionality; and

(D) explain the importance of advocating for early childhood education.

(9) The student documents technical knowledge and skills. The student is expected to:

(A) assemble professional portfolio components such as a resume, samples of learning experiences, service-learning log, and assessment results; and

(B) present the portfolio to interested stakeholders such as industry professionals, parents, community members, campus teachers and administrators, and peers.

§127.314. Communication and Technology in Education (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Education and Training. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Communication and Technology in Education is an extended course of study designed to provide students with the fundamentals of planning, managing, and training services needed to provide learning support services in Kindergarten-Grade 12 classrooms. Students will develop knowledge and skills regarding the professional, ethical, and legal responsibilities in teaching related to educational technology; students will also understand laws and pedagogical justifications regarding classroom technology use. Students will develop knowledge of developmentally appropriate practice for age level when technology is used by learners. This course provides an opportunity for students to participate in training related to standards set by the International Society for Technology in Education.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate written communication skills;

(B) perform job-appropriate numerical and arithmetic application;

(C) practice various forms of communication such as verbal and non-verbal communication skills used in educational and career settings;

(D) exhibit teamwork skills;

(E) apply decision-making skills;

(F) identify and implement problem-solving techniques;

(G) describe conflict-management skills;

(H) describe and demonstrate professionalism;

(I) describe effective work ethic practices;

(J) demonstrate appreciation for diversity;

(K) participate in training, education, or certification for employment;

(L) demonstrate skills related to seeking and applying for employment; and

(M) create a resume and cover letter to document information such as work experience, licenses, certifications, and work samples.

(2) The student understands the professional, ethical, and legal responsibilities when communicating in the educational field. The student is expected to:

(A) apply communication standards that promote professional, ethical, and legal conduct;

(B) identify times when communication between school and parents/community is necessary;

(C) distinguish between appropriate and inappropriate uses of social media and other communication platforms and methods; and

(D) cite sanctions and consequences for educator misconduct such as those stemming from inappropriate relationships.

(3) The student understands multiple forms of communication necessary for effective teaching. The student is expected to:

(A) demonstrate effective verbal communication skills with various stakeholders such as students, educators, parents/guardians, community members, and other professionals;

(B) demonstrate active listening skills to obtain and clarify information;

(C) identify various forms of digital communication for educators such as email, blogs, wikis, podcasts, vlogs, digital streaming, infographics, digital portfolios, or social media;

(D) construct effective and professional electronic communication with parents and stakeholders such as newsletters, emails, and websites;

(E) demonstrate effective professional collaboration and communication such as participation in professional learning communities, peer-coaching, and mentoring;

(F) demonstrate effective student-teacher communication such as assignment feedback and one-on-one interaction;

(G) facilitate effective student group work and multiple strategies for student engagement; and

(H) differentiate between approaches to communication based on student needs, including considerations for special populations and nonverbal communication.

(4) The student applies digital literacy concepts to communication with students and stakeholders. The student is expected to:

(A) apply digital literacy practices in communications to students and stakeholders such as desktop publishing, elements of art and design, and design thinking;

(B) demonstrate appropriate search strategies for finding resources on the internet such as Boolean searches;

(C) compare various digital media technologies such as digital books, databases, websites, interactive games, and digital videos; and

(D) evaluate and select appropriate software for specific purposes such as communication and research.

(5) The student evaluates technology and applications for classroom use. The student is expected to:

(A) demonstrate understanding of laws regarding classroom technology use such as Family Educational Rights and Privacy Act (FERPA), Children's Online Privacy Protection Act (COPPA), end-user license agreements (EULAs), and age restrictions;

(B) apply laws related to the legal use of electronic materials such as copyright, fair use, public domain, and open source;

(C) evaluate usage of classroom technology using a model such as substitution augmentation modification redefinition (SAMR) and technological pedagogical content knowledge (TPaCK);

(D) describe methods for approval of technology use in the district such as inventorying, licensing, and budgeting; and

(E) identify classroom management strategies appropriate for technology use in the classroom.

(6) The student creates engaging lessons and lesson plans incorporating technology. The student is expected to:

(A) analyze the relationship between technology and student engagement in the classroom;

(B) design learning experiences that incorporate 21st century learning skills such as creativity, collaboration, critical thinking, communication, and resiliency;

(C) create lessons using different types of technology such as presentation software, spreadsheet software, image editing software, video creation software, polling software, and word processing software;

(D) apply technology to assess student learning at the beginning of, during, and at the end of a lesson;

(E) design authentic learning experiences that align with content-area Texas Essential Knowledge and Skills and use technology to maximize active, deep learning across grade levels to show appropriate use based on age;

(F) create an interactive lesson that utilizes appropriate technology; and

(G) create a differentiated lesson that incorporates the appropriate use of technology.

§127.315. Instructional Practices (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: At least one credit in a course from the education and training career cluster. Recommended prerequisites: Principles of Education and Training, Human Growth and Development, or Child Development. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Instructional Practices is a field-based (practicum) course that provides students with background knowledge of child and adolescent development as well as principles of effective teaching and training practices. Students work under the joint direction and supervision of both a teacher with knowledge of early childhood, middle childhood, and adolescence education and exemplary educators or trainers in direct instructional roles with elementary-, middle school-, and high school-aged students. Students learn to plan and direct individualized instruction and group activities, prepare instructional materials, develop materials for educational environments, assist with record keeping, and perform other duties of teachers, trainers, paraprofessionals, or other educational personnel.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by the education profession and other related occupations. The student is expected to:

(A) demonstrate written communication;

(B) perform job-appropriate numerical and arithmetic application;

(C) practice various forms of communication such as verbal and non-verbal communication skills and appropriate uses of social media in educational and career settings;

(D) exhibit teamwork skills;

(E) apply decision-making skills;

(F) implement problem-solving techniques;

(G) acquire conflict-management skills;

(H) develop leadership skills;

(I) demonstrate professionalism to include appropriate attire expected of professionals in educational settings; and

(J) develop effective work ethic practices.

(2) The student identifies strategies that promote health and wellness by balancing the unique challenges of being an educator with personal responsibilities. The student is expected to:

(A) identify signs of personal stress and anxiety;

(B) choose appropriate boundaries for a healthy work-life balance; and

(C) implement strategies to manage health and wellness.

(3) The student explores the teaching and training profession. The student is expected to:

(A) demonstrate an understanding of the historical foundations of education and training in the United States;

(B) summarize and apply acquired pedagogical knowledge and skills needed by teaching and training professionals;

(C) identify qualities of effective schools;

(D) discuss non-traditional settings for teaching and training careers such as those in corporations, community outreach programs, nonprofits, and government entities; and

(E) formulate a professional philosophy of education based on a personal set of beliefs.

(4) The student understands the learner and the learning process. The student is expected to:

(A) relate and implement principles and theories of human development to teaching and training situations;

(B) relate and implement principles and theories about the learning process to teaching and training situations;

(C) demonstrate and implement behaviors and skills that facilitate the learning process;

(D) explain the relationship between effective instructional practices and providing support for learning differences, learner exceptionality, and learners with special needs;

(E) evaluate backgrounds, strengths, and skills of students when planning instruction; and

(F) demonstrate techniques for developing effective relationships with students that foster mutual respect and rapport and result in effective instruction.

(5) The student interacts effectively in the role of an educator. The student is expected to:

(A) demonstrate effective interaction skills with stakeholders such as students, educators, parents/guardians, community members, and other professionals;

(B) demonstrate methods for promoting stakeholder partnerships in improving educational outcomes; and

(C) describe the procedure for handling and reporting physical or emotional abuse.

(6) The student plans and develops effective instruction. The student is expected to:

(A) explain the role of the Texas Essential Knowledge and Skills in planning and evaluating instruction;

(B) explain the rationale for having a fundamental knowledge of the subject matter in order to plan, prepare, and deliver effective instruction;

(C) explain the rationale for and process of instructional planning components such as vertical alignment and scope and sequence;

(D) describe principles and theories that impact instructional planning;

(E) create clear short-term and long-term learning objectives that are developmentally appropriate for students; and

(F) demonstrate lesson planning to meet instructional goals.

(7) The student creates an effective learning environment. The student is expected to:

(A) describe and implement a safe and an effective learning environment that incorporates the principles of universal design;

(B) analyze and evaluate strategic student grouping techniques that result in effective instruction;

(C) demonstrate teacher and trainer practices that promote an effective learning environment;

(D) evaluate materials and equipment to determine age and grade level appropriateness and to meet the needs of diverse learners;

(E) identify classroom management techniques that promote an effective learning environment; and

(F) demonstrate communication, conflict-management, and mediation techniques supportive of an effective learning environment.

(8) The student assesses teaching and learning. The student is expected to:

(A) describe the role of assessment as part of the learning process;

(B) create assessments to measure student learning;

(C) analyze the assessment process;

(D) use appropriate assessment strategies in an instructional setting; and

(E) use assessment data to evaluate and revise lesson plans.

(9) The student understands the relationship between school and society. The student is expected to:

(A) explain the relationship between school and society;

(B) recognize and use resources for professional growth such as family, school, and community resources; and

(C) collaborate with stakeholders such as family, school, and community to promote learning.

(10) The student develops technology skills. The student is expected to:

(A) describe the role of technology in the instructional process;

(B) use technology applications appropriate for specific subject matter and student needs; and

(C) demonstrate skillful use of technology as a tool for instruction, evaluation, and management.

(11) The student understands the professional, ethical, and legal responsibilities in teaching and training. The student is expected to:

(A) describe teacher and trainer practices that promote professional and ethical conduct;

(B) analyze professional and ethical standards that apply to educators and trainers;

(C) analyze situations requiring decisions based on professional, ethical, and legal considerations; and

(D) analyze expected effects of compliance and noncompliance with the Code of Ethics and Standard Practices for Texas Educators.

(12) The student participates in field-based experiences in education and training. The student is expected to:

(A) apply instructional strategies and concepts within a local educational or training facility; and

(B) document, assess, and reflect on instructional experiences.

(13) The student documents technical knowledge and skills. The student is expected to:

(A) update professional portfolio components such as resume, samples of work, service-learning log, assessment results, and mock scholarship applications; and

(B) present the portfolio to interested stakeholders.

(14) The student demonstrates the knowledge and skills needed to provide meaningful, specific, and timely feedback to students, families, and other school personnel on the growth of students in relation to classroom goals while maintaining student confidentiality. The student is expected to:

(A) explain the role feedback plays in the learning process;

(B) provide guidance and feedback to motivate student behavior and outcomes;

(C) demonstrate methods of providing feedback to students such as checklists, classroom processes, and written documentation;

(D) demonstrate methods of accepting and reflecting on feedback to determine plans for improvement of educational outcomes; and

(E) apply questioning strategies to facilitate student discussion.

(15) The student demonstrates knowledge and understanding of teacher responsibility with regard to accommodations and modifications for students with special needs. The student is expected to:

(A) identify the Individuals with Disabilities Education Act and Section 504 of the Rehabilitation Act of 1973;

(B) explain the structure and components of an individualized education program (IEP);

(C) explain the structure and components of a Section 504 Plan; and

(D) compare accommodations and modifications for students with special needs.

(16) The student demonstrates proper record-keeping strategies needed by teachers to demonstrate evidence of student progress. The student is expected to:

(A) understand and demonstrate the use of learning management systems and record-keeping tools;

(B) outline school district policies related to teacher record keeping; and

(C) identify the essential components of behavioral and academic records according to state and school district policy.

(17) The student uses standard observation techniques to observe a variety of educational settings. The student is expected to:

(A) evaluate teaching styles, learning environments, and classroom management utilizing observation checklists or other observation and evaluation tools; and

(B) use observation and evaluation reports to reflect on teaching practices and develop strategies for improvement.

(18) The student assesses the benefits of how a mentor relationship impacts a teaching career. The student is expected to:

(A) recognize the benefits of a mentor relationship such as increased teacher retention, mentor guidance, and coaching; and

(B) seek out and foster mentorship opportunities.

(19) The student analyzes teacher employment requirements and professional growth opportunities for those in the education

profession such as required education and certification. The student is expected to:

(A) describe required education needed to become a certified teacher;

(B) explain the steps for becoming a certified teacher in Texas;

(C) compare certification requirements for various content and grade level areas of interest; and

(D) identify various financial aid sources available for teacher candidates such as scholarships, student loans, and student loan forgiveness options once certified.

§127.343. Practicum in Early Learning (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Child Guidance. Recommended prerequisites: Child Development or Child Development Associate Foundations. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Practicum in Early Learning is a field-based course that provides students background knowledge of early childhood development principles as well as principles of effective teaching and training practices. Students in the course work under the joint direction and supervision of both a teacher facilitator and an exemplary industry professional. Students learn to plan and direct individualized instruction and group activities, prepare instructional materials, assist with record keeping, make physical arrangements, and complete other responsibilities of early learning teachers, trainers, paraprofessionals, or other educational personnel.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate advanced written communication skills;

(B) perform job-appropriate mathematical applications;

(C) demonstrate appropriate forms of communication such as verbal and non-verbal communication used in educational and career settings;

(D) promote and exhibit teamwork skills;

(E) analyze and apply decision-making skills;

(F) implement problem-solving techniques effectively;

(G) analyze and demonstrate conflict-management skills;

(H) assess personal leadership skills;

(I) describe and demonstrate professionalism, including time-management skills; and

(J) analyze and demonstrate effective work ethic practices.

(2) The student explores the early childhood education profession. The student is expected to:

(A) analyze current trends and issues that impact early childhood education such as political, societal, and economic trends and issues;

(B) analyze qualities of effective early childhood education professionals and programs;

(C) develop a written summary of professional beliefs and values about early childhood education, how young children learn, and the role of an early educator;

(D) explore the educational and academic requirements and possible degrees and certifications available in early childhood education;

(E) develop and refine a personal career plan in preparation for a career in the field of early childhood development or education;

(F) explore and identify early childhood development or education opportunities in non-traditional settings such as those in corporations, community outreach programs, nonprofits, and government entities; and

(G) explore educational high-needs and teacher-specialty areas such as special education and bilingual and English as a second language education programs.

(3) The student understands the learner and learning process. The student is expected to:

(A) apply and reflect on the application of principles and theories of human development appropriate to early learning situations;

(B) apply and reflect on the application of principles and theories about the learning process to specific early learning situations;

(C) analyze the dynamics of educator and student behaviors that facilitate the early learning process;

(D) analyze teaching skills that facilitate the early learning process and document field-learning experiences; and

(E) demonstrate and evaluate effective instructional practices to accommodate diversity such as learning differences, learner exceptionality, and special-needs considerations.

(4) The student plans and implements effective instruction. The student is expected to:

(A) demonstrate and evaluate techniques promoting early childhood growth and development skills such as language, literacy, numeracy, motor learning, and cross-disciplinary content areas;

(B) develop age-appropriate lesson plans and instructional materials that align to student learning goals;

(C) evaluate the effectiveness of lesson plans and instructional strategies; and

(D) explain how learner and professional feedback is used to guide selection and adjustment of instructional strategies.

(5) The student creates and maintains an effective learning environment. The student is expected to:

(A) create and maintain a safe and an effective learning environment;

(B) integrate teacher or trainer practices that promote an effective learning environment;

(C) apply classroom management techniques that promote an effective learning environment; and

(D) demonstrate specific conflict-management and mediation techniques supportive of an effective learning environment.

(6) The student assesses instruction and learning. The student is expected to:

(A) develop and apply formal and informal assessments to track and monitor student learning and progress; and

(B) analyze assessment data to inform and modify instruction.

(7) The student understands the relationship between school, families, and community in early learning. The student is expected to:

(A) select family services and school and community resources to promote student growth;

(B) promote learning and build support through positive school partnership activities with stakeholders such as families, schools, communities, and business/industry; and

(C) collaborate with professional early learning community members to meet the needs of students and families.

(8) The student develops technology skills appropriate for effectively supporting students in the classroom. The student is expected to:

(A) utilize a variety of assistive technologies that are age-appropriate for specific student learning needs, including for early learners with special needs; and

(B) integrate various educational technologies as tools for instruction, evaluation, communication, and management.

(9) The student understands the professional, ethical, and legal responsibilities of early childhood professionals. The student is expected to:

(A) demonstrate and evaluate effective interaction skills with stakeholders such as students, educators, parents/guardians, community members, and other professionals;

(B) analyze professional and ethical standards that apply to early childhood professionals; and

(C) analyze situations requiring decisions based on professional, ethical, and legal considerations.

(10) The student explores the need and opportunities for continued professional development for early education professionals. The student is expected to:

(A) identify strategies and resources for the professional development of early education professionals such as research and assessment; and

(B) create a plan for professional career growth, including short-term and long-term goals.

(11) The student understands facility operations, including nutrition, program management, and safety guidelines. The student is expected to:

(A) explain the importance of accurate record maintenance such as personnel, student, incident, and facility documentation;

(B) create a meal plan that promotes good nutrition and wellness;

(C) explain the importance of allocation of facility resources and budget management; and

(D) explain the importance of safety procedures and regulations.

(12) The student continues to participate in field-based experiences in early childhood settings. The student is expected to:

(A) apply instructional strategies and concepts within a local educational or training facility; and

(B) document, assess, and reflect on instructional experiences.

(13) The student documents technical knowledge and skills. The student is expected to:

(A) gather artifacts and documentation that support attainment of technical skill competencies;

(B) update a professional portfolio to include components such as a resume, samples of work, service-learning log, recognitions, awards, scholarship essays, letters of recommendation, certifications, evaluations, and Child Development Associate (CDA) requirements; and

(C) present a portfolio to interested stakeholders.

§127.344. Extended Practicum in Early Learning (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Child Guidance. Recommended prerequisites: Child Development or Child Development Associate Foundations. Corequisite: Practicum in Early Learning. This course must be taken concurrently with Practicum in Early Learning and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Extended Practicum in Early Learning is a field-based internship that provides students background knowledge of early childhood development principles as well as principles of effective teaching and training practices. Students in the course work under the joint direction and supervision of both a teacher facilitator and an exemplary industry professional. Students learn to plan and direct individualized instruction and group activities, prepare instructional materials, assist with record keeping, make physical arrangements, and complete other responsibilities of early learning teachers, trainers, paraprofessionals, or other educational personnel.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to early childhood education professions;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as leadership, appreciation of diversity, conflict-management, work ethic, and adaptability with increased fluency;

(D) demonstrate technology applications skills such as effective use of social media, email, internet, publishing tools, presentation tools, spreadsheets, or databases with increased fluency to enhance work products; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) present information formally and informally;

(C) analyze, interpret, and communicate information; and

(D) apply active listening skills to obtain and clarify information.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands the professional, ethical, and legal responsibilities in early childhood education professions. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) show integrity by choosing the ethical course of action when making decisions;

(C) demonstrate proper etiquette and knowledge of acceptable-use policies when using networks, especially resources on the internet and intranet; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(5) The student continues to participate in field-based experiences in early childhood education and education and training professions. The student is expected to:

(A) apply instructional strategies and concepts with increased fluency within a local educational or training facility;

(B) apply principles and theories that impact instructional planning;

(C) develop curriculum and related materials to support instruction that aligns with current child development industry standards;

(D) demonstrate competency in foundation and enrichment subject areas;

(E) create lesson plans that meet instructional goals;

(F) document, assess, and reflect on instructional experiences; and

(G) collect representative work samples.

§127.345. Practicum in Education and Training (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Instructional Practices. Recommended prerequisites: Principles of Education and Training, Human Growth and Development, and Child Development. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Practicum in Education and Training is a field-based course that provides students background knowledge of child and adolescent development principles as well as principles of effective teaching and training practices. Students in the course work under the joint direction and supervision of both a teacher with knowledge of early childhood, middle childhood, and adolescence education and exemplary educators in direct instructional roles with elementary-, middle school-, and high school-aged students. Students learn to plan and direct individualized instruction and group activities, prepare instructional materials, assist with record keeping, make physical arrangements, and perform other duties of classroom teachers, trainers, paraprofessionals, or other educational personnel.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by teaching and training profession. The student is expected to:

(A) demonstrate advanced written communication skills;

(B) perform job-appropriate numerical and arithmetic application;

(C) demonstrate appropriate forms of communication such as verbal and non-verbal communication used in educational and career settings;

(D) promote and exhibit teamwork skills;

(E) analyze and apply decision-making skills;

(F) implement problem-solving techniques effectively;

(G) analyze and demonstrate conflict-management skills;

(H) assess personal leadership skills in education settings;

(I) describe and demonstrate professionalism; and

(J) analyze and demonstrate effective work ethic practices.

(2) The student analyzes strategies that promote health and wellness to address the unique challenges in balancing work and personal responsibilities for educators. The student is expected to:

(A) examine signs of personal stress and anxiety;

(B) describe and develop appropriate boundaries for a healthy work-life balance; and

(C) identify and implement strategies to manage health and wellness.

(3) The student explores the teaching and training field and profession. The student is expected to:

(A) analyze current trends and issues that impact education such as political, societal, and economic trends and issues;

(B) analyze practices of effective teaching and training professionals;

(C) analyze qualities of effective schools;

(D) develop a written summary of professional beliefs and values about education and training;

(E) determine the educational and academic requirements and possible degrees and certifications necessary for a profession of interest in teaching and training;

(F) refine a personal career plan in preparation for a career in the field of education or training;

(G) research and identify teaching and training opportunities in non-traditional settings such as those in corporations, community outreach programs, nonprofits, and government entities; and

(H) research and identify educational high-needs and teacher-shortage areas.

(4) The student understands the learner and learning process. The student is expected to:

(A) apply principles and theories of human development appropriate to specific teaching or training situations;

(B) apply principles and theories about the learning process to specific teaching or training situations;

(C) analyze the dynamics of educator and student behaviors that facilitate the learning process;

(D) analyze teaching skills that facilitate the learning process; and

(E) demonstrate and evaluate effective instructional practices to accommodate diversity such as learning differences, learner exceptionality, and special needs.

(5) The student interacts effectively in the role of an educator. The student is expected to:

(A) demonstrate and evaluate effective interaction skills with stakeholders such as students, educators, parents/guardians, community members, and other professionals; and

(B) demonstrate and evaluate techniques that promote literacy and numeracy.

(6) The student plans and uses effective instruction. The student is expected to:

(A) apply principles and theories that impact instructional planning;

(B) use lesson planning tools such as unit plans and scope and sequence and vertical alignment documents;

(C) develop instructional materials that align with the Texas Essential Knowledge and Skills;

(D) demonstrate competency in foundation and enrichment subject areas;

(E) apply research-based practices to create lessons plans that meet instructional goals;

(F) analyze the development of effective instructional strategies;

(G) evaluate and analyze effectiveness of lessons plans and instructional strategies used in a lesson or series of lessons; and

(H) explain how learner and professional feedback is used to guide selection and adjustment of instructional strategies.

(7) The student creates and maintains an effective learning environment. The student is expected to:

(A) apply principles of universal design to create and maintain a safe and effective learning environment;

(B) integrate teacher or trainer practices that promote an effective learning environment;

(C) apply classroom management techniques that promote an effective learning environment; and

(D) demonstrate specific conflict-management and mediation techniques supportive of an effective learning environment.

(8) The student assesses instruction and learning. The student is expected to:

(A) develop and apply formative and summative assessments to foster student learning;

(B) use assessment strategies to promote personal growth and teaching or training improvement;

(C) use self-reflection techniques to promote personal growth and teaching or training improvement; and

(D) use classroom and standardized test assessment data to drive instructional strategy.

(9) The student understands the relationship between school and society. The student is expected to:

(A) identify ways to support learning through advocacy;

(B) identify and select family, school, and community resources that support learning; and

(C) promote learning and build support through positive school partnership activities with stakeholders such as families, schools, communities, and business/industry.

(10) The student develops technology skills. The student is expected to:

(A) access and use current technology applications appropriate for specific subject matter and student needs; and

(B) integrate the use of technology as a tool for instruction, evaluation, and management effectively.

(11) The student understands the professional, ethical, and legal responsibilities in teaching and training. The student is expected to:

(A) analyze teacher and trainer practices that promote professional and ethical conduct;

(B) analyze professional and ethical standards that apply to educators and trainers;

(C) analyze situations requiring decisions based on professional, ethical, and legal considerations; and

(D) analyze potential consequences related to non-compliance with the Code of Ethics and Standard Practices for Texas Educators.

(12) The student explores the need and opportunities for continued professional development for educators and trainers. The student is expected to:

(A) identify strategies and resources for the professional development of educators or trainers such as research and assessment;

(B) demonstrate teacher or trainer practices that promote ongoing professional development and lifelong learning; and

(C) develop a plan for professional growth.

(13) The student participates in field-based experiences in education or training. The student is expected to:

(A) apply instructional strategies and concepts within a local educational or training facility; and

(B) document, assess, and reflect on instructional experiences.

(14) The student documents technical knowledge and skills. The student is expected to:

(A) gather artifacts and documentation that support attainment of technical skill competencies;

(B) update a professional portfolio to include components such as a resume, samples of work, service-learning logs, recognitions, awards, scholarship essays, letters of recommendation, certifications, and evaluations; and

(C) present a professional portfolio to interested stakeholders.

§127.346. Extended Practicum in Education and Training (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Education and Training Career Cluster. Prerequisite: Instructional Practices. Recommended prerequisites: Principles of Education and Training and Human Growth and Development. Corequisite: Practicum in Education and Training. This course must be taken concurrently with Practicum in Education and Training and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Education and Training Career Cluster focuses on planning, managing, and providing education and training services and related learning support services.

(3) Extended Practicum in Education and Training is a field-based internship that provides students background knowledge of child and adolescent development principles as well as principles of effective teaching and training practices. Students in the course work under the joint direction and supervision of both a teacher with knowledge of early childhood, middle childhood, and adolescence education and exemplary educators in direct instructional roles with elementary-, middle school-, and high school-aged students. Students

learn to plan and direct individualized instruction and group activities, prepare instructional materials, assist with record keeping, make physical arrangements, and complete other responsibilities of classroom teachers, trainers, paraprofessionals, or other educational personnel.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to education and training;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as leadership, appreciation for diversity, conflict management, work ethic, and adaptability with increased fluency;

(D) demonstrate technology applications skills such as effective use of social media, email, Internet, publishing tools, presentation tools, spreadsheets, or databases with increased fluency to enhance work products; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) effectively present information formally and informally;

(C) analyze, interpret, and effectively communicate information; and

(D) apply active listening skills to obtain and clarify information.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands the professional, ethical, and legal responsibilities in education and training. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) show integrity by choosing the ethical course of action when making decisions;

(C) demonstrate proper etiquette and knowledge of acceptable-use policies when using networks, especially resources on the Internet and intranet; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(5) The student continues to participate in field-based experiences in education and training. The student is expected to:

(A) apply instructional strategies and concepts with increased fluency within a local educational or training facility;

(B) apply principles and theories that impact instructional planning;

(C) develop curriculum and related materials to support instruction that align with the Texas Essential Knowledge and Skills;

(D) demonstrate competency in foundation and enrichment subject areas;

(E) create lessons plans that meet instructional goals;

(F) document, assess, and reflect on instructional experiences; and

(G) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER H. ENERGY

19 TAC §§127.351 - 127.357

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.351. Foundations of Energy (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2020-2021 school year.

(b) General requirements This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of the course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and success in current or emerging energy professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) In Foundations of Energy, students will conduct laboratory and field investigations, use scientific practices during investigations, and make informed decisions using critical thinking and scientific problem solving. Various systems will be described in terms of energy. Students will study a variety of topics that include energy transformation, the law of conservation of energy, energy efficiency, interrelationships among energy resources and society, and sources and flow of energy through the production, transmission, processing, and use of energy. Students will apply these concepts and perform investigations and experiments at least 40% of the time using safe practices.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) evaluate the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession;

(B) cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills by prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results;

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed;

(F) discuss and exhibit teamwork and leadership skills necessary for the workplace;

(G) define and demonstrate effective problem-solving skills; and

(H) apply computer-based skills and other technologies relevant to the energy industry.

(2) The student analyzes current and future career opportunities in the energy sector, including oil and gas exploration and production, refining and chemical processing, and renewable energy. The student is expected to:

(A) evaluate energy systems and identify careers within those systems;

(B) examine past market and employment trends in the energy sector;

(C) discuss current issues in energy production and predict future needs and employment opportunities in this field;

(D) identify career development, education, credentialing, and entrepreneurship opportunities in the energy sector; and

(E) apply competencies related to resources, information, and systems of operation in the energy sector.

(3) The student conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during laboratory and field investigations;

(B) use a wide variety of additional course apparatuses, equipment, techniques, and procedures as appropriate such as satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), scientific probes, microscopes, telescopes, modern video and image libraries, weather stations, fossil and rock kits, tectonic plate models, and planetary globes;

(C) engage in meaningful hands-on, minds-on conceptual activities in the areas of energy; and

(D) demonstrate an understanding of the use and conservation of resources and proper disposal or recycling of materials.

(4) The student uses critical thinking and problem solving to make informed decisions within and outside the classroom. The student is expected to:

(A) communicate and present valid conclusions from energy information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

(B) explain the impacts of energy discoveries by a variety of historical and contemporary scientists and entrepreneurs on current societal attitudes;

(C) compare advantages and disadvantages in the use of the various energy sources; and

(D) distinguish between scientific decision making (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(5) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:

(A) develop written and oral presentation skills related to energy issues and solutions by researching and describing the history of energy production in Texas and contributions of scientists and entrepreneurs; and

(B) develop data retrieval and analysis skills related to energy production and use by researching information about energy sources, including renewable and non-renewable sources, and energy efficiency and how each source is used to produce electrical energy.

(6) The student examines and explains concepts and procedures related to energy. The student is expected to:

(A) identify general purposes for energy, including transportation, light, cooking, heating or cooling, entertainment, and cleaning;

(B) explain and demonstrate transformations among various energy forms, including potential, kinetic, chemical, mechanical, electrical, and light energy;

(C) analyze the role of gravity in transforming energy;

(D) investigate and calculate the relationship between work, potential energy, and kinetic energy;

(E) examine various types of energy transfer mechanisms, determine the original form of energy and what form that energy is being transformed into, and use examples to analyze and calculate the relationships among work, kinetic energy, and potential energy;

(F) describe and apply the law of conservation of energy; and

(G) use basic calorimetry to determine the amount of energy stored in substances such as coal.

(7) The student understands the basics of fluid mechanics related to energy discovery, production, and transportation. The student is expected to:

(A) identify fluids used as fuels, including liquids and gases;

(B) identify fluids used in the discovery, production, and transportation of energy sources;

(C) explain capillary action and relate it to energy production; and

(D) explain, using formulas, how pressure and temperature affect the behavior of fluids.

(8) The student understands how and where energy is produced and identifies Texas energy resources. The student is expected to:

(A) research the location of energy resources and power production plants in Texas;

(B) compile information on the history of energy production in Texas and describe its past and current importance to the U.S. economy;

(C) investigate the role of technology in the future development of energy usage;

(D) identify ways to conserve energy;

(E) map the major sources of energy used in Texas;

(F) assess the impact of the various energy sources on the economy in Texas;

(G) analyze how supply and demand impacts Texas's economy in relation to energy; and

(H) compare and contrast the impact of energy sources and supply and demand in Texas with national and global data.

(9) The student investigates how energy resources such as water, oil, and natural gas are stored underground in rock formations. The student is expected to:

(A) assess the properties and geological histories of rocks and rock formations that enable energy storage;

(B) determine the physical properties of permeability and porosity of rock formations and relate these properties to the amount of water, oil, and natural gas held in these formations;

(C) explain how aquifers function and locate major aquifers in Texas; and

(D) investigate how innovations such as hydraulic fracturing and high-power transmission lines have made massive energy resources such as oil, gas, wind, and electricity available in Texas.

(10) The student knows differences between renewable and non-renewable resources. The student is expected to:

(A) identify and describe various renewable and non-renewable resources;

(B) describe and compare the energy efficiency of renewable and non-renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind;

(C) examine the benefits and hazards of using renewable and non-renewable energy sources;

(D) research methods by which benefits can be increased and hazards reduced in the use of renewable and non-renewable energy sources;

(E) examine different viewpoints of an energy source regarding availability, cost, potential pollution, impact to plant and animal habitat, and sustainability;

(F) analyze an energy source's relative availability and renewability and discuss how these factors inform decision making regarding a source's use; and

(G) analyze changing social perspectives and how they can influence scientific practices.

(11) The student knows how energy impacts the student's life and the role energy plays in international relations, the environment, standards of living, and the economy. The student is expected to:

(A) analyze the impact energy has on the environment;

(B) research and discuss the ethical and social issues surrounding Earth's energy resources;

(C) analyze the advantages and disadvantages of an energy source's long-term use;

(D) explain the relationship between energy and quality of life;

(E) research and describe the connection between energy production, transmission, processing, and marketing; and

(F) analyze the impact and effectiveness of the measures taken by the United States and other countries to use energy to reduce greenhouse gases, improve water and air quality, and extend life expectancy.

(12) The student investigates extended learning experiences such as career and technical student organizations and area energy museums and displays. The student is expected to:

(A) identify a minimum of three energy professionals for potential speaking invitations either in person or via the Internet;

(B) research and describe an energy-related organization such as a museum or local business; and

(C) compare educational requirements for different energy industry jobs in Texas.

§127.352. Oil and Gas Production I (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) In Oil and Gas Production I, students will identify specific career opportunities and skills, abilities, tools, certification, and safety measures associated with each career. Students will also understand components, systems, equipment, and production and safety regulations associated with oil and gas wells. To prepare for careers in oil and gas production, students must attain academic skills and knowledge, acquire technical knowledge and skills related to oil and gas production and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;

(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;

(C) demonstrate knowledge of personal and occupational safety, environmental regulations, and first-aid policy in the workplace;

(D) analyze employers' expectations such as appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(E) demonstrate leadership skills to accomplish organizational goals and objectives.

(2) The student understands the history of and process for drilling a well. The student is expected to:

(A) describe the history of drilling for petroleum in the United States and abroad;

(B) describe and appraise routine drilling operations, offshore drilling, and new drilling technologies;

(C) describe the tools and techniques for directional drilling;

(D) examine the differences between fishing, retrieving, and repairing pipe;

(E) describe the methods for completing a well in order for production to begin;

(F) assess fluid pressure;

(G) determine how the flow is initiated in a new well;

(H) differentiate between major components of a well and discuss the purpose, design, and operation of each component;

(I) describe activities associated with completing a well;

(J) describe the well completion processes and equipment;

(K) summarize the instruments and techniques used when logging and testing during the drilling and completion of a well;

(L) list the factors that are analyzed when studying a poorly producing well; and

(M) identify the responsibilities, characteristics, abilities, and work behaviors of personnel that are involved in well service.

(3) The student discusses and identifies components, systems, equipment, production, and safety regulations associated with oil and gas wells. The student is expected to:

(A) identify the major systems and equipment used in the production of oil and gas;

(B) identify and describe the wellhead equipment that controls fluid flow;

(C) trace the process flow through the oil and gas production systems and equipment;

(D) discuss the purpose of the wellhead and identify the major components;

(E) describe the purpose, design, and operation of each wellhead component;

(F) compare and contrast the major differences in wellhead construction;

(G) compare and contrast onshore and offshore facilities;

(H) compare and contrast oil and gas regions within the United States;

(I) describe the safety, health, and environmental concerns associated with working around a wellhead;

(J) explain how the wellhead system affects other production systems tied to the wellhead;

(K) describe the activities associated with monitoring and regulating well flow;

(L) describe the wellhead maintenance activities performed by the production technician;

(M) operate and troubleshoot a wellhead using a computer simulator, pilot plant, or tabletop unit; and

(N) identify the operating conditions that would warrant a manual or automatic shut-in of a well and steps involved in a manual shut-in of a well.

(4) The student discusses safety issues related to the oil and gas industry. The student is expected to:

(A) describe the safety, health, and environmental concerns associated with drilling, production, and maintenance; and

(B) research safety standards in the petroleum industry such as the Bureau of Safety and Environmental Enforcement (BSEE), United States Coast Guard (USCG), American Petroleum Institute (API), Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and others.

§127.353. Oil and Gas Production II (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Oil and Gas Production I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) In Oil and Gas Production II, students will gain knowledge of the specific requirements for entry into post-secondary education and employment in the petroleum industry; research and discuss petroleum economics; research and discuss the modes of transportation in the petroleum industry; research and discuss environmental, health, and safety concerns; research and discuss different energy sources; and prepare for industry certification. To prepare for careers in oil and gas production, students must attain academic skills and knowledge, acquire technical knowledge and skills related to oil and gas production and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;

(B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;

(C) apply technology skills to create an electronic portfolio of skills and abilities;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;

(E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and

(F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student researches and discusses the modes of transportation and environmental, health, and safety concerns. The student is expected to:

(A) describe evolution of transportation in the petroleum industry;

(B) research and access the various ground methods of transportation;

(C) survey health and safety policies, procedures, regulations, and practices as they relate to transportation in the petroleum industry;

(D) research and discuss petroleum economics;

(E) compare marketing, sales, and distribution of petroleum products;

(F) identify supply chain businesses that create new supplies of oil and gas;

(G) identify supply creation companies and how they operate;

(H) discuss the factors in investment decision making; and

(I) calculate rates of return to evaluate prospects.

(3) The student researches the different methods of disposing of oil and gas waste and methods of cleanup. The student is expected to:

(A) discuss the disposal methods of exploration and production wastes;

(B) identify cleanup methods for blowouts and spills; and

(C) identify refining processes that minimize environmental impact.

(4) The student researches and identifies the different energy sources and priorities for the oil and gas industry. The student is expected to:

(A) research the petroleum industry to identify renewable energy sources;

(B) present the challenges and priorities of the petroleum industry;

(C) research the critical technologies needed in the future; and

(D) research the nontechnical solutions to energy needs.

§127.354. Oil and Gas Production III (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2020-2021 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Oil and Gas Production II. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) In Oil and Gas Production III, students will gain knowledge of hydraulic and pneumatic systems and skill requirements to work in oil and gas and related industries. Students complete an advance core curriculum that includes hydraulic and pneumatic systems involved in oil and gas production. This program is designed to train students in all areas of down and mid-stream operation skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;

(B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;

(C) apply technology skills to create an electronic portfolio of skills and abilities;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;

(E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and

(F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student identifies the importance of oil field hydraulics and its contributions to the oil and gas industry. The student is expected to:

(A) identify companies that contributed to oil field hydraulics and fracturing and discuss those contributions;

(B) explain the history of hydraulic fracturing and its importance to the oil field industry and the process of producing wells in North America;

(C) describe the impact of hydraulics on energy in North America; and

(D) explain the impact on new oil and natural gas production in North America as it relates to technology.

(3) The student demonstrates an understanding of pneumatics and hydraulics and their significance and application in the petroleum engineering industry. The student is expected to:

(A) describe and define the basic functional components of the pneumatic system and the function of a pneumatic schematic;

(B) explain pneumatic pressure and identify its unit of measure during application procedures;

(C) explain the importance of a hydraulic system and identify the hydraulic system's five basic components (hydraulic pump, control valves, actuators, reservoir, and accumulators), including the hydraulic system's significance in the petroleum engineering industry; and

(D) define hydraulics and identify its unit of measure during application procedures.

(4) The student explains and demonstrates the six pneumatic safety rules and the importance of the rules in the petroleum industry. The student is expected to:

(A) explain the six pneumatic safety rules, including wearing safety glasses when building and operating pneumatics, keeping fingers clear of piston rods, never blowing compressed air at anyone, not turning the main air supply on until a circuit is connected, turning the air off if air is leaking from a joint, and turning the air off before altering a circuit;

(B) demonstrate safety precaution measures in pneumatics and discuss the importance of safety equipment during this process; and

(C) demonstrate and explain the importance of a pressure regulator in pneumatics, including the historical significance.

(5) The student demonstrates an understanding of basic cylinder circuits and pneumatic cylinder circuits and their significance and applications in the petroleum engineering industry. The student is expected to:

(A) explain the functions of the operation of a double acting pneumatic cylinder and each of its functions;

(B) describe the operation of five-way three-position directional control valves (DCV);

(C) describe the function of a pneumatic quick-connect fitting; and

(D) demonstrate how to safely connect the pneumatic circuit with a quick-connect fitting.

(6) The student understands the impact of a hydraulic schematic in oil field applications. The student is expected to:

(A) describe ISO symbols and appropriately use them to draw a hydraulic schematic; and

(B) create a hydraulic schematic.

(7) The student identifies the principles of hydraulic pressure and flow and discusses the basic hydraulic cylinder circuits and their application. The student is expected to:

(A) calculate the force output of an extending cylinder and the retraction force of a cylinder;

(B) explain the relevance of Pascal's Law to hydraulics;

(C) identify and discuss hydraulic motors and pumps; and

(D) identify hydraulic cylinders and their impact on single and double acting circuits.

§127.355. Oil and Gas Production IV (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2020-2021 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Oil and Gas Production III. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content alignment with challenging academic standards and relevant knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) Oil and Gas Production IV is designed to extend training for future petroleum engineering technicians in all areas of down and mid-stream operations. Students complete an intense core curriculum in areas that include hydrocarbon safety, drilling, petroleum geology, oil and gas exploration and production, reservoir operations, well head completions, petroleum data management operations and analysis, natural gas production, and economics. In conjunction with this course, students employ the latest computer software in engineering and petroleum, operations, data mining, and geological mapping.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development, education, and entrepreneurship opportunities in the oil and gas production field;

(B) identify careers in oil and gas production with required aptitudes in science, technology, engineering, mathematics, language arts, and/or social studies;

(C) apply technology skills to create an electronic portfolio of skills and abilities;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation;

(E) demonstrate knowledge of personal and occupational safety, health, environmental regulations, and first-aid policy in the workplace; and

(F) analyze employers' expectations, including appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills.

(2) The student explains the phases of well construction. The student is expected to:

(A) describe the function of the well completion phase and the different hole tests used in well completions;

(B) design the completion of the reservoir using technology such as computer designing software;

(C) describe the open hole completion and sand control completion processes; and

(D) describe conventional completions and their components and how they relate to production tubing.

(3) The student explains the concepts of safety in well completions and indicates tools and procedures for completing a drilled wellbore. The student is expected to:

(A) research health and safety standards for the workplace and environment such as Standards and Wireline Operations and Procedures and Occupational Safety and Health Administration (OSHA) and standards provided by professional organizations in the oil and gas industry such as the American Chemical Society, American Institute of Chemical Engineers, Center for the Advancement of Process Technology, Gulf Coast Process Technology Alliance, and American Petroleum Institute (API);

(B) identify well completion tools and equipment and their use during each well completion phase; and

(C) analyze the cost of safety during well completions.

(4) The student explains the concepts of hydraulic fracturing and its role during the well completion phase. The student is expected to:

(A) describe how the generic well design and drilling mud systems impact drilling;

(B) interpret ways in which generic platform wells, cuttings disposal routes, and drilling fluid design impact the generic well design; and

(C) evaluate the significance of reservoir formations.

(5) The student discusses the potential hazards and possible solutions of well and equipment testing. The student is expected to:

(A) evaluate potential hazards and formulate a safety plan that covers safety guidelines and equipment, including first-aid and safety uniforms;

(B) describe and accurately measure the flow of oil, gas, and water in real time;

(C) ensure precautions and measures are considered during the surface well testing; and

(D) discuss the importance of knowing the surrounding environment when well testing.

(6) The student researches the different types of coring and core analysis used in well completions and how they play an important role in well completion. The student is expected to:

(A) describe the role of coring and core analysis in well completions;

(B) identify the relationship between the factors such as core analysis and well logging that play an active role in well completions;

(C) explain well logging and its importance in formation evaluation;

(D) research different methods of formation testing by acquiring core samples;

(E) research drill stem testing;

(F) explain drill stem tests and their importance in measuring the flow of oil and gas in well completions; and

(G) evaluate the cost of completion operations for well completion.

§127.356. Introduction to Process Technology (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2020-2021 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) In Introduction to Process Technology, students will learn the social significance and workforce impact of process technology in industry and the opportunities available at various levels of education and training in industries using process technology.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate skills related to health and safety in the workplace as specified by appropriate government regulations;

(B) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(C) collaborate with others to solve problems;

(D) identify employers' work expectations; and

(E) research, evaluate, and apply various time-management techniques to develop work schedules.

(2) The student understands common definitions, terminology, and the basic foundations related to process technology. The student is expected to:

(A) describe the types of industry utilizing process technology and identify fields related to process technology;

(B) identify and describe the career opportunities in process technology, pathways to career development, and certification requirements of industries utilizing process technology, including job responsibilities, typical work schedules, and career opportunities;

(C) demonstrate the use of content such as technical concepts and vocabulary when analyzing information and following directions;

(D) identify currently emerging issues in process technology; and

(E) identify principles of instruments and instrument technology used in industrial process technology.

(3) The student identifies and discusses types of industrial piping, valves, and basic process equipment. The student is expected to:

(A) discuss the basics of piping, valves, and equipment used in industry; and

(B) demonstrate the ability to read and interpret the various types of industrial drawings, diagrams, and data sheets related to industrial piping, valves, and equipment.

(4) The student identifies and discusses the types of industrial electrical equipment and instrumentation used in process technology. The student is expected to:

(A) demonstrate the ability to read and interpret the various types of industrial drawings, diagrams, charts, and data sheets related to industrial electrical equipment;

(B) interpret industry standard circuit schematics;

(C) identify areas where quality, reliability, and safety can be integrated into a product; and

(D) describe the principles of electricity as applied in industrial process technology.

(5) The student discusses safety issues related to industrial process technology. The student is expected to:

(A) describe the safety, health, and environmental concerns and requirements for industries using process technology along with the history that led to modern standards;

(B) analyze and execute safety guidelines as described in various manuals, instructions, and regulations;

(C) describe the implications of negligent or improper maintenance;

(D) discuss and demonstrate how precision measuring instruments are used in industrial process technology; and

(E) research agencies that govern safety in industrial process technology, including their authority and requirements.

(6) The student demonstrates understanding of basic industrial mathematics. The student is expected to:

(A) perform common computations required in industrial process technology using mastered calculator skills;

(B) determine when to convert between fractions, decimals, whole numbers, and percentages mentally, on paper, or with a calculator when required in industrial process technology;

(C) identify and quantify causes and effects of uncertainties in measured data;

(D) demonstrate how exponents, symbols, and the order of operations are used to solve real world word problems commonly seen in process technology;

(E) determine appropriate formulas to compute cross sections, surface areas, and volumes of geometric figures such as circles, squares, and cylinders;

(F) estimate measurements and solve application problems involving industry drawings and data sheets using consistent units for all measurements and computation;

(G) describe and discuss how to use scientific notation and International System (SI) units to gather and record data with accuracy and precision;

(H) organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs;

(I) determine a dimension of an object given a scaled drawing having no dimensions; and

(J) represent and solve problems involving proportional relationships, including conversions between measurement systems using multiplication by a given constant factor such as unit rate.

(7) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem to develop innovative solutions;

(B) critically analyze information to determine value to the problem-solving task;

(C) analyze a variety of problem-solving strategies and critical-thinking skills; and

(D) conduct technical research to gather information necessary for decision making.

(8) The student applies comprehensive knowledge in a simulation environment to demonstrate the mastery of the concepts covered in this course. The student is expected to:

(A) represent or simulate a portion of a process system by generating an appropriate drawing, diagram, or data sheet;

(B) demonstrate how to achieve a specific goal with the use of a simple mockup of a process system;

(C) execute a simple mockup of a process system to achieve a specified goal;

(D) demonstrate appropriate safety equipment selection for use in a variety of assigned tasks;

(E) identify and apply mathematical operations to complete calculations and specified computations, including unit conversions for a simulated process system;

(F) explain how visual depictions, data readouts, and trends in a computer-based process simulator relate to actual valves, piping, equipment, electrical gear, and instrumentation in a process system; and

(G) develop critical-thinking skills using simulations to identify and solve problems associated with process technology.

(9) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:

(A) discuss and critique the validity of conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports; and

(B) record, express, and manipulate relationships among data using graphs, charts, and equations.

§127.357. Petrochemical Safety, Health, and Environment (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2020-2021 school year.

(b) General requirements. The course is a Level 3 course and is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Energy Career Cluster focuses on Texas's diverse economic landscape, geography and natural resources, including renewable energy potential, transportation system, labor force, and leadership in environmental research.

(3) Petrochemical Safety, Health, and Environment addresses the shortage of process technology operators/technicians by educating students on the safety rules, regulations, and operations of the petrochemical process technology operator. Students enrolled in this course will learn about the knowledge and skills required in occupational safety, health, and environment as well as the governing regulatory authorities and the legal aspects of the industry in order to maintain a safe work environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) research the three major roles of safety, health, and environment as it pertains to process technology operators/technicians;

(B) describe the role of process technicians in relation to safety, health, and environmental issues;

(C) identify the importance of safety, health, and environment as they relate to the performance of all job tasks and regulatory compliance issues within the industries, including, but not limited to, petrochemical plants, refineries, oil and gas production, and power generation; and

(D) explain the importance of interpreting the safety, health, and environmental procedures standards, requirements, and regulations as a process technology operator/technician.

(2) The student examines compliance standards to ensure safe work practices as they relate to safety, health, and environmental regulations. The student is expected to:

(A) identify the legal governing agencies and describe regulatory requirements as they apply to the petrochemical industry, its employees, and the community;

(B) identify specific state and federal regulations and the related specific tasks performed by process technology operators/technicians;

(C) identify safety programs used in the gulf coast area;

(D) determine types of administrative controls and permitting systems to ensure safe work practices, especially as the controls relate to confined spaces and log-out and tag-out (LOTO);

(E) demonstrate the proper usage of typical safety equipment and systems used in local plants;

(F) describe how engineering controls are designed to allow process technology operators/technicians to operate equipment with system safeguards;

(G) describe the different types of personal protective equipment (PPE), including fire resistant clothing (FRC), hard hats, safety shoes, hearing protection, safety glasses, and acid suits;

(H) evaluate the types of monitors that measure exposure ratings for noise, heat, and radiation;

(I) describe the different types of respiratory protection according to their levels of protection, including air purifying, air supply, escape packs, and self-contained breathing apparatus (SCBA); and

(J) identify the types of monitoring instruments that process operators/technicians use to monitor the atmosphere, oxygen content, explosive atmosphere, and toxicity.

(3) The student summarizes the environmental requirements that are designed to safeguard society. The student is expected to:

(A) describe the types of spills and releases and the environmental factors that can impact them;

(B) identify specific systems that are in place to mitigate or prevent hazards to the environment and to individuals, including safe disposal of hazardous materials;

(C) identify the regulatory governmental agencies, including Occupational Safety and Health Administration (OSHA), Mining Safety and Health Administration (MSHA), Texas Commission on Environmental Quality (TCEQ), and the Environmental Protection Agency (EPA), that protect our safety, health, and environment;

(D) identify the Hazard Communication (HAZCOM) program and its components, including written Emergency Response Plans (ERPs), labeling containers that contain hazardous chemicals, and Safety Data Sheets (SDS) for hazardous chemicals produced or imported;

(E) describe the different types of hazards, including fire and explosions, ergonomic, biological, and blood borne pathogens; and

(F) describe the Maritime Security Act (MARSEC), which protects against terroristic threats.

(4) The student describes equipment and energy and work surface hazards. The student is expected to:

(A) define the types of equipment and energy and work surface hazards, including electrical, rotating equipment, thermal, elevation/heights/fall protection, chemical, slip and trips, and machine guarding;

(B) identify hazards as they pertain to construction, vehicles, weather, and security, and describe how to protect the point of access and the site, including contractors who might have limited safety knowledge, new equipment installation, traffic control, and training on heavy machinery; and

(C) determine how weather conditions can adversely impact safety at a petrochemical plant or other process industry, including heat stress, hurricanes, freeze precautions, adverse weather conditions, lightning, and wind.

(5) The student identifies environmental pollutants as well as regulations to protect the environment. The student is expected to:

(A) describe environmental pollutants, including toxic chemicals;

(B) identify the Material Safety Data Sheet (MSDS) manual list of the hazardous and toxic chemicals for process control sites;

(C) summarize the EPA petition process for approval of chemicals created by a plant;

(D) determine the permissions that must be acquired before site production begins, including a toxicology report such as a Chemical Inventory Management System (CIMS) for a local plant; and

(E) describe the types of environmental controls that are in place to protect the environment such as monitoring and air and water permits.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

SUBCHAPTER I. ENGINEERING

19 TAC §§127.391 - 127.401

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the

subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.391. Principles of Applied Engineering (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Principles of Applied Engineering provides an overview of the various fields of science, technology, engineering, and mathematics and their interrelationships. Students develop engineering communication skills, which include computer graphics, modeling, and presentations, by using a variety of computer hardware and software applications to complete assignments and projects. Upon completing this course, students will have an understanding of the various fields of engineering and be able to make informed career decisions.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress, speak, and conduct oneself in a manner appropriate for the profession;

(B) cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks.

(2) The student investigates the components of engineering and technology systems. The student is expected to:

(A) investigate and report on the history of engineering disciplines, including chemical, civil, electrical, and mechanical engineering;

(B) identify the inputs, processes, and outputs associated with technological systems;

(C) describe the difference between open and closed systems;

(D) describe how technological systems interact to achieve common goals;

(E) compare engineering, science, and technology career paths, including entry-level employment, military service, apprenticeships, community and technical colleges, and universities;

(F) conduct and present research on emerging and innovative technology; and

(G) demonstrate proficiency of the engineering design process.

(3) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:

(A) use clear and concise written, verbal, and visual communication techniques;

(B) maintain a design and computation engineering notebook;

(C) develop and present ideas using sketching and computer-aided design and drafting (CADD);

(D) draw conclusions using industry-standard visualization techniques and media;

(E) maintain a paper or digital portfolio using the engineering documentation process; and

(F) use collaborative tools such as desktop or web-based applications to share and develop information.

(4) The student uses appropriate tools and demonstrates safe work habits. The student is expected to:

(A) master relevant safety tests;

(B) follow lab safety guidelines as prescribed by instructor in compliance with local, state, and federal regulations;

(C) identify industry safety terminology related to the personal work environment such as Occupational Safety and Health Administration (OSHA), American Society of Mechanical Engineers (ASME), and personal protective equipment (PPE);

(D) recognize the classification of hazardous materials and wastes;

(E) describe appropriate ways to dispose of hazardous materials and wastes;

(F) maintain, safely handle, and properly store laboratory equipment;

(G) describe the implications of negligent or improper maintenance; and

(H) demonstrate the use of precision measuring instruments.

(5) The student describes the factors that affect the progression of technology and analyzes the potential intended and unintended consequences of technological advances. The student is expected to:

(A) describe how technology has affected individuals, societies, cultures, economies, and environments;

(B) describe how the development and use of technology influenced past events;

(C) describe how and why technology progresses; and

(D) predict possible changes caused by the advances of technology.

(6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. The student is expected to:

(A) identify and describe an engineering design process needed for a project, including the design process and prototype development and initiating, planning, executing, monitoring and controlling, and closing a project;

(B) identify the chemical, mechanical, and physical properties of engineering materials and identify testing methods associated with the materials;

(C) use problem-solving techniques to develop technological solutions such as product, process, or system;

(D) use consistent units for all measurements and computations; and

(E) assess the risks and benefits of a design solution.

(7) The student understands the opportunities and careers in fields related to robotics, process control, and automation systems. The student is expected to:

(A) describe applications of robotics, process control, and automation systems;

(B) apply design concepts to problems in robotics, process control, and automation systems;

(C) identify fields and career opportunities related to robotics, process control, and automation systems; and

(D) identify emerging trends in robotics, process control, and automation systems.

(8) The student understands the opportunities and careers in fields related to electrical and mechanical systems. The student is expected to:

(A) describe the applications of electrical and mechanical systems;

(B) describe career opportunities in electrical and mechanical systems;

(C) identify emerging trends in electrical and mechanical systems; and

(D) describe and apply basic electronic theory.

(9) The student collaborates as a team member while completing a comprehensive project. The student is expected to:

(A) apply the design process, including decision matrices, as a team participant;

(B) perform different roles within the project as a team member;

(C) formulate decisions using collaborative strategies such as decision and design matrices and conflict resolution;

(D) maintain an engineering notebook for the project;

(E) develop and test the model for the project; and

(F) demonstrate communication skills by preparing and presenting the project, including building consensus setback resolution and decision matrices.

(10) The student demonstrates a knowledge of drafting by completing a series of drawings that can be published by various media. The student is expected to:

(A) set up, create, and modify drawings;

(B) store and retrieve geometry;

(C) demonstrate and use appropriate line types in engineering drawings;

(D) draw two-dimensional, single-view objects;

(E) create multi-view working drawings using orthographic projection;

(F) dimension objects using current American National Standards Institute (ANSI) standards;

(G) draw single-line two-dimensional pictorial representations; and

(H) create working drawings that include section views.

(11) The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:

(A) identify and define an engineering problem;

(B) formulate goals, objectives, and requirements to solve an engineering problem;

(C) determine the design parameters such as materials, personnel, resources, funding, manufacturability, feasibility, and time associated with an engineering problem;

(D) establish and evaluate potential constraints, including health, safety, social, environmental, ethical, political, regulatory, and legal, pertaining to a problem;

(E) identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;

(F) test and evaluate proposed solutions using engineering methods such as creating models, prototypes, mock-ups, or simulations or performing critical design review, statistical analysis, or experiments;

(G) apply structured techniques such as a decision tree, design matrix, or cost-benefit analysis to select and justify a preferred solution to a problem;

(H) predict performance, failure modes, and reliability of a design solution; and

(I) prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.

§127.392. AC/DC Electronics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) AC/DC Electronics focuses on the basic electricity principles of alternating current/direct current (AC/DC) circuits. Students will demonstrate knowledge and applications of circuits, electronic measurement, and electronic implementation. Through use of the design process, students will transfer academic skills to component designs in a project-based environment. Students will use a variety of computer hardware and software applications to complete assignments and projects. Additionally, students will explore career opportunities, employer expectations, and educational needs in the electronics industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student demonstrates the skills necessary for success in a technical career. The student is expected to:

(A) identify training, education, employment, and career opportunities, including differences between an electronic technician, electronic technologist, and electrical engineer;

(B) investigate and work toward industry certifications;

(C) discuss ethical issues related to electronics;

(D) identify and demonstrate respect for diversity in the workplace;

(E) identify and demonstrate appropriate actions and consequences relating to discrimination, harassment, and inequality;

(F) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; and

(G) discuss *Accreditation Board for Engineering and Technology* (ABET) accreditation and implications.

(3) The student participates in team projects in various roles. The student is expected to:

(A) explain the importance of teamwork in the field of electronics;

(B) apply principles of effective teamwork and problem solving, including collaboration and conflict resolution; and

(C) demonstrate proper attitudes as a team leader and team member.

(4) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

(5) The student practices safe and proper work habits. The student is expected to:

(A) master relevant safety tests;

(B) comply with safety guidelines as described in various manuals, instructions, and regulations;

(C) identify governmental and organizational regulations for health and safety in the workplace related to electronics;

(D) identify and classify hazardous materials according to Occupational Safety and Health Administration (OSHA) regulations and industry standards;

(E) dispose of hazardous materials appropriately;

(F) perform maintenance on selected tools, equipment, and machines;

(G) handle and store tools and materials correctly; and

(H) describe the results of improper maintenance of material, tools, and equipment.

(6) The student develops an understanding of basic direct current (DC) electricity principles. The student is expected to:

(A) describe DC and give examples of its application and generation;

(B) demonstrate an understanding of atomic theory and the relationship between atomic number and a material's conductivity and insulation characteristics;

(C) identify and apply the proper use of electronic schematics and symbols, including switches, voltage, current, ground, resistors, fuses, circuit breakers, volt meters, and amp meters;

(D) define and describe switches, voltage source, current source, ground, resistors, fuses, circuit breakers, volt meters, amp meters, voltage, current, and resistance;

(E) identify the resistance value from the resistor color code;

(F) express Ohm's Law in three forms with appropriate symbols and units;

(G) express the Power Law in three forms with appropriate symbols and units;

(H) describe series, parallel, and combination circuits;

(I) apply Ohm's Law to calculate current, voltage drops, and resistance for each component in a multi-component series, parallel, and combination circuit;

(J) apply the Power Law to calculate current, voltage drops, resistance, and power for each component in a multi-component series, parallel, and combination circuit; and

(K) express current and resistance values in both scientific notation and engineering notation.

(7) The student develops an understanding of basic alternating current (AC) electricity principles. The student is expected to:

(A) describe AC and give examples of its application and generation;

(B) calculate peak, peak-to-peak, average, and root mean square (RMS) voltage;

(C) explain the relationship between mechanical load and current in a generator;

(D) identify the purpose and application of a transformer;

(E) identify voltage and current values relative to a turns ratio in a transformer;

(F) describe and calculate capacitance and capacitive reactance; and

(G) describe and calculate inductance and inductive reactance.

(8) The student implements the concepts and skills that form the technical knowledge of electronics using project-based assessments. The student is expected to:

(A) apply Ohm's law, Kirchhoff's laws, and power laws to actual or simulated circuits;

(B) build series, parallel, and combination circuits;

(C) demonstrate an understanding of magnetism and induction as they relate to electronic circuits;

(D) perform electrical-electronic troubleshooting assignments;

(E) identify actual electronic components, including resistors, capacitors, switches, fuses, power sources, and inductors;

(F) explain how torque is produced in a motor; and

(G) explain where counter electromotive force (CEMF) comes from in a motor.

(9) The student applies the concepts and skills to simulated and actual work situations. The student is expected to:

(A) measure and calculate resistance, current, voltage, and power in series, parallel, and complex circuits;

(B) apply electrical theory to generators, electric motors, and transformers; and

(C) design analog circuits using common components.

(10) The student learns the function and application of the tools, equipment, and materials used in electronics through project-based assignments. The student is expected to:

(A) use tools and laboratory equipment in a safe manner to construct and repair circuits;

(B) use precision measuring instruments to analyze circuits and prototypes;

(C) demonstrate an understanding of the difference between current and voltage measurement;

(D) use a multimeter to perform resistance, voltage, and current measurements;

(E) describe and perform measurements, including period and amplitude, using an oscilloscope;

(F) use multiple software applications to simulate circuit behavior and present concepts; and

(G) use a project notebook to record measured values, lab observations and results, circuit operational requirements, and circuit design and modifications.

(11) The student designs a circuit using appropriate design processes and techniques. The student is expected to:

(A) interpret industry standard circuit schematics;

(B) identify areas where quality, reliability, and safety can be designed into a circuit;

(C) improve a circuit design to meet a specified need;

(D) sketch schematics; and

(E) explore new technologies that may affect electronics.

(12) The student builds a prototype circuit using the appropriate tools, materials, and techniques. The student is expected to:

(A) identify and describe the steps needed to produce a prototype;

(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and

(C) present a final project using a variety of media.

§127.393. Solid State Electronics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: AC/DC Electronics. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) In Solid State Electronics, students will demonstrate knowledge and applications of advanced circuits, electrical measurement, and electrical implementation used in the electronics and computer industries. Students will transfer advanced academic skills to apply engineering principles and technical skills to troubleshoot, repair, and modify electronic components, equipment, and power electronic systems in a project-based environment. Additionally, students will explore career opportunities, employer expectations, and educational needs in the electronics industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student demonstrates the skills necessary for success in a technical career. The student is expected to:

(A) identify training, education, employment, and career opportunities, including differences between an electronic technician, electronic technologist, and electrical engineer;

(B) identify employment and career opportunities;

(C) identify industry certifications;

(D) discuss ethical issues related to electronics and incorporate proper ethics in submitted projects;

(E) identify and demonstrate respect for diversity in the workplace;

(F) identify appropriate actions and consequences relating to discrimination, harassment, and inequality;

(G) explore electronics career and preparation programs;

(H) explore career preparation learning experiences, including, but not limited to, job shadowing, mentoring, and apprenticeship training; and

(I) discuss *Accreditation Board for Engineering and Technology* (ABET) accreditation and implications.

(3) The student participates in team projects in various roles. The student is expected to:

(A) explain the importance of teamwork in the field of electronics;

(B) apply principles of effective teamwork and problem solving, including collaboration and conflict resolution; and

(C) demonstrate proper attitudes as a team leader and team member.

(4) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

(5) The student demonstrates principles of project documentation and work flow. The student is expected to:

(A) complete work orders and related documentation;

(B) identify factors affecting cost and strategies to minimize costs;

(C) prepare a project budget;

(D) prepare a production schedule;

(E) identify intellectual property and other legal restrictions; and

(F) read and interpret technical drawings, manuals, and bulletins.

(6) The student practices safe and proper work habits. The student is expected to:

(A) master relevant safety tests;

(B) comply with safety guidelines as described in various manuals, instructions, and regulations;

(C) identify governmental and organizational regulations for health and safety in the workplace related to electronics;

(D) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations and industry standards;

(E) dispose of hazardous materials and wastes appropriately;

(F) perform maintenance on selected tools, equipment, and machines;

(G) handle and store tools and materials correctly; and

(H) describe the results of negligent or improper maintenance of material, tools, and equipment.

(7) The student implements the concepts and skills that form advanced knowledge of electronics using project-based rubrics. The student is expected to:

(A) apply Ohm's law, Kirchhoff's laws, and power laws to advanced circuit theory;

(B) demonstrate advanced knowledge of the theory of direct current, alternating current, digital circuits, and semi-conductor circuits through Thevenin and Norton's theorems;

(C) apply knowledge of voltage regulation devices;

(D) apply knowledge of the design and use of diodes, transistors, and analog components with integrated circuits;

(E) implement knowledge of solid-state components and devices such as a power supply design;

(F) demonstrate knowledge of the similarities and differences in optoelectronic devices;

(G) implement knowledge of transmission theory;

(H) implement knowledge of microprocessor applications;

(I) apply electronic theory to generators, electric motors, power supplies, electronic amplifiers, electronic oscillators, communication circuits, and systems; and

(J) complete advanced electrical-electronic troubleshooting assignments to industry standards.

(8) The student learns the function and application of the tools, equipment, and materials used in electronics through specific project-based assessments. The student is expected to:

(A) use tools and laboratory equipment in a safe manner to construct and repair circuits;

(B) use precision measuring instruments to analyze circuits and prototypes;

(C) describe and perform measurement techniques with analog, digital, or storage oscilloscopes;

(D) use multiple software applications to simulate circuit behavior and present concepts; and

(E) identify and describe the functions of computer hardware devices.

(9) The student designs products using appropriate design processes and techniques. The student is expected to:

(A) interpret advanced industry standard schematics;

(B) identify areas where quality, reliability, and safety can be designed into a product;

(C) improve a product design to meet a specified need;

(D) produce advanced schematics to industry standards;

(E) discuss the process of obtaining a patent;

(F) use a variety of technologies to design components such as computer simulation software; and

(G) explore innovative technologies that may affect electronics.

(10) The student builds a simulated or physical prototype using the appropriate tools, materials, and techniques. The student is expected to:

(A) identify and describe the steps needed to produce a prototype;

(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and

(C) present the prototype using a variety of media to a panel.

§127.394. Digital Electronics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: Algebra I and Geometry. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Digital Electronics is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discreet voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world of electronics. Digital electronics is the foundation of modern electronic devices such as cellular phones, digital audio players, laptop computers, digital cameras, and high-definition televisions. The primary focus of Digital Electronics is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be success-

ful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student demonstrates the skills necessary for success in a technical career. The student is expected to:

(A) distinguish the differences between an engineering technician, engineering technologist, and engineer;

(B) identify employment and career opportunities;

(C) identify industry certifications;

(D) discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;

(E) identify and demonstrate respect for diversity in the workplace;

(F) identify and demonstrate appropriate actions and identify consequences relating to discrimination, harassment, and inequality;

(G) explore electronics engineering careers and preparation programs;

(H) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; and

(I) discuss *Accreditation Board for Engineering and Technology* (ABET) accreditation and implications.

(4) The student participates in team projects in various roles. The student is expected to:

(A) explain the importance of teamwork in the field of electronics;

(B) apply principles of effective problem solving in teams to practice collaboration and conflict resolution; and

(C) demonstrate proper attitudes as a team leader and team member.

(5) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

(6) The student practices safe and proper work habits. The student is expected to:

(A) master relevant safety tests;

(B) comply with safety guidelines as described in various manuals, instructions, and regulations;

(C) identify governmental and organizational regulations for health and safety in the workplace related to electronics;

(D) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;

(E) dispose of hazardous materials and wastes appropriately;

(F) perform maintenance on selected tools, equipment, and machines;

(G) handle and store tools and materials correctly; and

(H) describe the results of improper maintenance of material, tools, and equipment.

(7) The student explores the fundamentals of analog and digital electronics. The student uses appropriate notation and understands the logic of circuit design and logic gates. The student is expected to:

(A) use scientific notation, engineering notation, and Systems International (SI) notation to conveniently write very large or very small numbers frequently encountered when working with electronics;

(B) describe the process of soldering and how it is used in the assembly of electronic components;

(C) explain the different waveforms and distinctive characteristics of analog and digital signals;

(D) identify the voltage levels of analog and digital signals;

(E) determine whether a material is a conductor, an insulator, or a semiconductor based on its atomic structure;

(F) analyze the three fundamental concepts of voltage, current, and resistance;

(G) define circuit design software and explain its purpose;

(H) identify the fundamental building block of sequential logic;

(I) identify the components of a manufacturer's datasheet, including a logic gate's general description, connection diagram, and function table;

(J) categorize integrated circuits by their underlying circuitry, scale of integration, and packaging style;

(K) describe the advantages and disadvantages of the various sub-families of transistor-transistor logic (TTL) gates;

(L) explain that a logic gate is depicted by its schematic symbol, logic expression, and truth table;

(M) evaluate the different functions of input and output values of combinational and sequential logic;

(N) explain combinational logic designs implemented with AND gates, OR gates, and INVERTER gates; and

(O) identify the fundamental building block of sequential logic.

(8) The student understands and uses multiple forms of AND-OR-Invert (AOI) logic. The student is expected to:

(A) develop an understanding of the binary number system and its relationship to the decimal number system as an essential component in the combinational logic design process;

(B) translate a set of design specifications into a truth table to describe the behavior of a combinational logic design by listing all possible input combinations and the desired output for each;

(C) derive logic expressions from a given truth table;

(D) demonstrate logic expressions in sum-of-products (SOP) form and products-of-sum (POS) form;

(E) explain how all logic expressions, whether simplified or not, can be implemented using AND gates and INVERTER gates or OR gates and INVERTER gates; and

(F) apply a formal design process to translate a set of design specifications into a functional combinational logic circuit.

(9) The student understands, explains, and applies NAND and NOR Logic and understands the benefits of using universal gates. The student is expected to:

(A) apply the Karnaugh Mapping graphical technique to simplify logic expressions containing two, three, and four variables;

(B) define a "don't care" condition and explain its significance;

(C) explain why NAND and NOR gates are considered universal gates;

(D) demonstrate implementation of a combinational logic expression using only NAND gates or only NOR gates;

(E) discuss the formal design process used for translating a set of design specifications into a functional combinational logic circuit implemented with NAND or NOR gates; and

(F) explain why combinational logic designs implemented with NAND gates or NOR gates will typically require fewer integrated circuits (IC) than AOI equivalent implementations.

(10) The student understands combinational logic systems, including seven-segment displays, Exclusive OR and Exclusive NOR gates, and multiplexer/de-multiplexer pairs. The student understands the relative value of various logic approaches. The student is expected to:

(A) use seven-segment displays used to display the digits 0-9 as well as some alpha characters;

(B) identify the two varieties of seven-segment displays;

(C) describe the formal design process used for translating a set of design specifications into a functional combinational logic circuit;

(D) develop an understanding of the hexadecimal and octal number systems and their relationships to the decimal number system;

(E) explain the primary intended purpose of Exclusive OR (XOR) and Exclusive NOR (XNOR) gates;

(F) describe how to accomplish the addition of two binary numbers of any bit length;

(G) explain when multiplexer/de-multiplexer pairs are most frequently used;

(H) explain the purpose of using de-multiplexers in electronic displays that use multiple seven-segment displays;

(I) identify the most commonly used method for handling negative numbers in digital electronics;

(J) discuss the use of programmable logic devices and explain designs for which they are best suited; and

(K) compare and contrast circuits implemented with programmable logic devices with circuits implemented with discrete logic.

(11) The student understands and describes multiple types of sequential logic and various uses of sequential logic. The student is expected to:

(A) explain the capabilities of flip-flop and transparent latch logic devices;

(B) discuss synchronous and asynchronous inputs of flip-flops and transparent latches;

(C) explore the use of flip-flops, including designing single event detection circuits, data synchronizers, shift registers, and frequency dividers;

(D) explain how asynchronous counters are characterized and how they can be implemented;

(E) explore the use of the asynchronous counter method to implement up counters, down counters, and modulus counters;

(F) explain how synchronous counters are characterized and how they can be implemented;

(G) explore the use of the synchronous counter method to implement up counters, down counters, and modulus counters;

(H) describe a state machine;

(I) identify common everyday devices that machines are used to control such as elevator doors, traffic lights, and combinational or electronic locks; and

(J) discuss various ways state machines can be implemented.

(12) The student explores microcontrollers, specifically their usefulness in real-world applications. The student is expected to:

(A) demonstrate an understanding of the use of flowcharts as graphical organizers by technicians, computer programmers, engineers, and other professionals and the benefits of various flowcharting techniques;

(B) develop an understanding of basic programming skills, including variable declaration, loops, and debugging;

(C) identify everyday products that use microcontrollers such as robots, garage door openers, traffic lights, and home thermostats;

(D) describe a servo motor;

(E) explore the way microcontrollers sense and respond to outside stimuli;

(F) explain why digital devices are only relevant if they can interact with the real world;

(G) explain the importance of digital control devices, including microcontrollers in controlling mechanical systems; and

(H) demonstrate an understanding that realistic problem solving with a control system requires the ability to interface analog inputs and outputs with a digital device.

§127.395. Robotics I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9 and 10. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) In Robotics I, students will transfer academic skills to component designs in a project-based environment through implementation of the design process. Students will build prototypes or use simulation software to test their designs. Additionally, students will explore career opportunities, employer expectations, and educational needs in the robotic and automation industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) demonstrate the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student demonstrates the skills necessary for success in a technical career. The student is expected to:

(A) distinguish the differences among an engineering technician, engineering technologist, and engineer;

(B) identify employment and career opportunities;

(C) identify industry certifications;

(D) discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;

(E) identify and demonstrate respect for diversity in the workplace;

(F) identify appropriate actions and consequences relating to discrimination, harassment, and inequality;

(G) explore robotic engineering careers and preparation programs;

(H) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training; and

(I) discuss *Accreditation Board for Engineering and Technology* (ABET) accreditation and implications.

(3) The student participates in team projects in various roles. The student is expected to:

(A) explain the importance of teamwork in the field of robotics;

(B) apply principles of effective problem solving in teams to collaboration and conflict resolution; and

(C) demonstrate proper attitudes as a team leader and team member.

(4) The student develops skills for managing a project. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) develop a plan for production of an individual product.

(5) The student practices safe and proper work habits. The student is expected to:

(A) master relevant safety tests;

(B) comply with safety guidelines as described in various manuals, instructions, and regulations;

(C) identify governmental and organizational regulations for health and safety in the workplace related to electronics;

(D) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;

(E) dispose of hazardous materials and wastes appropriately;

(F) perform maintenance on selected tools, equipment, and machines;

(G) handle and store tools and materials correctly; and

(H) describe the results of improper maintenance of material, tools, and equipment.

(6) The student develops the ability to use and maintain technological products, processes, and systems. The student is expected to:

(A) demonstrate the use of computers to manipulate a robotic or automated system and associated subsystems;

(B) maintain systems to ensure safe and proper function and precision operation;

(C) describe feedback control loops used to provide information; and

(D) describe types and functions of sensors used in robotic systems.

(7) The student develops an understanding of engineering principles and fundamental physics. The student is expected to:

(A) demonstrate knowledge of Newton's Laws as applied to robotics such as rotational dynamics, torque, weight, friction, and traction factors required for the operation of robotic systems;

(B) demonstrate knowledge of motors, gears, gear ratios, and gear trains used in the robotic systems;

(C) describe the application of the six simple machines to robotics;

(D) describe the operation of direct current (DC) motors, including control, speed, and torque; and

(E) describe the operation of servo motors, including control, angle, and torque.

(8) The student develops an understanding of the characteristics and scope of manipulators, accumulators, and end effectors required for a robotic or automated system to function. The student is expected to:

(A) describe the relationship between robotic arm construction and robot stability;

(B) describe the relationship between torque and gear ratio to weight of payload in a robotic arm operation; and

(C) demonstrate knowledge of linkages and gearing in end effectors used in a robotic arm system.

(9) The student uses engineering design methodologies. The student is expected to:

(A) demonstrate an understanding of and discuss the design process;

(B) think critically, identify the system constraints, and make fact-based decisions;

(C) apply testing and reiteration strategies to develop or improve a product;

(D) apply decision-making strategies when developing solutions;

(E) identify quality-control issues in engineering design and production;

(F) describe perceptions of the quality of products and how they affect engineering decisions;

(G) use an engineering notebook to document the project design process as a legal document; and

(H) interpret industry standard system schematics.

(10) The student learns the function and application of the tools, equipment, and materials used in robotic and automated systems through specific project-based assessments. The student is expected to:

(A) use tools and laboratory equipment in a safe manner to construct and repair systems;

(B) use precision measuring instruments to analyze systems and prototypes; and

(C) use multiple software applications to simulate robot behavior and present concepts.

(11) The student produces a product using the appropriate tools, materials, and techniques. The student is expected to:

(A) identify and describe the steps needed to produce a prototype;

(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype;

(C) construct a robotic or automated system to perform specified operations using the design process;

(D) test and evaluate the design in relation to pre-established requirements such as criteria and constraints;

(E) refine the design of a robotic or automated system to ensure quality, efficiency, and manufacturability of the final product; and

(F) present the final product using a variety of media.

§127.396. Robotics II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Robotics I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) In Robotics II, students will explore artificial intelligence and programming in the robotic and automation industry. Through implementation of the design process, students will transfer academic skills to component designs in a project-based environment. Students will build prototypes and use software to test their designs.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) distinguish the differences among an engineering technician, engineering technologist, and engineer;

(B) identify employment and career opportunities;

(C) identify industry certifications;

(D) recognize the principles of teamwork related to engineering and technology;

(E) identify and use appropriate work habits;

(F) locate and report on governmental regulations and laws, including health, safety, and labor codes related to engineering;

(G) discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;

(H) demonstrate respect for diversity in the workplace;

(I) demonstrate appropriate actions and identify consequences relating to discrimination, harassment, and inequality;

(J) demonstrate effective oral and written communication skills using a variety of software applications and media; and

(K) explore robotic engineering careers and preparation programs.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student learns and contributes productively as an individual and as a member of a project team. The student is expected to:

(A) demonstrate an understanding of and discuss how teams function;

(B) apply teamwork to solve problems;

(C) follow directions and decisions of responsible individuals of the project team;

(D) participate in establishing team procedures and team norms; and

(E) work cooperatively with others to set and accomplish goals in both competitive and non-competitive situations.

(4) The student develops skills of project management. The student is expected to:

(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;

(B) develop a project schedule and complete work according to established criteria;

(C) participate in the organization and operation of a real or simulated engineering project; and

(D) translate and employ a Project Management Plan for production of a product.

(5) The student practices safe and proper work habits. The student is expected to:

(A) master relevant safety tests;

(B) comply with safety guidelines as described in various manuals, instructions, and regulations;

(C) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;

(D) dispose of hazardous materials and wastes appropriately;

(E) comply with established guidelines for working in a lab environment;

(F) handle and store tools and materials correctly;

(G) employ established inventory control and organization procedures; and

(H) describe the results of negligent or improper maintenance.

(6) The student develops the ability to use and maintain technological products, processes, and systems. The student is expected to:

(A) demonstrate the use of computers to manipulate a robotic or automated system and associated subsystems;

(B) troubleshoot and maintain systems and subsystems to ensure safe and proper function and precision operation;

(C) implement feedback control loops used to provide information; and

(D) implement different types of sensors used in robotic or automated systems and their operations.

(7) The student demonstrates an understanding of advanced mathematics and physics in robotic and automated systems. The student is expected to:

(A) apply the concepts of acceleration and velocity as they relate to robotic and automated systems;

(B) describe the term degrees of freedom and apply it to the design of joints used in robotic and automated systems;

(C) describe angular momentum and integrate it in the design of robotic joint motion, stability, and mobility;

(D) use the impulse-momentum theory in the design of robotic and automated systems;

(E) explain translational, rotational, and oscillatory motion in the design of robotic and automated systems;

(F) apply the operation of direct current (DC) motors, including control, speed, and torque;

(G) apply the operation of servo motors, including control, angle, and torque;

(H) interpret sensor feedback and calculate threshold values;

(I) apply measurement and geometry to calculate robot navigation;

(J) implement movement control using encoders; and

(K) implement path planning using geometry and multiple sensor feedback.

(8) The student creates a program to control a robotic or automated system. The student is expected to:

(A) use coding languages and proper syntax;

(B) use programming best practices for commenting and documentation;

(C) describe how and why logic is used to control the flow of the program;

(D) create a program flowchart and write the pseudocode for a program to perform an operation;

(E) create algorithms for evaluating a condition and performing an appropriate action using decisions;

(F) create algorithms that loop through a series of actions for a specified increment and for as long as a given condition exists;

(G) create algorithms that evaluate sensor data as variables to provide feedback control;

(H) use output commands and variables;

(I) use selection programming structures such as jumps, loops, switch, and case; and

(J) implement subroutines and functions.

(9) The student develops an understanding of the characteristics and scope of manipulators, accumulators, and end effectors required for a robotic or automated system to function. The student is expected to:

(A) demonstrate knowledge of robotic or automated system arm construction;

(B) demonstrate an understanding and apply the concepts of torque, gear ratio, stability, and weight of payload in a robotic or automated system arm operation; and

(C) demonstrate an understanding and apply the concepts of linkages and gearing in end effectors and their use in a robotic or an automated arm system.

(10) The student uses engineering design methodologies. The student is expected to:

(A) implement the design process;

(B) demonstrate critical thinking, identify the system constraints, and make fact-based decisions;

(C) apply formal testing and reiteration strategies to develop or improve a product;

(D) apply and defend decision-making strategies when developing solutions;

(E) identify and improve quality-control issues in engineering design and production;

(F) apply Six Sigma to analyze the quality of products and how it affects engineering decisions;

(G) use an engineering notebook to document the project design process as a legal document; and

(H) create and interpret industry standard system schematics.

(11) The student learns the function and application of the tools, equipment, and materials used in robotic and automated systems through specific project-based assessments. The student is expected to:

(A) use and maintain tools and laboratory equipment in a safe manner to construct and repair systems;

(B) use precision measuring instruments to analyze systems and prototypes;

(C) implement a system to identify and track all components of the robotic or automated system and all elements involved with the operation, construction, and manipulative functions; and

(D) use multiple software applications to simulate robot behavior and present concepts.

(12) The student produces a product using the appropriate tools, materials, and techniques. The student is expected to:

(A) use the design process to design a robotic or automated system that meets pre-established criteria and constraints;

(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype;

(C) implement sensors in the robotic or automated system;

(D) construct the robotic or automated system;

(E) use the design process to evaluate and formally test the design;

(F) refine the design of the robotic or automated system to ensure quality, efficiency, and manufacturability of the final robotic or automated system; and

(G) present the final product using a variety of media.

§127.397. Engineering Science (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: Algebra I, one credit in biology, and at least one credit in a course from the science, technology, engineering, and mathematics career cluster. Recommended prerequisites: Geometry, Integrated Physics and Chemistry (IPC), one credit in chemistry, or one credit in physics. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Engineering Science is an engineering course designed to expose students to some of the major concepts and technologies that they will encounter in a postsecondary program of study in any engineering domain. Students will have an opportunity to investigate engineering and high-tech careers. In Engineering Science, students will employ science, technology, engineering, and mathematical concepts in the solution of real-world challenge situations. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. Students will also learn how to document their work and communicate their solutions to their peers and members of the professional community.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established

and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as dial caliper, micrometer, protractor, compass, scale rulers, multimeter, and circuit components;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and

experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.

(6) The student investigates engineering-related fields and career opportunities. The student is expected to:

(A) differentiate between engineering and engineering technology;

(B) compare the roles or job descriptions for career opportunities in the fields of pure science, engineering, and engineering technology;

(C) identify and differentiate between the different engineering disciplines; and

(D) demonstrate appropriate oral, written, and visual forms of technical communication.

(7) The student demonstrates an understanding of design problems and works individually and as a member of a team to solve design problems. The student is expected to:

(A) solve design problems individually and in a team;

(B) create solutions to existing problems using a design process;

(C) use a design brief to identify problem specifications and establish project constraints;

(D) use communication to achieve a desired goal within a team; and

(E) work as a member of a team to conduct research to develop a knowledge base, stimulate creative ideas, and make informed decisions.

(8) The student understands mechanisms, including simple and compound machines, and performs calculations related to mechanical advantage, drive ratios, work, and power. The student is expected to:

(A) explain the purpose and operation of components, including gears, sprockets, pulley systems, and simple machines;

(B) explain how components, including gears, sprockets, pulley systems, and simple machines, make up mechanisms;

(C) distinguish between the six simple machines and their attributes and components;

(D) measure forces and distances related to a mechanism;

(E) calculate work and power in mechanical systems;

(F) determine experimentally the efficiency of mechanical systems; and

(G) calculate mechanical advantage and drive ratios of mechanisms.

(9) The student understands energy sources, energy conversion, and circuits and performs calculations related to work and power. The student is expected to:

(A) identify and categorize energy sources as nonrenewable, renewable, or inexhaustible;

(B) define and calculate work and power in electrical systems;

(C) calculate and explain how power in a system converts energy from electrical to mechanical; and

(D) define voltage, current, and resistance and calculate each quantity in series, parallel, and combination electrical circuits using Ohm's law.

(10) The student understands system energy requirements and how energy sources can be combined to convert energy into useful forms. The student understands the relationships between material conductivity, resistance, and geometry in order to calculate energy transfer and determine power loss and efficiency. The student is expected to:

(A) explain the purpose of energy management;

(B) evaluate system energy requirements in order to select the proper energy source;

(C) explain and design how multiple energy sources can be combined to convert energy into useful forms;

(D) describe how hydrogen fuel cells create electricity and heat and how solar cells create electricity;

(E) measure and analyze how thermal energy is transferred via convection, conduction, and radiation;

(F) analyze how thermal energy transfer is affected by conduction, thermal resistance values, convection, and radiation; and

(G) calculate resistance, efficiency, and power transfer in power transmission and distribution applications for various material properties.

(11) The student understands the interaction of forces acting on a body and performs calculations related to structural design. The student is expected to:

(A) illustrate, calculate, and experimentally measure all forces acting upon a given body;

(B) locate the centroid of structural members mathematically or experimentally;

(C) calculate moment of inertia of structural members;

(D) define and calculate static equilibrium;

(E) differentiate between scalar and vector quantities;

(F) identify properties of a vector, including magnitude and direction;

(G) calculate the X and Y components given a vector;

(H) calculate moment forces given a specified axis;

(I) calculate unknown forces using equations of equilibrium; and

(J) calculate external and internal forces in a statically determinate truss using translational and rotational equilibrium equations.

(12) The student understands material properties and the importance of choosing appropriate materials for design. The student is expected to:

(A) conduct investigative non-destructive material property tests on selected common household products;

(B) calculate and measure the weight, volume, mass, density, and surface area of selected common household products; and

(C) identify the manufacturing processes used to create selected common household products.

(13) The student uses material testing to determine a product's function and performance. The student is expected to:

(A) use a design process and mathematical formulas to solve and document design problems;

(B) obtain measurements of material samples such as length, width, height, and mass;

(C) use material testing to determine a product's reliability, safety, and predictability in function;

(D) identify and calculate test sample material properties using a stress-strain curve; and

(E) identify and compare measurements and calculations of sample material properties such as elastic range, proportional limit, modulus of elasticity, elastic limit, resilience, yield point, plastic deformation, ultimate strength, failure, and ductility using stress-strain data points.

(14) The student understands that control systems are designed to provide consentient process control and reliability and uses computer software to create flowcharts and control system operating programs. The student is expected to:

(A) create detailed flowcharts using a computer software application;

(B) create control system operating programs using computer software;

(C) create system control programs that use flowchart logic;

(D) select appropriate input and output devices based on the need of a technological system; and

(E) judge between open- and closed-loop systems in order to select the most appropriate system for a given technological problem.

(15) The student demonstrates an understanding of fluid power systems and calculates values in a variety of systems. The student is expected to:

(A) identify and explain basic components and functions of fluid power devices;

(B) differentiate between pneumatic and hydraulic systems and between hydrodynamic and hydrostatic systems;

(C) use Pascal's Law to calculate values in a fluid power system;

(D) distinguish between gauge pressure and absolute pressure and between temperature and absolute temperature;

(E) calculate values in a pneumatic system using the ideal gas laws; and

(F) calculate and experiment with flow rate, flow velocity, and mechanical advantage in a hydraulic system model.

(16) The student demonstrates an understanding of statistics and applies the concepts to real-world engineering design problems. The student is expected to:

(A) calculate and test the theoretical probability that an event will occur;

(B) calculate the experimental frequency distribution of an event occurring;

(C) apply the Bernoulli process to events that only have two distinct possible outcomes;

(D) apply AND, OR, and NOT logic to solve complex probability scenarios;

(E) apply Bayes's theorem to calculate the probability of multiple events occurring;

(F) calculate the central tendencies of a data array, including mean, median, and mode;

(G) calculate data variations, including range, standard deviation, and variance; and

(H) create and explain a histogram to illustrate frequency distribution.

(17) The student demonstrates an understanding of kinematics in one and two dimensions and applies the concepts to real-world engineering design problems. The student is expected to:

(A) calculate distance, displacement, speed, velocity, and acceleration from data;

(B) calculate experimentally the acceleration due to gravity given data from a free-fall device;

(C) calculate the X and Y components of an object in projectile motion; and

(D) determine and test the angle needed to launch a projectile a specific range given the projectile's initial velocity.

§127.398. Engineering Mathematics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Algebra II. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Engineering Mathematics is a course where students solve and model design problems. Students will use a variety of mathematical methods and models to represent and analyze problems that represent a range of real-world engineering applications such as robotics, data acquisition, spatial applications, electrical measurement, manufacturing processes, materials engineering, mechanical drives, pneumatics, process control systems, quality control, and computer programming.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student uses mathematically based hydraulics concepts to measure and find pump output, understand pressure versus cylinder force, and understand flow rate verses cylinder speed. The student is expected to:

(A) explain how flow rate can be measured in gallons per minute and liters per minute;

(B) calculate and record data using actual flow rates from a flow meter chart;

(C) calculate, measure, and illustrate the force output and speed of an extending and retracting cylinder; and

(D) determine and depict the stroke time of a cylinder in gallons per minute.

(4) The student uses mathematical concepts of structure design to define and describe statics, acquire data, apply concepts of moments and bending stress, and apply concepts of truss design and analysis. The student is expected to:

(A) calculate a resultant force;

(B) apply the concept of equilibrium to force calculations;

(C) calculate a force using a free-body diagram;

(D) develop an application of strain gauges that determines mathematically and experimentally the force on a structural element;

(E) calculate the magnitude of force applied to a rotational system;

(F) apply the moment equilibrium equation to force calculations;

(G) calculate, measure, and illustrate a bending moment on a beam;

(H) determine and depict the bending stress in a beam;

(I) calculate forces in truss using a six-step problem-solving method;

(J) apply modulus of elasticity to the deflection of beams;

(K) calculate a beam deflection for a given load;

(L) determine and depict the critical load for buckling using Euler's formula; and

(M) design and apply factors of safety to column and beam design.

(5) The student understands the role of trigonometry in spatial applications. The student is expected to:

(A) apply trigonometric ratios, including sine, cosine, and tangent, to spatial problems; and

(B) determine the distance and height of remote objects using trigonometry.

(6) The student understands the concepts of design processes with multi-view computer-aided drafting and design drawings for facilities layouts, precision part design, process design, injection mold design, and computer-aided manufacturing, as applied to processes using 3D printing, laser cutting, and computer numerical control. The student is expected to:

(A) determine a dimension of an object given a scaled drawing having no dimensions;

(B) compare and contrast the function of production time and production rate;

(C) calculate and apply the proper cycle time and analyze machines required to meet a specified production rate;

(D) demonstrate the calculation and application of output shaft speed and torque in a gear train;

(E) create a method to determine the direction of a gear train's output shaft;

(F) design a spur gear train given speed and torque requirements;

(G) calculate and apply the proper spacing between the centers of gears in a gear train to a specified tolerance;

(H) apply positional tolerances to assembled parts;

(I) predict the production cost of a product given process information and a bill of materials;

(J) apply the correct spindle speed for a computer-aided manufacturing device by calculation;

(K) apply the correct feed rate for a computer-aided manufacturing device by using calculation;

(L) calculate the pressure drop in an injection mold system;

(M) design a gate size in an injection mold system using the gate width and depth formulas;

(N) determine the size of a mold; and

(O) create size runners for a multi-cavity mold.

(7) The student calculates electronic quantities and uses electrical measuring instruments to experimentally test their calculations. The student is expected to:

(A) apply common electronic formulas to solve problems;

(B) use engineering notation to properly describe calculated and measured values;

(C) compare and contrast the mathematical differences between a direct current and alternating current;

(D) show the effect and give an application of an inductor in an alternating current circuit;

(E) show the effect and give an application of a capacitor in an alternating current circuit;

(F) create a resistive capacitive timing circuit in a time-delay circuit;

(G) calculate the output voltage and current load of a transformer;

(H) calculate the effective alternating current voltage root mean square given the peak alternating current voltage and the peak alternating current voltage given the root mean square value; and

(I) calculate the cost of operating an electric motor.

(8) The student applies mathematical principles of pneumatic pressure and flow to explain pressure versus cylinder force, apply and manipulate pneumatic speed control circuits, and describe maintenance of pneumatic equipment, centrifugal pump operation and characteristics, data acquisition systems, pump power, and pump system design. The student is expected to:

(A) calculate the force output of a cylinder in retraction and extension;

(B) explain how gage pressure and absolute pressure are different;

(C) explain the individual gas laws and use the ideal gas law to solve problems;

(D) convert air volumes at pressures to free air volumes;

(E) compare dew point and relative humidity to explain their importance;

(F) explain the importance of the two units of pump flow rate measurement;

(G) convert between mass and volumetric flow rate;

(H) differentiate between unit analysis such as converting units of pressure between English and SI units and dimensional analysis such as Force and Pressure;

(I) convert between units of head and pressure;

(J) explain the importance of total dynamic head in terms of suction and discharge head;

(K) demonstrate the measurement of the total head of a centrifugal pump;

(L) calculate Reynolds number and determine the type of fluid flow in a pipe, including laminar flow, transitional flow, and turbulent flow;

(M) calculate friction head loss in a given pipe length using head loss tables or charts;

(N) calculate total suction lift, total suction head, total discharge head, and the total dynamic head of a system for a given flow rate;

(O) calculate hydraulic power;

(P) calculate centrifugal pump brake horsepower given pump efficiency and hydraulic power;

(Q) calculate the effect of impeller diameter and speed on the flow rate of a centrifugal pump and pump head;

(R) predict the effect of impeller diameter on a pump head capacity curve; and

(S) calculate net positive suction head.

(9) The student applies mathematical principles of material engineering, including tensile strength analysis, data acquisition sys-

tems, compression testing and analysis, shear and hardness testing and analysis, and design evaluation. The student is expected to:

(A) calculate stress, strain, and elongation using the modulus of elasticity for a material or model with a given set of data;

(B) analyze and explain the importance of sensitivity in relation to material engineering;

(C) analyze the operation of a data-acquisition application or program;

(D) mathematically analyze a part for stress and strain under a compression load;

(E) calculate shear stress for a material with a given set of data;

(F) use the Brinell hardness number to determine the ultimate tensile strength of a material;

(G) apply factors of safety to material engineering designs; and

(H) create material testing conditions for a model using equipment such as a polariscope.

(10) The student applies mathematical principles for mechanical drives, including levers, linkages, cams, turnbuckles, pulley systems, gear drives, key fasteners, v-belt drives, and chain drives. The student is expected to:

(A) calculate the weight of an object for a given mass;

(B) analyze and calculate torque for a given application using the proper units of measurement;

(C) calculate the magnitude of force applied to a rotational system;

(D) calculate the mechanical advantage of first-, second-, and third-class levers;

(E) compare the advantages and disadvantages of the three classes of levers for different applications;

(F) calculate and analyze the coefficient of friction in its proper units of measurement;

(G) analyze and calculate mechanical advantage for simple machines using proper units of measurement;

(H) calculate the mechanical advantage of gear drive systems;

(I) compare and contrast at least two methods of loading a mechanical drive system;

(J) calculate rotary mechanical power applied to an application;

(K) analyze the mechanical efficiency of a given application;

(L) demonstrate various examples of pitch and analyze its proper application;

(M) calculate the shaft speed and torque of a belt drive and chain drive system; and

(N) calculate sprocket ratio and analyze its importance to various applications.

(11) The student applies mathematical principles of quality assurance, including using precision measurement tools, statistical process control, control chart operation, analysis of quality assurance control charts, geometric dimensioning and tolerancing, and location, orientation, and form tolerances. The student is expected to:

(A) evaluate the readings of dial calipers and micrometers to make precise measurements;

(B) use at least three measures of central tendency to analyze the quality of a product;

(C) use a manually constructed histogram to analyze a given set of data;

(D) construct and use a mean-value-and-range chart to determine if a process remains constant over a specified range of time;

(E) examine the maximum and minimum limits of a dimension given its tolerance; and

(F) use position tolerance to calculate the location of a hole.

§127.399. Introduction to Computer-Aided Design and Drafting (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended Prerequisite: Principles of Applied Engineering, Principles of Architecture and Design, or Principles of Manufacturing. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Introduction to Computer-Aided Design and Drafting (CADD) allows students to acquire knowledge and skills needed to use design software, including an introduction to CADD equipment and software selection and interfaces. Students gain skills in setting up a CADD workstation; upgrading a computer to run advanced CADD software; working with storage devices; storing, retrieving, backing-up, and sharing databases, file servers, and local area networks (LANs); and transferring drawing files over the internet.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe the roles, responsibilities, and dynamics of a team as applied in appropriate industry fields;

(B) explain employers' work expectations;

(C) use effective and accurate architectural or engineering vocabulary throughout design and drafting process;

(D) demonstrate knowledge of the concepts and skills related to health in the workplace; and

(E) demonstrate safety in the workplace as specified by appropriate governmental regulations.

(2) The student demonstrates knowledge of the CADD software. The student is expected to:

(A) describe computer-aided design, drafting, and CADD applications;

(B) demonstrate how to start and exit CADD software without corrupting files;

(C) use draw files;

(D) save, close, and open saved files;

(E) determine and specify drawing units and limits;

(F) describe and use the Cartesian coordinate system;

(G) use drawing snap and grid functions; and

(H) demonstrate the use of dynamic input and the command line.

(3) The student demonstrates the use of CADD tools for basic drawing and plotting. The student is expected to:

(A) draw objects using the line tool;

(B) draw circles, arcs, ellipses, and elliptical arcs;

(C) draw polylines, rectangles, donuts, and filled circles;

(D) draw true spline curves;

(E) create drawing templates;

(F) describe basic line conventions;

(G) create and manage layers;

(H) draw objects on separate layers;

(I) print and plot drawings;

(J) demonstrate organizational skills to influence the sequential process when creating drawings;

(K) construct geometric figures of lines, splines, circles, and arcs;

(L) create and edit text using appropriate style and size to annotate drawings;

(M) use control accuracy enhancement tools for entity positioning methods such as snap and xyz;

(N) use editing commands;

(O) use viewing commands to perform zooming and panning;

(P) plot drawings on media using layout and scale;

(Q) use query commands to interrogate database for entity characteristics, distance, area, and status;

(R) move, stretch, and offset objects;

(S) create a radius between objects;

(T) trim and extend objects;

(U) break and join objects;

(V) change object properties; and

(W) create hatching and manipulate properties such as calculating the area of an enclosed shape.

(4) The student demonstrates the use of CADD tools display and viewpoints. The student is expected to:

(A) create multiple viewpoints in the drawing window;

(B) select appropriate object snaps for various drawing tasks;

(C) create orthographic drawings;

(D) analyze challenges and identify solutions for design problems;

(E) investigate the use of space, scale, and environmental features to create three-dimensional form or the illusion of depth and form;

(F) prepare multi-view scaled drawings;

(G) select proper drawing scale, views, and layout;

(H) create drawings containing horizontal and vertical surfaces;

(I) create drawings containing circles and arcs;

(J) create removed details and conventional breaks using sectional drawing techniques;

(K) create assembly drawings;

(L) create detail drawings; and

(M) create technical drawings and title blocks associated with the different CAD drawings.

(5) The student demonstrates the use of software tools to properly create text within a CADD drawing. The student is expected to:

(A) use proper text standards for technical drawings;

(B) calculate drawing scale and text height using a scale ratio;

(C) apply text styles to enhance readability of drawings;

(D) demonstrate the use of tools to create multi-line text objects and single-line text;

(E) edit existing text; and

(F) create, insert, and modify tables.

(6) The student demonstrates the use of CADD editing tools within drawings. The student is expected to:

(A) draw chamfers and fillets;

(B) use editing tools to modify existing drawings;

(C) edit polylines and splines;

(D) move and copy objects;

(E) create mirror images and align objects; and

(F) scale and array objects.

(7) The student demonstrates the use of grips in drawings. The student is expected to:

(A) apply grips to stretch, move, rotate, scale, mirror, and copy objects;

(B) demonstrate the use of Quick Properties and the Properties palette to access CADD tools; and

(C) create selections by using the Quick Select dialog box.

(8) The student demonstrates the use of scale and dimension standards and practices. The student is expected to:

(A) apply standard dimensioning rules;

(B) draw scales and dimensions;

(C) create, edit, and manage dimension styles;

(D) add linear and angular dimensions to a drawing;

(E) draw datum and chain dimensions;

(F) dimension circles and arcs;

(G) control the appearance of existing dimensions and dimension text; and

(H) change dimension line spacing and alignment.

(9) The student creates and demonstrates standard blocks using tool palettes. The student is expected to:

(A) create and save text information blocks;

(B) insert blocks into a drawing;

(C) edit and update a block in a drawing;

(D) create blocks as a drawing file;

(E) construct and use a symbol library of blocks; and

(F) purge unused items from a drawing.

(10) The student prepares surface developments. The student is expected to:

(A) prepare developments of prisms, cylinders, cones, and pyramids;

(B) prepare developments of a transition piece; and

(C) prepare drawings involving intersecting pieces.

(11) The student designs and prepares basic architectural drawings. The student is expected to:

(A) solve design problems to gain new perspectives;

(B) apply critical-thinking and problem-solving skills to develop creative solutions for design problems;

(C) draw a site plan;

(D) draw a floor plan;

(E) draw interior and exterior elevations;

(F) draw a roof plan;

(G) prepare door and window schedules;

(H) draw wall sections;

(I) draw a plot plan; and

(J) draw an electrical and reflected ceiling plan.

(12) The student designs and prepares a technical drawing. The student is expected to:

(A) draw individual parts;

(B) draw the closed assembly drawings per the parts; and

(C) draw and explode the assembly with the parts list.

§127.400. Intermediate Computer-Aided Design and Drafting (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Architectural Design I, Introduction to Computer-Aided Design and Drafting, or Engineering Design and Presentation I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Science (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) In Intermediate Computer-Aided Design and Drafting (CADD), students develop practices and techniques used in computer-aided drafting, emphasizing the development and use of prototype drawings, construction of pictorial drawings, construction of three-dimensional drawings, interfacing two-dimensional and three-dimensional environments, and extracting data. Basic rendering techniques will also be developed. Emphasis is placed on drawing set-up; creating and modifying geometry; storing and retrieving predefined shapes; placing, rotating, and scaling objects; adding text and dimensions; using layers and coordinating systems, as well as using input and output devices.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe the roles, responsibilities, and dynamics of a team as applied in appropriate industry fields;

(B) explain employers' work expectations;

(C) demonstrate knowledge of the concepts and skills related to health and safety in the workplace as specified by appropriate governmental regulations;

(D) evaluate and justify decisions based on ethical reasoning;

(E) evaluate alternative responses to workplace situations based on personal, professional, ethical, and legal responsibilities and employer policies;

(F) identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace;

(G) interpret and explain written organizational policies and procedures; and

(H) demonstrate personal responsibility, ethics, and integrity, including respect for intellectual property, when accessing information and creating design projects.

(2) The student demonstrates an understanding of CADD terminology, tools, and symbols. The student is expected to:

(A) apply the Cartesian Coordinate Systems to illustrate the application of Z coordinates;

(B) describe the CADD menu structure;

(C) differentiate between type-in commands, icons, and pulldown menus;

(D) manipulate the standard draw commands;

(E) demonstrate modifying commands;

(F) explain the various modes of viewing drawings; and

(G) define and modify dimension styles.

(3) The student produces hand sketches to organize ideas and communicate design ideas. The student is expected to:

(A) demonstrate the use of graphic descriptions;

(B) develop skill in sketching or mark making to plan, execute, and construct two-dimensional images and three-dimensional models;

(C) demonstrate methods of projection; and

(D) use proper drafting techniques to convert sketches into an electronic drawing using CADD.

(4) The student demonstrates an understanding of commands in a CADD system. The student is expected to:

(A) operate CADD software;

(B) demonstrate draw commands;

(C) modify drawn objects in CADD software;

(D) create two-dimensional and three-dimensional objects;

(E) convert two-dimensional drawings to three-dimensional drawings;

(F) convert three-dimensional drawings to two-dimensional drawings;

(G) prepare text blocks in CADD software;

(H) manipulate an external reference or file;

(I) import files of different formats into CADD;

(J) demonstrate the plot command in print or plot drawings; and

(K) import and export data using attributes.

(5) The student preforms computer-aided drafting functions. The student is expected to:

(A) create text styles, text justification, and multi-line text;

(B) create and use multi-leaders;

(C) edit dimensions;

(D) work with dimension styles;

(E) crosshatch objects;

(F) isolate and hide objects;

(G) use selection set methods;

(H) use rectangular, polar, and path arrays;

(I) use rotation reference angles;

(J) use elements of creativity and organizational principles to create visually coherent viewports and layouts;

(K) create and manage layers and properties;

(L) use page setup for plotting;

(M) create, insert, and edit reusable content such as symbols and blocks;

(N) use specific line types using the Standard Alphabet of Lines;

(O) create fills and gradients; and

(P) edit hatch patterns and fills.

(6) The student creates drawings using the CADD software. The student is expected to:

(A) translate hand sketches into CADD software;

(B) create projected mechanical drawings;

(C) create drawings with external references;

(D) complete a three-dimensional parametric model;

(E) organize a complex assembly, including an animated exploded assembly;

(F) compare various methods of drawing solids;

(G) construct a composite drawing using multiple drawings;

(H) justify correct drawing methods;

(I) draw lines, arcs, and circles to represent plans or mechanical assemblies;

(J) create text styles, text justification, and multi-line text;

(K) create and use multi-leaders;

(L) edit dimensions, including dimension styles;

(M) isolate and hide objects;

(N) use selection set methods;

(O) use elements of creativity and organizational principles to create visually coherent viewports and layouts;

(P) create and manage layers;

(Q) use page setup for plotting; and

(R) prepare multi-view drawings, including sectional and auxiliary views.

(7) The student creates electrical drawings. The student is expected to:

(A) prepare schematic drawings;

(B) prepare printed circuit board assembly drawing packages;

(C) prepare connection drawings;

(D) prepare interconnection drawings;

(E) prepare wiring drawings;

(F) prepare cable drawings and/or harness drawings;

(G) prepare component drawings; and

(H) prepare logic diagrams.

(8) The student creates mechanical drawings. The student is expected to:

(A) prepare fastener, cam, gear, spring, and bearing drawings;

(B) prepare detail drawings;

(C) prepare surface developments;

(D) prepare welding drawings;

(E) prepare bearing drawings;

(F) prepare casting drawings;

(G) prepare forging drawings;

(H) prepare tool drawings;

(I) prepare molding diagrams;

(J) prepare stamping drawings;

(K) prepare numerical-control drawings;

(L) modify drawings to include material specifications and parts list; and

(M) identify geometric tolerances and dimensioning of specific machined surfaces.

(9) The student prepares CADD project designs. The student is expected to:

(A) develop a floor plan depicting all elements of the building, including BIM (building information modeling);

(B) render a site plan that depicts all elements of the site;

(C) render exterior and interior elevations;

(D) draw a specified roof type within a plan;

(E) prepare door and window schedules;

(F) draw a wall and building section;

(G) draw an overall site plan;

(H) draw a building plot plan;

(I) review and revise plans throughout the design process to refine and achieve design objective;

(J) demonstrate flexibility and adaptability throughout the design process; and

(K) define a basic project materials list.

§127.401. Physics For Engineering (One Credit), Adopted 2024.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 10-12. Prerequisites: one credit of Algebra I and one credit of Chemistry, Physics, or Integrated Physics and Chemistry. Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) In Applied Physics and Engineering, students conduct laboratory and field investigations, use scientific and engineering practices during investigations, and make informed decisions using critical thinking and scientific problem solving. Various systems are described in terms of space, time, energy, and matter. Students study topics, including laws of motion, conservation of energy, momentum, electricity, magnetism, thermodynamics, and characteristics and behavior of waves. Students apply physics concepts and perform laboratory experimentations for at least 40% of instructional time using safe practices.

(4) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific hypotheses and theories. Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental inves-

tigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide tools for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations, other organizations that foster leadership and career development in the profession such as student chapters of related professional associations, or practical, hands-on activities or experiences through which a learner interacts with industry professionals in a workplace, which may be an in-person, virtual, or simulated setting. Learners prepare for employment or advancement along a career pathway by completing purposeful tasks that develop academic, technical, and employability skills.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe and demonstrate how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) describe and demonstrate how to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as ammeters, balances, ballistic carts or equivalent, batteries, calipers, Celsius thermometers, consumable chemicals, collision apparatus, computers and modeling software, constant velocity cars, data acquisition probes and software, discharge tubes with power supply (H, He, Ne, Ar), dynamics and force demonstration equipment, electroscopes, electrostatic generators, electrostatic kits, friction blocks, graphing technology, hand-held visual spectroscopes, hot plates, iron filings, laser pointers, light bulbs, macrometers, magnets, magnetic compasses, mass sets, metric rulers, meter sticks, models and diagrams, motion detectors, multimeters, optics bench, optics kit, optic lenses, pendulums, photogates, plane mirrors, polarized film, prisms, protractors, resistors, ripple tank with wave generators, rope or string, scientific calculators, simple machines, slinky springs, springs, spring scales, standard laboratory glassware, stopwatches, switches, tuning forks, timing devices, trajectory apparatus, voltmeters, wave motion ropes, wires, or other equipment and materials that will produce the same results;

(E) collect quantitative data using the International System of Units (SI) and qualitative data as evidence;

(F) organize quantitative and qualitative data using notebooks or engineering journals, bar charts, line graphs, scatter plots, data tables, equations, conceptual mathematical relationships, labeled drawings and diagrams, or graphic organizers such as Venn diagrams;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) assess and optimize experimental processes and engineering designs.

(4) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.

(6) The student thinks critically and creatively to devise a system or process in applying fundamental engineering solutions needed for a project to meet desired needs and specifications within constraints. The student is expected to:

(A) identify an engineering need through collaborative conversation or research;

(B) develop a proposal to execute an engineering solution that includes performance metrics and constraints such as economics, resources, or safety;

(C) analyze an implemented engineering solution and suggest changes to improve the engineering design or process; and

(D) assess the risks or trade-offs and benefits of a design solution such as accessibility, aesthetics, codes, cost, functionality, ethical considerations, or sustainability.

(7) The student uses the scientific and engineering practices to investigate physical concepts and phenomena. The student is expected to:

(A) develop and test hypotheses that can be supported by observational evidence;

(B) compare scientific concepts such as particle or wave behavior or the law of thermodynamics to describe physical phenomena;

(C) design procedures to conduct an investigation;

(D) perform accurate measurement techniques using precision instruments and proper techniques;

(E) identify and quantify causes and effects of uncertainties in measured data;

(F) analyze and interpret data using equations, tables, charts, and graphs to reveal potential patterns, trends, and sources of error; and

(G) communicate conclusions supported through various methods such as laboratory reports, labeled drawings, graphic organizers, journals, summaries, oral reports, or technology-based reports.

(8) The student demonstrates appropriate safety techniques in field and laboratory environments. The student is expected to:

(A) locate and apply safety guidelines as described in various manuals, instructions, or regulations; and

(B) identify hazardous materials and properly dispose of wastes.

(9) The student describes and applies the laws governing motion in a variety of situations. The student is expected to:

(A) generate and interpret relevant equations for one-dimensional motion using graphs and charts;

(B) define scalar and vector quantities;

(C) calculate displacement, distance, speed, velocity, average velocity, frames of reference, acceleration, and average acceleration using one-dimensional equations;

(D) calculate displacement, velocity, average velocity, acceleration, and average acceleration within a frame of reference using graphical vector addition;

(E) use graphs and charts to generate and interpret relevant equations for two-dimensional motion;

(F) explain projectile and circular motion using two-dimensional equations or vectors and apply the concepts to an investigation such as testing a catapult or carousel;

(G) explain Newton's first law of motion and apply the concepts of equilibrium and inertia to investigations using relevant real-world examples such as rockets, satellites, and automobile safety devices;

(H) conduct investigations that include calculations and free body diagrams to observe the effect of forces on objects, including tension, friction, normal force, gravity, centripetal force, and applied force, using the relationship between force, mass, and acceleration as represented by Newton's second law of motion;

(I) conduct or design investigations such as those that involve rockets, tug-of-war, or balloon cars to illustrate and analyze the simultaneous forces between two objects as represented in Newton's third law of motion using free body diagrams;

(J) design a model based on Newton's law of universal gravitation between two or more objects to determine the relationships between force, their masses, and the distance between their centers;

(K) design, evaluate, and refine a device that uses the concepts of impulse and conservation of momentum to minimize the net force on objects during collisions such as those that occur during vehicular accidents or sports activities or when a personal electronic device is dropped; and

(L) describe and calculate the mechanical energy of the power generated within, the impulse applied to, and the momentum of a physical system.

(10) The student describes the nature of forces in the physical world. The student is expected to:

(A) use Coulomb's law to predict how the magnitude of the electric force between two objects depends on their charges and the distance between their centers;

(B) build models such as generators, motors, and transformers that show how electric, magnetic, and electromagnetic forces and fields work in everyday life;

(C) test a variety of materials to determine conductive or insulative properties based on their electric properties;

(D) design, evaluate, and refine series and parallel circuits using schematics, digital resources, or materials such as switches, wires, resistors, lightbulbs, batteries, multimeters, voltmeters, and ammeters; and

(E) construct series and parallel circuits and use Ohm's Law to calculate current, potential difference, resistance, and power of various real-world series and parallel circuits such as models of in-home wiring, automobile wiring, and simple electrical devices.

(11) The student describes and applies the laws of the conservation of energy. The student is expected to:

(A) describe the transformations among work, potential energy, and kinetic energy using the work-energy theorem;

(B) calculate work, power, kinetic energy, and potential energy;

(C) identify, describe, and give real-world examples of simple machines such as levers, pulleys, wheels axles, wedges, screws, and inclined planes;

(D) calculate the mechanical advantage of simple machines; and

(E) apply the laws of conservation of energy to a physical system using simple machines such as a Rube Goldberg machine.

(12) The student analyzes the concept of thermal energy. The student is expected to:

(A) explain the laws of thermodynamics and how they relate to systems such as engines, heat pumps, refrigeration, solar, and heating and air conditioning;

(B) investigate and demonstrate the movement of thermal energy through various states of matter by convection, conduction, and radiation through environmental and man-made systems; and

(C) design, construct, and test a device or system that either minimizes or maximizes thermal energy consumption and perform a cost-benefit analysis such as comparing materials and energy sources that are renewable and nonrenewable.

(13) The student analyzes the properties of wave motion and optics. The student is expected to:

(A) examine and describe oscillatory motion using pendulums and wave propagation in various types of media;

(B) investigate and analyze characteristics of waves, including period, velocity, frequency, amplitude, and wavelength;

(C) investigate and calculate the relationship between wave speed, frequency, and wavelength;

(D) compare the characteristics and behaviors of transverse waves and longitudinal waves, including electromagnetic waves and sound waves;

(E) describe how the differences in wavelength and frequency within the electromagnetic spectrum impact real-world technologies such as radio, x-rays, and microwaves;

(F) investigate and explain behaviors of waves, including reflection, refraction, diffraction, interference, resonance, polarization, and the Doppler effect; and

(G) describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER J. HEALTH SCIENCE

19 TAC §§127.461, 127.462, 127.474 - 127.493, 127.553 - 127.555

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.461. Principles of Health Science (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services, and biotechnology research and development.

(3) The Principles of Health Science course is designed to provide an overview of the therapeutic, diagnostic, health informatics, support services, and biotechnology research and development systems of the health care industry.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) identify employer expectations such as punctuality, attendance, time management, communication, organizational skills, and productive work habits.

(2) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) convert units between systems of measurement;

(B) apply data from tables, charts, and graphs to provide solutions to health-related problems;

(C) interpret technical material related to the health science industry;

(D) organize, compile, and write ideas into reports and summaries;

(E) plan and prepare effective oral presentations;

(F) formulate responses using precise language to communicate ideas;

(G) describe biological and chemical processes that maintain homeostasis;

(H) identify and analyze principles of body mechanics and movement such as forces and the effects of movement, torque, tension, and elasticity on the human body;

(I) identify human needs according to Maslow's Hierarchy of Human Needs;

(J) describe the stages of development related to the life span;

(K) identify the concepts of health and wellness throughout the life span;

(L) analyze and evaluate communication skills for maintaining healthy relationships throughout the life span;

(M) research the historical significance of health care;

(N) describe the impact of health services on the economy;

(O) analyze the impact of local, state, and national government on the health science industry;

(P) identify diverse and cultural influences that have impacted contemporary aspects of health care delivery; and

(Q) research and compare practices used by various cultures and societies to solve problems related to health.

(3) The student uses verbal and nonverbal communication skills. The student is expected to:

(A) identify components of effective and non-effective communication;

(B) demonstrate effective communication skills for responding to the needs of individuals in a diverse society;

(C) evaluate the effectiveness of conflict-resolution techniques in various situations; and

(D) accurately interpret, transcribe, and communicate medical vocabulary using appropriate technology.

(4) The student implements the leadership skills necessary to function in a democratic society. The student is expected to:

(A) identify traits of a leader;

(B) demonstrate leadership skills, characteristics, and responsibilities of leaders such as goal-setting and team building; and

(C) demonstrate the ability to effectively conduct and participate in meetings.

(5) The student assesses career options and the preparation necessary for employment in the health science industry. The student is expected to:

(A) locate, evaluate, and interpret career options and employment information; and

(B) recognize the impact of career decisions, including the causes and effects of changing employment situations.

(6) The student identifies academic preparation and skills necessary for employment as defined by the health science industry. The student is expected to identify academic requirements for professional advancement such as certification, licensure, registration, continuing education, and advanced degrees.

(7) The student identifies the career pathways related to health science. The student is expected to:

(A) compare health science careers within the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems; and

(B) identify the collaborative role of team members between systems to deliver quality health care.

(8) The student examines the role of the multidisciplinary team in providing health care. The student is expected to:

(A) explain the concept of teaming to provide quality health care; and

(B) examine the role of professional organizations in the preparation and governance of credentialing and certification.

(9) The student interprets ethical behavior standards and legal responsibilities. The student is expected to:

(A) compare published professional codes of ethics and scope of practice;

(B) explain principles of ethical behavior and confidentiality, including the consequences of breach of confidentiality;

(C) discuss ethical issues related to health care, including implications of technological advances;

(D) examine issues related to malpractice, negligence, and liability; and

(E) research laws governing the health science industry.

(10) The student recognizes the rights and choices of the individual. The student is expected to:

(A) identify situations related to autonomy;

(B) identify wellness strategies for the prevention of disease;

(C) evaluate positive and negative effects of relationships on physical and emotional health such as peers, family, and friends in promoting a healthy community;

(D) review documentation related to rights and choices; and

(E) demonstrate an understanding of diversity and cultural practices influencing contemporary aspects of health care.

(11) The student recognizes the importance of maintaining a safe environment and eliminating hazardous situations. The student is expected to:

(A) identify governing regulatory agencies such as the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration, U.S. Food and Drug Administration, Joint Commission, and National Institute of Health;

(B) identify industry safety standards such as standard precautions, fire prevention and safety practices, and appropriate actions to emergency situations; and

(C) relate safety practices in the health science industry.

(12) The student identifies the technology used in the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems. The student is expected to:

(A) research and identify technological equipment used in the diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems;

(B) identify potential malfunctions of technological equipment; and

(C) recognize and explain the process for reporting equipment or technology malfunctions.

§127.462. Principles of Bioscience (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Principles of Bioscience provides an overview of biotechnology, bioengineering, and related fields. Topics related to genetics, proteins, and nucleic acids reinforce the applications of Biology content. Students will further study the increasingly important agricultural, environmental, economic, and political roles of bioenergy and biological remediation; the roles of nanoscience and nanotechnology in biotechnology medical research; and future trends in biological science and biotechnology.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student explores biotechnology career opportunities. The student is expected to:

(A) determine interests in the field of biotechnology through explorations such as career assessments, interactions with biotechnology professionals, media, and literature;

(B) identify career options in the field of biotechnology;

(C) identify reliable sources of career information;

(D) research and communicate interests, knowledge, educational level, abilities, and skills needed in a biotechnology-related occupation;

(E) identify conventional and non-conventional career opportunities that match interests and aptitudes;

(F) research applications of biotechnology in medicine, the environment, and settings such as pharmaceutical, agricultural, and industrial;

(G) use technology to research biotechnology topics, including identifying and selecting appropriate scholarly references; and

(H) analyze and discuss professional publications such as academic and peer-reviewed journals and technical reports.

(3) The student evaluates ethical and legal issues in biotechnology. The student is expected to:

(A) identify current ethical and legal issues;

(B) describe the history of biotechnology and related ethical and legal issues;

(C) discuss legal and technology issues for at least two biotechnology-related areas; and

(D) analyze examples of biotechnology views supported by objective and subjective sources such as scientific data, economic data, and sociocultural contexts.

(4) The student examines federal, state, local, and industry regulations as applied to biotechnological processes through researching credible sources. The student is expected to:

(A) identify local, state, and federal agencies responsible for regulating the biotechnology industry such as the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the U.S. Food and Drug Administration (FDA), and the Centers for Disease Control and Prevention (CDC);

(B) identify professional organizations participating in the development of biotechnology policies;

(C) identify and define terms related to biotechnology regulations such as Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and Globally Harmonized System (GHS); and

(D) outline the methods and procedures used in biotechnology laboratories to follow local, state, and federal regulations such as those in the agricultural and health areas.

(5) The student demonstrates knowledge of the business climate for biotechnology industry sectors in the current market. The student is expected to:

(A) identify professional publications;

(B) identify the various biotechnology industry sectors;

(C) investigate and report on career opportunities in the biotechnology industry sectors; and

(D) identify professional organizations such as those at the local, state, and national levels.

(6) The student researches and exhibits employability skills that support a career in the biotechnology industry. The student is expected to:

(A) demonstrate verbal, non-verbal, written, and electronic communication skills;

(B) demonstrate skills used to secure and maintain employment;

(C) demonstrate appropriate workplace etiquette;

(D) display productive work habits and attitudes; and

(E) identify appropriate safety equipment and practices as outlined in Texas Education Agency-approved and industry-approved safety standards such as the use of personal protective equipment (PPE) and safety data sheets (SDS).

(7) The student investigates how biotechnology impacts the origins of waste and resource recovery. The student is expected to:

(A) identify biotechnology manufacturing processes and their end products, including waste and marketable products;

(B) explore the impacts of waste on biotic and abiotic factors in the environment such as effects on biological life cycles and pollution from nonbiodegradable single-use materials and microplastics;

(C) analyze the results of manufacturing refuse;

(D) explain the negative impacts of waste with respect to the individual, society, and the global population;

(E) investigate solutions to waste through bioremediation; and

(F) investigate evidence supporting waste management through regulations, public policy, and technology development.

(8) The student examines the relationship of biotechnology to the development of commercial products. The student is expected to:

(A) identify applications of agricultural biotechnology such as selective breeding of livestock and plants, aquaculture, horticultural products, and genetically modified organisms;

(B) identify applications of industrial biotechnology such as fermented food and beverages, genetically engineered proteins for industry, biocatalysts, bio polymers, biosensors, bioremediation, and biofuels;

(C) identify applications of medical and pharmaceutical biotechnology such as genetically modified cells, antibodies, vaccine and gene therapy, genetic testing for human disease/disorders, three-dimensional bio-printing, and medicines from plants, animals, fungi, and bacteria;

(D) identify applications of research and development in biotechnology such as deoxyribonucleic acid (DNA) and protein synthesis and sequencing, genetic testing and screening, DNA identification, RNAi, siRNA, miRNA, the CRISPR/Cas9 system, and synthetic biology;

(E) identify the applications of biotechnology in the fields of forensics, law enforcement, nanotechnology, and bioinformatics;

(F) research ethical considerations, laws, and regulations for biotechnological applications such as bioinformatics, genetic engineering, and nanotechnology; and

(G) identify the function of laboratory equipment, including a microscope, thermocycler, pH meter, hot plate stirrer, electronic balance, autoclave, centrifuge, transilluminator, micropipette, incubator, electrophoresis unit, vortex mixer, water bath, laboratory glassware, biosafety cabinet, and chemical fume hood.

§127.474. Mathematics for Medical Professionals (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for student in Grades 11 and 12. Prerequisites: Geometry and Algebra II. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Mathematics for Medical Professionals course is designed to serve as the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding in medical mathematics, students will extend and apply mathematical skills necessary for health science professions. Course content consists primarily of high school level mathematics concepts and their applications to health science professions.

(4) The mathematical process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) demonstrate adaptability skills such as problem solving and creative thinking.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in health science professions;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems in health science professions;

(D) communicate mathematical ideas, reasoning, and their implications to the health science field using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas in health science professions;

(F) analyze mathematical relationships to connect and communicate mathematical ideas in health science professions; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication as it applies to health science professions.

(3) The student generates deeper mathematical understandings through problems involving numerical data that arise in health science professions. The student extends existing knowledge and skills to analyze real-world clinical situations. The student is expected to:

(A) add, subtract, multiply, and divide rational numbers fluently in problem-solving situations related to health science professions;

(B) keep track of and manage inventory using the First In, Last Out (FILO) concept;

(C) solve health science related problems involving ratios, rates, and percentages accurately and precisely, including lab analysis, body fluid analysis, vital signs, medication dosages and administration, growth charts, body surface area, parenteral solutions and data collection related to homeostasis;

(D) learn to read and use military time fluently for health science situations, including medication administration, scheduling, and documentation;

(E) apply appropriate estimation techniques used in health science professions to estimate percent and then confirm those estimates with calculations; and

(F) read and determine accurate numerical value of Roman numerals as used in the health science professions, including cranial nerves.

(4) The student applies the process standards in mathematics to create and analyze mathematical models of health science situations to make informed decisions related to improved health care outcomes by appropriate, proficient, and efficient use of tools, including technology. The student judges the validity of a prediction and uses

mathematical models to represent, analyze, and solve dynamic health care problems. The student is expected to:

(A) collect data to create a scatterplot and apply various functions to model the data in an effort to interpret results and make predictions in health science situations such as interpreting growth charts, interpreting disease and mortality rates, and diagnosing and determining treatment modalities;

(B) create, represent, and analyze appropriate mathematical functions such as linear, quadratic, exponential, logarithmic, and sinusoidal functions used to model, interpret and predict situations that occur in health science professions such as supply and demand, inventory control, and cost analysis within clinical situations;

(C) determine or analyze an appropriate sinusoidal model for health science situations that can be modeled with periodic functions, including those related to electrocardiograms (EKG), repolarization of the heart, and medication dosage and administration;

(D) write and solve systems of equations, especially those representing mixtures, which apply to health science situations, including intravenous (IV) solutions and medication dosages;

(E) use properties of logarithmic and exponential functions to solve equations related to health science situations such as determining the pH of a solution, the concentration of hydrogen ions (H^+) given the pH, calculating the absorbance and transmittance, and determining exponential growth and decay; and

(F) calculate accurate and precise unit rates used in health science situations.

(5) The student applies mathematical process standards to obtain accurate and precise measurements. The student is expected to:

(A) define each of the health science professions that require a unique set of measurement or calculation standards and explain or identify the importance of each measurement system (apothecary, metric, household systems);

(B) explain the necessity of obtaining accurate measurements in the health science professions;

(C) use dimensional analysis with precision and accuracy in performing unit conversions from one measurement system to another, including the use of proportions and unit rates in pharmacology;

(D) classify the specific system to which a given unit belongs and explain its similarity or differences to units in other measurement systems;

(E) select and use appropriate measurement tools used in health science professions such as rulers, tape measures, thermometers, syringes, scales, and sphygmomanometer gauges to obtain accurate and precise measurements; and

(F) select and use appropriate measurement techniques used in health science professions to obtain accurate and precise measurements, including determining measures for medication, nutrition, fluids, and homeostasis.

(6) The student applies mathematical process standards to analyze statistical information used in health science professions. The student is expected to:

(A) obtain and analyze lab reports to evaluate if values lie outside normal parameters;

(B) obtain and analyze vital signs by comparing to normal parameters;

(C) calculate and apply measures of central tendency in application problems in the health science field;

(D) demonstrate an understanding of the significance of the normal distribution;

(E) demonstrate an understanding of and apply the Empirical Rule to find probabilities from normal distributions;

(F) calculate and use the z-score to calculate standard deviation of a normal distribution using a formula;

(G) calculate the percentile rank for a given score using a formula;

(H) describe characteristics of well-designed and well-conducted experiments, observational studies, and surveys in the health science field, including the ethical issues associated with each;

(I) distinguish between populations and samples;

(J) explain placebo and placebo effect; and

(K) define epidemiology and its extension of statistical procedures to public health issues.

(7) The student applies mathematical process standards to solve geometric problems arising in health science professions. The student is expected to:

(A) calculate volumes of various liquids and solids encountered in health science professions, including irregularly shaped solids, using formulas and geometric reasoning;

(B) calculate surface area of various surfaces encountered in health science professions, including body surface area, using formulas and geometric reasoning;

(C) calculate appropriate angles encountered in health science professions such as medication administration, body positioning, and physical therapy using geometric reasoning; and

(D) calculate and analyze range of motion using a goniometer.

§127.475. Biotechnology I (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 11 and 12. Prerequisite: one credit in biology. Recommended prerequisites: Principles of Bioscience and one credit in chemistry. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) In Biotechnology I, students will apply advanced academic knowledge and skills to the emerging fields of biotechnology such as agricultural, medical, regulatory, and forensics. Students will have the opportunity to use sophisticated laboratory equipment, per-

form statistical analysis, and practice quality-control techniques. Students will conduct laboratory and field investigations and make informed decisions using critical thinking, scientific problem solving, and the engineering design process. Students in Biotechnology I will study a variety of topics that include structures and functions of cells, nucleic acids, proteins, and genetics.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as microscopes, thermocyclers, pH meters, hot plate stirrers, glass bulb thermometers, timing devices, electronic balances, vortex mixers, autoclaves, micropipettes, centrifuges, gel and capillary electrophoresis units, cameras, data collection probes, spectrophotometers, transilluminators, incubators, water baths, laboratory glassware, biosafety cabinets, and chemical fume hoods;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using laboratory notebooks, written lab reports, graphs, charts, tables, digital tools, diagrams, scientific drawings, and student-prepared models;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.

(6) The student explores the emerging field of biotechnology. The student is expected to:

(A) define biotechnology and provide examples of biotechnology products such as recombinant proteins, fermented foods, biopharmaceuticals, and genetically modified foods;

(B) compare applications of bioinformatics such as deoxyribonucleic acid (DNA) barcoding, sequencing, National Center for Biotechnology Information (NCBI) tools, ClinVar, Genemonon Mastermind, genetic testing, phylogenetic relationships, and the use of online databases;

(C) research and identify career opportunities in genetics, bioinformatics, and in fields such as molecular, forensic, medical, regulatory, and agricultural biotechnology;

(D) identify significant contributions of diverse scientists to biotechnology and explain their impact on society;

(E) define bioethics and evaluate the applications of bioethics;

(F) evaluate different points of view about issues and current events in biotechnology;

(G) identify applications in agricultural biotechnology such as genetically modified organisms (GMOs), plant propagation from tissue culturing, and aquaculture hydroponics;

(H) identify applications in medical biotechnology such as vaccines production, stem cells therapy, gene therapy, pharmaceutical production, pharmacogenetics, genomics, synthetic biology, and personalized medicine;

(I) identify applications in forensic biotechnology such as capillary electrophoresis, real-time polymerase chain reaction, DNA fingerprinting, restriction fragment length polymorphisms (RFLP) analysis, toxicology, and serology; and

(J) identify solutions to waste through bioremediation and non-biotechnological standard solutions such as landfills, incineration, absorbent materials, and catalytic materials.

(7) The student summarizes biotechnology laboratory procedures and their applications in the biotechnology industry. The student is expected to:

(A) identify the major sectors of the biotechnology industry such as medical and pharmaceutical, agricultural, industrial, forensic, and research and development;

(B) identify the biotechnology laboratory procedures used in each sector such as selective breeding, genetic engineering, DNA analysis, and protein analysis; and

(C) compare and contrast the different applications used in biotechnology laboratory procedures of each sector.

(8) The student understands the role of genetics in the biotechnology industry. The student is expected to:

(A) explain terms related to molecular biology, including nucleic acids, nitrogen bases, nucleotides, mRNA, rRNA, tRNA, ribosomes, amino acids, transcription, translation, polymerase, and protein synthesis;

(B) compare and contrast the structures and functions of DNA and ribonucleic acid (RNA), including nitrogen bases, nucleotides, the helical nature of DNA, and hydrogen bonding between purines and pyrimidines;

(C) distinguish between nuclear and mitochondrial DNA and their gamete sources;

(D) describe the DNA replication process in eukaryotic and prokaryotic cells, including leading and lagging strands and Okazaki fragments;

(E) illustrate the process of protein synthesis, including ribosomal subunits and the role of tRNA;

(F) describe the structures and functions of proteins, including three-dimensional folding, enzymes, and antibodies;

(G) explain the molecular structures of genes, including enhancers, promoters, exons, introns, and coding regions;

(H) describe the different types of mutations, including inversions, deletions, duplications, and substitutions;

(I) explain the effects of mutation types on phenotype and gene function; and

(J) describe unique elements of the molecular structure of a chromosome such as short tandem repeats (STR), transposons, and methylation and acetylation of DNA.

(9) The student analyzes the importance of recombinant DNA technology and genetic engineering. The student is expected to:

(A) describe the fundamental steps in recombinant DNA technology;

(B) explain how recombinant DNA technology such as nuclear transfer cloning is used to clone genes and create recombinant proteins;

(C) explain the role of tissue cultures in genetic modification procedures;

(D) describe plant- and animal-tissue culture procedures;

(E) compare and contrast growing conditions for plant and animal tissue cultures;

(F) explain the role of restriction enzymes; and

(G) distinguish between vectors commonly used in biotechnology for DNA insertion, including plasmids, adenoviruses, retroviruses, and bacteriophages.

(10) The student examines federal, state, local, and industry regulations as related to biotechnology. The student is expected to:

(A) discuss the relationship between the local, state, and federal agencies responsible for regulation of the biotechnology industry such as the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), the U.S. Food and Drug Administration (FDA), and the Centers for Disease Control and Prevention (CDC); and

(B) analyze policies and procedures used in the biotechnology industry such as quality assurance, standard operating procedures (SOPs), Good Manufacturing Practices (GMPs), and International Organization for Standardization (ISO) quality systems.

(11) The student performs biotechnology laboratory procedures. The student is expected to:

(A) measure volumes and weights to industry standards with accuracy and precision;

(B) analyze data and perform calculations and statistical analysis as it relates to biotechnology laboratory experiments;

(C) demonstrate proficiency in pipetting techniques;

(D) identify microorganisms using staining methods such as the Gram stain, methylene-blue stain, and acid-fast staining;

(E) prepare a restriction digest, isolate nucleic acids, and evaluate results using techniques such as gel and capillary electrophoresis, Northern blot analysis, and Southern blot analysis;

(F) explain the importance of media components to the outcome of cultures;

(G) isolate, maintain, and store microbial cultures safely;

(H) prepare seed inoculum; and

(I) perform plating techniques such as streak plating, spread plating, and the Kirby-Bauer method.

(12) The student prepares solutions and reagents for the biotechnology laboratory. The student is expected to:

(A) demonstrate aseptic techniques for establishing and maintaining a sterile work area;

(B) prepare, dispense, and monitor physical properties of stock reagents, buffers, media, and solutions;

(C) calculate and prepare a dilution series; and

(D) determine optimum conditions of reagents for experimentation.

(13) The student conducts quality-control analysis while performing biotechnology laboratory procedures. The student is expected to:

(A) perform validation testing on laboratory reagents and equipment; and

(B) analyze data and perform calculations and statistical analysis on results of quality-control samples.

§127.476. Biotechnology II (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in chemistry and Biotechnology I. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Biotechnology II has the components of any rigorous scientific or bioengineering program of study. This course applies the standard skills mastered in Biotechnology I and includes additional skills related to assay design, protein analysis, applications of genetic engineering, and quality management. After taking this course, students should be prepared for entry-level lab technician jobs.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices.

Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;

(B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;

(C) present written and oral communication in a clear, concise, and effective manner;

(D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and

(E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as microscopes, thermocyclers, pH meters, hot plate stirrers, glass bulb thermometers, timing devices, electronic balances, vortex mixers, autoclaves, micropipettes, centrifuges, gel and capillary electrophoresis units, cameras, data collection probes, spectrophotometers, transilluminators, incubators, water baths, laboratory glassware, biosafety cabinets, and chemical fume hoods;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using laboratory notebooks, written lab reports, graphs, charts, tables, digital tools, diagrams, scientific drawings, and student-prepared models;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.

(6) The student prepares for an entry-level career in biotechnology. The student is expected to:

(A) research and identify career opportunities in genetics, bioinformatics, and fields such as molecular, forensic, medical, regulatory, and agricultural biotechnology;

(B) identify the significance of recent advances in molecular, forensic, medical, regulatory, and agricultural biotechnology;

(C) discuss current bioethical issues related to the field of biotechnology;

(D) create a job-specific resume; and

(E) develop a career plan.

(7) The student analyzes academic and professional journals and technical reports. The student is expected to:

(A) identify the scientific methodology used by a researcher;

(B) examine a prescribed research design and identify dependent and independent variables;

(C) evaluate a prescribed protocol to determine the purpose for each of the procedures performed; and

(D) interpret data and evaluate conclusions.

(8) The student explores assay design in the field of biotechnology. The student is expected to:

(A) define assay requirements and optimizations;

(B) perform statistical analysis on assay design and experimental data such as linearity, system sustainability, limit of detection, and R2 values;

(C) determine an unknown protein concentration using a standard curve and technique such as a Bradford assay; and

(D) evaluate enzyme kinetics using a colorimetric assay.

(9) The student explores applications related to protein expression in the field of biotechnology. The student is expected to:

(A) describe the fundamental steps in recombinant deoxyribonucleic acid (DNA) technology;

(B) produce a recombinant protein such as green fluorescent protein (GFP);

(C) analyze proteins using techniques such as enzyme-linked immunosorbent assay (ELISA), spectrophotometry, and sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE); and

(D) isolate a specific protein from a biological sample using techniques such as chromatography and Western blot analysis.

(10) The student explores applications of recombinant DNA technology and genetic engineering. The student is expected to:

(A) prepare and maintain tissue cultures commonly used in genetic modification procedures;

(B) evaluate the effects of changes to growing conditions such as pH, temperature, and growth media;

(C) evaluate the results of a bacterial transformation using a restriction enzyme digest and Southern blot analysis;

(D) compare and contrast vectors commonly used in biotechnology applications, including plasmids, adenoviruses, retroviruses, and bacteriophages;

(E) explain the steps and components of the polymerase chain reaction (PCR); and

(F) explain applications of CRISPR/Cas9 technology in gene editing and diagnostics.

(11) The student prepares solutions and reagents for the biotechnology laboratory. The student is expected to:

(A) demonstrate aseptic techniques for establishing and maintaining a sterile work area;

(B) prepare, dispense, and monitor physical properties of stock reagents, buffers, media, and solutions;

(C) calculate and prepare a dilution series;

(D) determine acceptability and optimum conditions of reagents for experimentation; and

(E) prepare multi-component solutions of given molarity or concentration and volume.

(12) The student investigates the role of quality in the biotechnology industry, The student is expected to:

(A) describe the product pipeline in the biotechnology industry;

(B) describe the importance of quality assurance and quality control;

(C) explain the importance of documentation to quality assurance and quality control;

(D) describe the importance of corrective and preventive action (CAPA);

(E) describe Quality Management Systems (QMS) components, including inspection, audit, surveillance, and prevention;

(F) describe Good Manufacturing Practices (GMP), Good Clinical Practices (GCP), Good Documentation Practices (GDP), Good Lab Practices (GLP), and International Organization for Standardization (ISO);

(G) perform validation testing on laboratory reagents and equipment;

(H) analyze data and perform calculations and statistical analysis on results of quality-control samples such as standard deviation and percent error; and

(I) apply and create industry protocols such as laboratory method protocols, standard operating procedures (SOPs), and validation forms.

§127.477. Medical Terminology (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services, and biotechnology research and development.

(3) The Medical Terminology course is designed to introduce students to the structure of medical terms, including prefixes, suffixes, word roots, singular and plural forms, and medical abbreviations. The course allows students to achieve comprehension of medical vocabulary appropriate to medical procedures, human anatomy and physiology, and pathophysiology.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to learn the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) exemplify professional work standards such as appearance, attire, time management, organizational skills, and responsibilities.

(2) The student recognizes the terminology related to the health science industry. The student is expected to:

(A) identify abbreviations, acronyms, and symbols related to the health science industry;

(B) recognize the incorrect use of abbreviations, acronyms, and symbols through review of The Joint Commission's "Do Not Use List";

(C) identify and define the component parts of medical words, including root, prefix, suffix, and combining vowels;

(D) practice word-building skills;

(E) research the origins of eponyms;

(F) recall directional terms and anatomical planes related to body structure;

(G) define and accurately spell occupationally specific terms such as those relating to the body systems, surgical and diagnostic procedures, diseases, and treatment; and

(H) use prior knowledge and experiences to understand the meaning of terms as they relate to the health science industry.

(3) The student demonstrates communication skills using the terminology applicable to the health science industry. The student is expected to:

(A) demonstrate appropriate verbal strategies such as correct pronunciation of medical terms and written strategies such as correct spelling in a variety of health science scenarios;

(B) employ increasingly precise language to communicate; and

(C) translate technical material related to the health science industry.

(4) The student examines available resources. The student is expected to:

(A) examine medical and dental dictionaries and multimedia resources;

(B) integrate resources to interpret technical materials; and

(C) investigate electronic and digital media with appropriate supervision.

(5) The student interprets medical abbreviations. The student is expected to:

(A) distinguish medical abbreviations used throughout the health science industry; and

(B) translate medical abbreviations in simulated technical material such as physician progress notes, radiological reports, and laboratory reports.

(6) The student appropriately translates health science industry terms. The student is expected to:

(A) interpret, transcribe, and communicate vocabulary related to the health science industry;

(B) translate medical terms to conversational language to facilitate communication;

(C) distinguish medical terminology associated with medical specialists such as geneticists, pathologists, and oncologists;

(D) summarize observations using medical terminology; and

(E) interpret contents of medical scenarios correctly.

§127.478. Health Science Theory (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: one credit in biology and at least one credit in a course from the health science career cluster. Recommended prerequisite: Medical Terminology. Recommended corequisite: Health Science Clinical. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Science Theory course is designed to provide for the development of advanced knowledge and skills related to a wide variety of health careers. Students will become familiar with industry-based standards for documenting and maintaining medical information; research industry employment requirements, including education, certification, and licensing requirements; and evaluate ethical and legal responsibilities of health science professionals. Students will employ hands-on experiences for continued clinical knowledge and skill development.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to learn the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) model industry expectations of professional conduct such as attendance, punctuality, appropriate professional dress, proper hygiene, and time management.

(2) The student demonstrates patient-centered skills and interactions that foster trust and lead to a quality customer service experience. The student is expected to:

(A) demonstrate care, empathy, and compassion;

(B) communicate medical information accurately and efficiently in language that patients can understand; and

(C) comply with Health Insurance Portability and Accountability Act (HIPAA) policy standards.

(3) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) solve mathematical calculations appropriate to situations in a healthcare-related environment;

(B) express ideas clearly in writing and develop skills in documentation related to health science;

(C) interpret complex technical material related to the health science industry;

(D) summarize biological and chemical processes in the body such as maintaining homeostasis; and

(E) research topics related to health science such as the global impact of disease prevention.

(4) The student demonstrates verbal, non-verbal, and electronic communication skills. The student is expected to:

(A) demonstrate therapeutic communication appropriate to the situation;

(B) use appropriate verbal and non-verbal skills when communicating with persons with sensory loss and language barriers in a simulated setting; and

(C) use electronic communication devices in the classroom or clinical setting appropriately.

(5) The student analyzes and evaluates communication skills for maintaining healthy relationships in the healthcare workplace. The student is expected to:

(A) evaluate how healthy relationships influence career performance;

(B) identify the role of communication skills in building and maintaining healthy relationships;

(C) demonstrate strategies for communicating needs, wants, and emotions in a healthcare setting; and

(D) evaluate the effectiveness of conflict-resolution techniques in various simulated healthcare workplace situations.

(6) The student documents and records medical information into a permanent health record. The student is expected to:

(A) research document formats such as dental or medical records;

(B) prepare health documents or records according to industry-based standards; and

(C) record health information on paper and electronic formats such as patient history, vital statistics, and test results.

(7) The student describes industry requirements necessary for employment in health science occupations. The student is expected to:

(A) research education, certification, licensing, and continuing education requirements and salary related to specific health science careers; and

(B) practice employment procedures for a specific health science career such as resume building, application completion, and interviewing.

(8) The student identifies problems and participates in the decision-making process. The student is expected to:

(A) apply critical-thinking, adaptability, and consensus-building skills to solve problems relevant to health science;

(B) evaluate the impact of decisions in health science; and

(C) suggest modifications to a decision or plan based on healthcare outcomes.

(9) The student demonstrates comprehension and proficiency of clinical skills used by health science professionals in a classroom or clinical setting. The student is expected to:

(A) comply with specific industry standards related to safety requirements;

(B) employ medical vocabulary specific to the healthcare setting;

(C) perform admission, discharge, and transfer functions in a simulated setting;

(D) demonstrate skills related to assisting patients with activities of daily living such as dressing, undressing, grooming, bathing, and feeding;

(E) determine proper equipment needed for patient ambulation such as gait belts, wheelchairs, crutches, or walkers;

(F) demonstrate skills related to assessing range of motion and assisting with mobility, including positioning, turning, lifting, and transferring patients for treatment or examination;

(G) role play techniques used in stressful situations such as situations involving trauma and chronic and terminal illness;

(H) demonstrate first aid, vital signs, cardiopulmonary resuscitation, and automated external defibrillator skills; and

(I) identify basic skills specific to a health science profession such as medical assistant, dental assistant, emergency medical technician-basic, phlebotomy technician, and pharmacy technician.

(10) The student evaluates ethical behavioral standards and legal responsibilities of a health science professional. The student is expected to:

(A) research and describe the role of professional associations and regulatory agencies;

(B) examine legal and ethical behavior standards such as Patient Bill of Rights, advanced directives, and HIPAA; and

(C) investigate the legal, ethical, and professional ramifications of unacceptable or discriminatory behavior.

(11) The student exhibits the leadership skills necessary to function in a healthcare setting. The student is expected to:

(A) identify essential leadership skills of health science professionals;

(B) assess group dynamics in real or simulated groups; and

(C) integrate consensus-building techniques.

(12) The student maintains a safe work environment. The student is expected to:

(A) describe governmental regulations and guidelines from entities such as the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), Occupational Safety and Health Administration (OSHA), U.S. Food and Drug Administration (FDA), The Joint Commission, and the National Institute of Health (NIH), and Texas Department of State Health Services (DSHS);

(B) explain protocols related to hazardous materials and situations such as personal protective equipment (PPE) and blood borne pathogen exposure;

(C) describe how to assess and report unsafe conditions;

(D) identify the benefits of recycling and waste management for cost containment and environmental protection; and

(E) demonstrate proper body mechanics to reduce the risk of injury.

(13) The student assesses wellness strategies for the prevention of disease. The student is expected to:

(A) research wellness strategies for the prevention of disease;

(B) evaluate positive and negative effects of relationships on physical and emotional health;

(C) explain the benefits of positive relationships between community members and health professionals in promoting a healthy community;

(D) research and analyze the effects of access to quality health care;

(E) research alternative health practices and therapies; and

(F) explain the changes in structure and function of the body due to trauma and disease.

§127.479. Health Science Clinical (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Biology. Corequisite: Health Science Theory. This course must be taken concurrently with Health Science Theory and may not be taken as a stand-alone course. Districts are encouraged to offer this course in a consecutive block with Health Science Theory to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Science Clinical course is designed to provide for the development of advanced knowledge and skills related to a wide variety of health careers. Students will employ hands-on experiences for continued knowledge and skill development.

(4) To pursue a career in the health science industry, students should recognize, learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social studies in health science. The student is expected to:

(A) solve mathematical calculations appropriate to situations in a health-related environment;

(B) communicate using medical terminology;

(C) express ideas in writing and develop skills in documentation;

(D) interpret complex technical material related to the health science industry;

(E) summarize biological and chemical processes that maintain homeostasis;

(F) explain the changes in structure and function due to trauma and disease; and

(G) research the global impact of disease prevention and cost containment.

(3) The student displays verbal and non-verbal communication skills. The student is expected to:

(A) demonstrate therapeutic communication appropriate to the situation;

(B) execute verbal and nonverbal skills when communicating with persons with sensory loss and language barriers; and

(C) use electronic communication devices with appropriate supervision such as facsimile, scanner, electronic mail, and telephone.

(4) The student analyzes and evaluates communication skills for maintaining healthy relationships throughout the life span. The student is expected to:

(A) evaluate how a healthy relationship influences career goals;

(B) demonstrate communication skills in building and maintaining healthy relationships;

(C) demonstrate strategies for communicating needs, wants, and emotions; and

(D) evaluate the effectiveness of conflict resolution techniques in various practical situations.

(5) The student relates appropriate information in the practical setting to the proper authority. The student is expected to:

(A) identify and retrieve reportable information; and

(B) report information according to facility policy in the practical setting.

(6) The student identifies documents integrated into the permanent record of the health informatics system. The student is expected to:

(A) research and describe document formats; and

(B) compile and record data according to industry based standards.

(7) The student describes academic requirements necessary for employment in the health science industry. The student is expected to:

(A) research specific health science careers; and

(B) review employment procedures for a specific health science career.

(8) The student identifies problems and participates in the decision-making process. The student is expected to:

(A) analyze systematic procedures for problem solving;

(B) evaluate the impact of decisions; and

(C) suggest modifications based on decision outcomes.

(9) The student implements the knowledge and skills of a health science professional in the clinical setting. The student is expected to:

(A) comply with specific industry standards related to safety and substance abuse;

(B) model industry expectations of professional conduct such as attendance, punctuality, personal appearance, hygiene, and time management;

(C) articulate comprehension of assignment;

(D) employ medical vocabulary specific to the health care setting;

(E) perform admission, discharge, and transfer functions in a simulated setting;

(F) demonstrate skills related to activities of daily living in rehabilitative care such as range of motion, positioning, and ambulation according to the health science industry standards, regulatory agency standards, and professional guidelines;

(G) role play techniques used in stressful situations such as trauma, chronic, and terminal illness;

(H) demonstrate first aid, vital signs, cardiopulmonary resuscitation, and automated external defibrillator skills in a laboratory setting; and

(I) perform skills specific to a health science professional such as medical assistant, dental assistant, emergency medical technician-basic, phlebotomy technician, and pharmacy technician.

(10) The student evaluates ethical behavioral standards and legal responsibilities. The student is expected to:

(A) research and describe the role of professional associations and regulatory agencies;

(B) examine legal and ethical behavior standards such as Patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act;

(C) investigate the legal and ethical ramifications of unacceptable behavior; and

(D) perform within the designated scope of practice.

(11) The student exhibits the leadership skills necessary to function in a democratic society. The student is expected to:

(A) identify leadership skills of health science professionals;

(B) participate in group dynamics; and

(C) integrate consensus-building techniques.

(12) The student maintains a safe environment. The student is expected to:

(A) conform to governmental regulations and guidelines from entities such as the World Health Organization, Centers for Disease Control and Prevention, Occupational Safety and Health Administration, U.S. Food and Drug Administration, Joint Commission, and National Institute of Health;

(B) explain protocol related to hazardous materials and situations such as material safety data sheets;

(C) observe and report unsafe conditions; and

(D) practice recycling and waste management for cost containment and environmental protection.

(13) The student assesses wellness strategies for the prevention of disease. The student is expected to:

(A) research wellness strategies for the prevention of disease;

(B) evaluate positive and negative effects of relationships on physical and emotional health;

(C) explain the benefits of positive relationships among community health professionals in promoting a healthy community;

(D) research and analyze access to quality health care; and

(E) research alternative health practices and therapies.

§127.480. World Health and Emerging Technologies (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology and at least one credit in a Level 2 or higher course from the health science career cluster. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The World Health and Emerging Technologies course is designed to examine major world health problems and emerging technologies as solutions to these medical concerns. It is designed to improve students' understanding of cultural, infrastructural, political, educational, and technological constraints and inspire ideas for appropriate technological solutions to global medical care issues.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) exemplify professional work standards such as appearance, attire, time management, organizational skills, and responsibilities.

(2) The student explores and discusses current major human health problems in the world. The student is expected to:

(A) describe the pathophysiology of the three leading causes of death in developing and developed countries;

(B) discuss history of diseases and the evolution of medical technology over time;

(C) contrast health problems in developing and developed countries;

(D) compare the functions of public health organizations, including the Centers for Disease Control and Prevention (CDC) and World Health Organization (WHO), at the local, state, national, and international levels;

(E) define and calculate incidence, morbidity, and mortality;

(F) identify and describe the challenges in global health that can have the greatest impact on health in developing nations; and

(G) investigate various social determinants of health such as food insecurity, homelessness, or financial insecurities.

(3) The student explains who pays for health care in the world today. The student is expected to:

(A) compare the availability and quality of health care in developing and developed countries;

(B) discuss and contrast the four basic healthcare system models, including the Beveridge Model, Bismarck Model, National Health Insurance Model, and the Out-of-Pocket Model, and compare these models to existing payment mechanisms in the United States of America;

(C) explain how countries that have different healthcare systems such as Canada, the United Kingdom, Japan, Germany, Taiwan, Switzerland, and the United States of America pay for health care and compare their patient outcomes such as infant mortality rates, rate of cancer, or rate of heart disease;

(D) describe how healthcare expenditures have changed over time; and

(E) identify the major contributors to the rising healthcare industry costs.

(4) The student describes the engineering technologies developed to address clinical needs. The student is expected to:

(A) describe technologies that support the prevention and treatment of infectious diseases;

(B) explain the implication of vaccines on the immune system and on public health;

(C) discuss the dangers of antibiotic overuse and misuse;

(D) investigate technologies such as genetics and molecular diagnostics used for the early detection and treatments of several types of cancers;

(E) describe and discuss the technologies used in the diagnosis and treatment of heart disease;

(F) describe and discuss technologies developed to support vital organ failure; and

(G) investigate emerging digital technology such as telehealth and remote monitoring and its impact on healthcare delivery.

(5) The student explores how human clinical trials are designed, conducted, and evaluated. The student is expected to:

(A) describe and discuss types of clinical trials, including the role of the institutional review board;

(B) define and calculate a sample size;

(C) identify quantitative and qualitative methods used in clinical trials; and

(D) compare and contrast different phases of pharmaceutical trials.

(6) The student recognizes the ethical and legal aspects involved in clinical research. The student is expected to identify issues and explain the ethical and legal guidelines, including informed consent and patient confidentiality, for the conduct of research involving human subjects.

(7) The student explains how research guides the development of new medical technologies. The student is expected to:

(A) describe how health science research is funded;

(B) explain the role of the U.S. Food and Drug Administration in approving new drugs and medical devices; and

(C) analyze factors that affect the dissemination of new medical technologies.

(8) The student applies research principles to create a project that addresses a major health topic. The student is expected to:

(A) facilitate data analysis and communicate experimental results clearly by effectively using technology such as creating visual aids; and

(B) present the project to classmates, health professionals, parents, or instructors.

§127.481. Anatomy and Physiology (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: one credit in biology and one credit in chemistry, Integrated Physics and Chemistry, or physics. Recommended prerequisite: a course from the Health Science Career Cluster. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Anatomy and Physiology course is designed for students to conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Anatomy and Physiology will study a variety of topics, including the structure and

function of the human body and the interaction of body systems for maintaining homeostasis.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability skills. The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) investigate necessary skills for heath careers related to anatomy and physiology.

(2) Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as lab notebooks or journals, calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, meter sticks, electronic balances, micro pipettors, hand lenses, Celsius thermometers, hot plates, timing devices, Petri dishes, agar, lab incubators, dissection equipment, reflex hammers, pulse oximeters, stethoscope, otoscope, blood pressure monitors (sphygmomanometers), pen lights, ultrasound equipment, and models, diagrams, or samples of biological specimens or structures;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish among scientific hypotheses, theories, and laws.

(3) Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) Scientific and engineering practices. The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) or health science field in order to investigate careers.

(6) Human body organization. The student demonstrates an understanding of the anatomic and physiological basis of life and the ability to explain the interdependence of structure and function in biological systems. The student is expected to:

(A) distinguish between the six levels of structural organization in the human body, including chemical, cellular, tissue, organ, system, and organism, and explain their interdependence;

(B) identify and use appropriate directional terminology when referring to the human body, including directional terms, planes, body cavities, and body quadrants;

(C) identify and describe the major characteristics of living organisms, including response to stimuli, growth and development, homeostasis, cellular composition, metabolism, reproduction, and the ability to adapt to the environment;

(D) research and describe negative and positive feedback loops as they apply to homeostasis; and

(E) research and identify the effects of the failure to maintain homeostasis as it relates to common diseases in each of the body systems.

(7) Histology. The student demonstrates the ability to analyze the structure and function of eukaryotic cells in relation to the formation of tissue. The student is expected to:

(A) define tissue and identify the four primary tissue types, their subdivisions, and functions;

(B) compare epithelial tissue and connective tissue in terms of cell arrangement and interstitial materials;

(C) describe the process of tissue repair involved in the normal healing of a superficial wound; and

(D) describe the general metabolic pathways of carbohydrates, lipids, and proteins.

(8) Skeletal system. The student analyzes the relationships between the anatomical structures and physiological functions of the skeletal system. The student is expected to:

(A) identify and differentiate between the axial skeleton and appendicular skeleton;

(B) identify the types of joints, including gliding, hinge, pivot, saddle, and ball and socket, and describe the movements of each;

(C) identify and locate the anatomy of bone, including spongy and compact tissue, epiphysis, diaphysis, medullary cavity, periosteum, bone marrow, and endosteum;

(D) explain the major physiological functions of the skeletal system;

(E) describe the role of osteoblasts, osteocytes, and osteoclasts in bone growth and repair;

(F) identify and describe the different types of fractures such as compound, complete, simple, spiral, greenstick, hairline, transverse, and comminuted; and

(G) identify and describe common diseases and disorders of the skeletal system such as scoliosis, osteoporosis, and bone cancer.

(9) Integumentary system. The student analyzes the relationships between the anatomical structures and physiological functions of the integumentary system. The student is expected to:

(A) identify and describe the structures of the integumentary system, including layers of the skin, accessory organs within each layer, and glandular components in each layer;

(B) describe the factors that can contribute to skin color;

(C) describe and explain the process of tissue repair and scar formation; and

(D) identify and describe common diseases and disorders of the integumentary system such as skin cancer and psoriasis.

(10) Muscular system. The student analyzes the relationships between the anatomical structures and physiological functions of the muscular system. The student is expected to:

(A) explain the major physiological functions of the muscular system, including voluntary movement, involuntary movement, heat production, and maintaining posture;

(B) explain the coordination of muscles, bones, and joints that allows movement of the body, including the methods of attachment of ligaments and tendons;

(C) examine common characteristics of muscle tissue, including excitability, contractibility, extensibility, and elasticity;

(D) identify and describe the appearance, innervation, and function of the three muscle types, including cardiac, skeletal, and smooth;

(E) examine the microscopic anatomy of a muscle fiber, including sarcomere, actin, and myosin;

(F) describe the mechanisms of muscle contraction at the neuromuscular junction;

(G) name, locate, and describe the action of major voluntary muscles in regions of the body, including the head and neck, trunk, upper extremity, and lower extremity;

(H) identify and describe common diseases and disorders of the muscular system such as muscle strains and muscular dystrophy; and

(I) analyze and describe the effects of pressure, movement, torque, tension, and elasticity on the human body.

(11) Nervous system. The student analyzes the relationship between the anatomical structures and physiological functions of the nervous system. The student is expected to:

(A) summarize and distinguish between the major physiological functions of the nervous system, including sensation, integration, and motor response;

(B) identify the senses and explain their relationship to nervous system;

(C) investigate and explain the interdependence between the cranial and spinal nerves with the special senses of vision, hearing, smell, and taste;

(D) describe the anatomy of the structures associated with the senses, including vision, hearing, smell, taste, and touch;

(E) identify the anatomical and physiological divisions of the peripheral nervous system and central nervous system;

(F) explain the glial cells within the central nervous system and peripheral nervous system and their associated functions;

(G) analyze the functional and structural differences between gray and white matter relative to neurons;

(H) distinguish between the types of neurons and explain the initiation of a nerve impulse during resting and action potential;

(I) categorize the major neurotransmitters by chemical and physical mechanisms; and

(J) identify and describe common diseases and disorders of the nervous system such as epilepsy, neuralgia, Parkinson's disease, and Alzheimer's disease.

(12) Endocrine system. The student analyzes the relationships between the anatomical structures and physiological functions of the endocrine system. The student is expected to:

(A) identify and locate the nine glands associated with the endocrine system, including the ovaries, testes, pineal gland, pituitary gland, thyroid gland, parathyroid glands, thymus, pancreas, and adrenal glands;

(B) compare and contrast endocrine and exocrine glands and identify the glands associated with each;

(C) describe the hormones associated with each endocrine gland;

(D) research the impact of the endocrine systems on homeostatic mechanisms and other body systems such as the integration between the hypothalamus and the pituitary gland;

(E) explain how the endocrine glands are regulated, including neural, hormonal, and humoral control; and

(F) identify and describe common diseases and disorders of the endocrine system such as hypothyroidism, pancreatic cancer, and diabetes.

(13) Urinary system. The student analyzes the relationships between the anatomical structures and physiological functions of the urinary system. The student is expected to:

(A) identify and describe the anatomical structures and functions of the urinary system, including the kidney, ureters, bladder, and urethra;

(B) compare and contrast the anatomical structures and describe the functions of the male and female urinary system;

(C) summarize and illustrate the structures, functions, and types of nephrons;

(D) examine the methods of fluid balance and homeostasis in the urinary system, including fluid intake and output;

(E) analyze the composition of urine and the process of urine formation, including filtration, reabsorption, and secretion;

(F) describe the relationship between the nervous system, renal system, and muscular system before and during micturition; and

(G) identify and describe common diseases and disorders of the urinary system such as chronic kidney disease, kidney stones, urinary tract infections, and renal cancer.

(14) Cardiovascular system. The student analyzes the relationships between the anatomical structures and physiological functions of the cardiovascular system. The student is expected to:

(A) identify the major functions of the cardiovascular system, including transport, maintaining homeostasis, and immune response;

(B) compare and contrast the anatomical structure of arteries, arterioles, capillaries, venules, and veins;

(C) investigate and illustrate how systemic circulation transports blood, gasses, and nutrients from the heart to the internal anatomy of the heart, including tissue layers, chambers, and valves, and external anatomy of the heart, including coronary vessels;

(D) describe the relationship between blood flow and blood pressure, including systolic and diastolic pressure, pulse pressure, and mean arterial pressure;

(E) compare and contrast coronary, pulmonary, and systemic circulation, and describe the major vessels of each;

(F) illustrate how the PQRST waves of an electrocardiogram (EKG) demonstrate the conduction of electricity through the structures of the heart;

(G) describe the relationship between the cardiovascular system, nervous system, and muscular system in regulating cardiac output; and

(H) identify and describe common diseases and disorders of the cardiovascular system such as heart disease, myocardial infarction, ischemia, and hypertrophic cardiomyopathy.

(15) Lymphatic system. The student analyzes the relationships between the anatomical structures and physiological functions of the lymphatic system and understands the immune response. The student is expected to:

(A) evaluate the interaction of the lymphatic system with other body systems such as the circulatory system;

(B) describe the structure and function of the lymphatic organs and explain how lymph moves through the body;

(C) identify and describe the role and function of the immune cells, including T cells and B cells, within the lymphatic system structures;

(D) identify and determine antigens associated with ABO blood typing, including Rhesus (Rh) factor;

(E) summarize the ways the body protects and defends against disease, including inflammation, barrier defenses, and active and passive immunity;

(F) describe the role of antigens and antibodies in the immune response; and

(G) identify and describe common diseases and disorders associated with the lymphatic and immune systems such as inherited or acquired immunodeficiencies, autoimmune diseases, and lymphomas.

(16) Digestive system. The student analyzes the relationships between the anatomical structures and physiological functions of the digestive system. The student is expected to:

(A) examine the anatomical structures and function of the alimentary canal and accessory organs;

(B) compare and contrast mechanical and chemical digestive processes;

(C) evaluate the modes by which energy is processed and stored within the body, including ingestion, propulsion, absorption, and elimination; and

(D) identify and describe common diseases and disorders of the digestive system such as gallstones, Crohn's disease, irritable bowel syndrome, and gastroesophageal reflux disorder.

(17) Respiratory system. The student analyzes the relationships between the anatomical structures and physiological functions of the respiratory system. The student is expected to:

(A) identify and sequence the anatomical structures and functions of the respiratory system;

(B) compare and contrast the functions of upper and lower respiratory tract;

(C) describe the physiology of respiration, including internal and external respiration and gas exchange;

(D) describe the relationship between the respiratory and cardiovascular systems during pulmonary circulation;

(E) investigate factors that affect respiration, including exercise and environmental changes such as altitude; and

(F) identify and describe common diseases of the respiratory system such as asthma, emphysema, pneumonia, viruses, and allergies.

(18) Reproductive system. The student analyzes the relationships between the anatomical structures and physiological functions of the reproductive system. The student is expected to:

(A) explain embryological development of cells, tissues, organs, and systems;

(B) describe and examine the location, structure, and functions of the internal and external female and male reproductive organs and accessory glands;

(C) describe and compare the process of oogenesis and spermatogenesis;

(D) research and discuss the physiological effects of hormones on the stages of the menstrual cycle;

(E) identify and distinguish the hormones involved in maturation and development throughout the life cycle, including puberty, gestation, and menopause; and

(F) identify and describe common diseases and disorders of the reproductive system such as sexually transmitted diseases and cancers of the female and male reproductive systems.

(19) Emerging technologies. The student identifies emerging technological advances in science and healthcare treatment and delivery. The student is expected to:

(A) research and discuss advances in science and medicine at the organ and tissue level such as bionics and wearable monitoring technologies; and

(B) research and describe advances in science and medicine at the cellular level such as stem cells and gene therapy.

§127.482. Pathophysiology (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a Level 2 or higher course from the health science career cluster. Recommended prerequisite: Anatomy and Physiology. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Pathophysiology course is designed for students to conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Pathophysiology will study disease processes and how humans are affected. Emphasis is placed on prevention and treatment of disease.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have

been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner; and

(B) demonstrate the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micro pipettors, hand lenses, Celsius thermometers, hot plates, timing devices, Petri dishes, lab incubators, biochemical media and stains dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using lab notebooks or journals, lab reports, labeled drawings, graphic organizers, peer reviewed medical journals, summaries, oral reports, and technology-based reports;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) or health science field in order to investigate careers.

(6) The student analyzes the mechanisms of pathology. The student is expected to:

(A) describe abnormal biological and chemical processes at the cellular level;

(B) examine and analyze changes resulting from mutations and neoplasms by examining cells, tissues, organs, and systems;

(C) investigate factors that contribute to disease, including age, gender, environment, lifestyle, and heredity; and

(D) analyze and describe how the body's compensating mechanisms attempt to maintain homeostasis when changes occur.

(7) The student examines the process of pathogenesis. The student is expected to:

(A) differentiate and identify pathogenic organisms using microbiological techniques such as gram staining, biochemical identification, and microscopic observation;

(B) research and summarize the stages of pathogenesis, including incubation period, prodromal period, and exacerbation or remission;

(C) analyze the body's natural defense systems against infection, including barriers, the inflammatory response, and the immune response;

(D) analyze other mechanisms of disease prevention and treatment such as vaccinations, antibiotics, chemotherapy, and immunotherapy; and

(E) evaluate the effects of chemical agents, environmental pollution, and trauma on the disease process.

(8) The student examines diseases throughout the body's systems. The student is expected to:

(A) investigate the etiology, signs and symptoms, diagnosis, prognosis, and treatment of diseases;

(B) explore and describe advanced technologies for the diagnosis and treatment of disease;

(C) research and describe reemergence of diseases such as malaria, tuberculosis, polio, and measles;

(D) research the causes, prevention, and impact of nosocomial infections and differentiate between the causes, prevention, and impact of nosocomial infections versus community-acquired infections;

(E) research and describe antibiotic-resistant diseases such as methicillin-resistant *Staphylococcus aureus*;

(F) differentiate between various types of diseases and disorders, including hereditary, infectious, and auto-immune; and

(G) investigate ways diseases such as diabetes, Parkinson's, lupus, and congestive heart failure affect multiple body systems.

(9) The student integrates the effects of disease prevention and control. The student is expected to:

(A) evaluate public health issues related to asepsis, isolation, immunization, and quarantine;

(B) analyze the effects of stress and aging on the body;

(C) analyze patient medical data and interpret medical laboratory test results to inform diagnosis and treatment;

(D) analyze and interpret epidemiological data to determine common trends and predict outcomes in disease progression;

(E) research and summarize diseases that threaten world health and propose intervention strategies; and

(F) develop a prevention plan that considers how behaviors contribute to lifestyle diseases.

§127.483. Pharmacy I (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10 and 11. Recommended prerequisites: Introduction to Pharmacy Science or Principles of Health Science and one credit in biology. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The goal of Pharmacy I is for the student to gain a strong foundation in the knowledge and skills needed to pursue a career in the pharmaceutical field (e.g., pharmacy technician, pharmacist). Knowledge includes pharmacology, pharmacy law, medication safety, the dispensing process, and inventory. Pharmacy I is designed to be the second course in a pathway leading to college and career readiness in the healthcare therapeutics professions. The course content aligns with the competencies of pharmacy technician certification examinations.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student exhibits personal and interpersonal knowledge and skills. The student is expected to:

(A) model ethical conduct in complex situations;

(B) model a respectful and professional attitude when interacting with diverse patient populations, colleagues, and professionals;

(C) apply self-management skills such as stress and change management;

(D) apply interpersonal skills, including negotiation skills, conflict resolution, customer service, and teamwork;

(E) practice problem-solving skills in respect to complex ethical decision making; and

(F) compare unethical and illegal conduct in the workplace.

(2) The student communicates effectively with diverse populations. The student is expected to:

(A) practice a respectful and professional attitude when interacting with diverse patient populations, colleagues, and professionals; and

(B) compare communication techniques that are effective for various population clients such as terminally ill, intellectually disabled, visually/hearing impaired, and elderly/pediatric populations.

(3) The student interprets pharmacy correspondence utilizing medical abbreviations and terminology typically found in the pharmacy setting. The student is expected to:

(A) employ pharmacy terminology and abbreviations in creating and utilizing correspondence in the pharmacy such as prescriptions, medication administration records (MARs), and patient order sheets;

(B) compare terminology typically used in the community and institutional pharmacy settings; and

(C) translate sig codes and abbreviations used in the pharmacy.

(4) The student distinguishes between the requirements of various federal agencies. The student is expected to:

(A) explain the handling and disposal of non-hazardous, hazardous, and pharmaceutical substances and waste;

(B) discuss the requirements for controlled substance prescriptions, including new, refill, and transfer prescriptions, according to the Drug Enforcement Administration (DEA) controlled substances schedules;

(C) describe Food and Drug Administration (FDA) recall requirements based on classification for medications, devices, supplies, and supplements;

(D) interpret and apply state and federal laws pertaining to processing, handling, and dispensing of medications, including controlled substances;

(E) interpret state and federal laws and regulations pertaining to pharmacy technicians; and

(F) explain pharmacy compliance with professional standards and relevant legal, regulatory, formulary, contractual, and safety requirements.

(5) The student recalls drug information. The student is expected to:

(A) identify brand name, generic name, classification, and indication of use for common medications with automaticity;

(B) discuss common and life-threatening drug interactions and contraindications;

(C) identify narrow therapeutic index (NTI) medications; and

(D) access and use references such as United States Pharmacopeia (USP) standards, drug reference books, and clinical information sources as needed to perform job duties.

(6) The student explains the dispensing process. The student is expected to:

(A) identify a prescription or medication order for completeness, including drug strength, dosage form, directions, quantity, and refills, and obtain missing information if needed;

(B) communicate with patients to obtain information, including demographics, medication history, health conditions, allergies, and insurance, for the patient profile;

(C) practice assisting pharmacists in collecting, organizing, and recording demographic and clinical information for the *Pharmacists' Patient Care Process*;

(D) perform the necessary mathematical calculations required for order entry, including formulas, ratios, concentrations, percent strength, dilutions, proportions, and allegations;

(E) identify equipment and supplies, including diabetic supplies, spacers, and oral/injectable syringes, required for drug administration based on the package size and unit dose;

(F) identify and describe the importance of lot numbers, expiration dates, and National Drug Codes (NDC) on drug packaging;

(G) practice and adhere to effective infection control procedures;

(H) apply appropriate cleaning standards, including hand washing and cleaning counting trays, countertops, and equipment; and

(I) explain the state pharmacy boards' roles in the regulation of pharmacy technicians and that differences exist between states in the processing, handling, and dispensing of prescription medications.

(7) The student identifies common medication errors and explains error prevention strategies. The student is expected to:

(A) identify high-alert/risk and look-alike/sound-alike (LASA) medications;

(B) describe error prevention strategies, including using Tall Man lettering, trailing/leading zeros, and barcodes; separating inventory; and limiting use of error-prone abbreviations;

(C) describe types of prescription errors, including abnormal doses, early refill, incorrect quantity, incorrect patient, and incorrect drug;

(D) explain pharmacy professional standards for and the role of the pharmacy technician in the patient care process;

(E) identify opportunities to assist pharmacists in the identification of patients who desire or require counseling to optimize the use of medications, equipment, and devices;

(F) discuss the pharmacy technician's role in patient and medication safety practices such as how to calculate dosage of pediatric over-the-counter drugs;

(G) explain how pharmacy technicians assist pharmacists in responding safely and legally to emergent patient situations; and

(H) explain basic safety and emergency preparedness procedures applicable to pharmacy services.

(8) The student performs inventory procedures according to federal, state, local, and facility guidelines. The student is expected to:

(A) identify proper storage for medications in regard to temperature, light sensitivity, product demand, fast movers, cost, and restricted access;

(B) explain the definition and purpose of a formulary or approved/preferred product list;

(C) describe procedures for inventory control, including removal of expired and recalled drug products, rotating inventory, performing a physical inventory, ordering medications and supplies, monitoring periodic automatic replenishment (PAR) levels, and using just-in-time ordering;

(D) explain accepted procedures in purchasing pharmaceuticals, devices, and supplies; and

(E) explain accepted procedures for identifying and disposing of expired medications.

§127.484. Pharmacy II (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and Pharmacy I. Recommended prerequisite: Algebra I, Introduction to Pharmacy Science, and Pharmacy I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Pharmacy II course provides students with the advanced knowledge and skills to explore various careers in the pharmacy field, including pharmacology, pharmacy law, medication errors, inventory pharmacy calculations, compounding, and workflow expectations in a pharmacy setting. Pharmacy II is designed to be the third course in a pathway leading to college and career readiness in the healthcare therapeutics professions. The course content aligns with the competencies of pharmacy technician certification examinations.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student exhibits personal and interpersonal knowledge and skills. The student is expected to:

(A) apply appropriate verbal communication in a clear, concise, and effective manner;

(B) apply appropriate non-verbal communication in a clear, respectful, and effective manner;

(C) apply appropriate adaptability skills such as problem solving and creative thinking;

(D) create or evaluate a career plan using methods such as identifying educational pathways, developing career goals, and assessing individual aptitudes;

(E) demonstrate teamwork;

(F) create an occupation-specific resume; and

(G) identify soft skills desired by employers.

(2) The student communicates effectively with diverse populations. The student is expected to:

(A) practice a respectful and professional attitude in communications with diverse patient populations, colleagues, and professionals such as written, oral, and electronic communications;

(B) demonstrate communication techniques that are effective for various populations such as terminally ill, intellectually disabled, visually/hearing impaired, and elderly/pediatric populations; and

(C) demonstrate skills for supporting communication between various stakeholders such as serving as a liaison between the nurse and the patient.

(3) The student demonstrates the use of medical terminology and abbreviations in a pharmacy setting. The student is expected to:

(A) interpret and translate prescription and medication orders according to pharmacy settings such as community and hospital environments;

(B) create pharmacy correspondence such as prescriptions, medication administration records (MARs), and patient order sheets using medical terminology and abbreviations;

(C) use medical terminology found in various pharmacy settings to communicate appropriately; and

(D) translate sig codes and abbreviations used in the pharmacy to communicate instructions to patients.

(4) The student applies the strictest requirements using the laws of local, state, and federal agencies. The student is expected to:

(A) demonstrate the proper handling and disposal of non-hazardous, hazardous, and pharmaceutical substances and waste;

(B) apply the requirements for controlled substance prescriptions, including new, refill, and transfer prescriptions;

(C) apply the requirements for receiving, storing, ordering, labeling, and dispensing controlled substances and the reverse distribution, take-back, and loss or theft of controlled substances;

(D) classify controlled substances such as cocaine, heroin, marijuana, fentanyl, dextroamphetamine, amphetamine salts, benzodiazepines, and anabolic steroids according to their Drug Enforcement Administration (DEA) schedules;

(E) identify the federal requirements for restricted drugs such as pseudoephedrine and related medication processing programs such as Risk Evaluation and Mitigation Strategies (REMS) and iPLEDGE;

(F) demonstrate the process for Food and Drug Administration (FDA) recalls based on classification for medications, devices, supplies, and supplements; and

(G) explain pharmacy compliance with professional standards such as scope of practice and relevant legal, regulatory, formulary, contractual, and safety requirements.

(5) The student interprets drug information. The student is expected to:

(A) apply knowledge of brand name, generic name, classification, and indication of use for common medications such as the top 200 drugs with automaticity in a pharmacy setting;

(B) analyze the common and life-threatening drug interactions and contraindications such as drug-disease, drug-drug, drug-lab, and drug-food;

(C) apply knowledge of the narrow therapeutic index (NTI) to drug use evaluations; and

(D) integrate the use of digital and hard copy references such as United States Pharmacopeia (USP) standards, drug reference books, and clinical information sources as needed to perform job duties.

(6) The student demonstrates the dispensing process in various pharmacy settings. The student is expected to:

(A) analyze a prescription and medication order for completeness, including drug strength, dosage form, directions, quantity, date, and refills, and obtain missing information if needed;

(B) communicate with patients or care givers using the appropriate modality to obtain information, including demographics, medication history, health conditions, allergies, and insurance, for the patient profile;

(C) collect, organize, and record demographic and clinical information accurately for patient continuity of care;

(D) identify the required steps in preparing sterile compounded products, including putting on (donning) personal protective equipment (PPE), cleaning the vertical or horizontal flow hoods, selecting correct supplies, and preparing the product for dispensing;

(E) select the appropriate equipment and supplies, including diabetic supplies, spacers, and oral/injectable syringes, for drug administration based on package size and unit dose;

(F) apply lot numbers, expiration dates, and National Drug Codes (NDC) on drug packaging for the dispensing of medication; and

(G) differentiate between the use of effective infection control procedures such as sterile and non-sterile compounding in various pharmacy related settings.

(7) The student analyzes common medication errors and practices error prevention strategies. The student is expected to:

(A) use knowledge of high alert/risk and look-alike/sound-alike (LASA) medications to prevent medication errors;

(B) apply knowledge of current error prevention strategies such as using Tall Man lettering, trailing/leading zeros, and barcodes; separating inventory; and limiting use of error-prone abbreviations to prevent medication errors;

(C) apply knowledge of various prescription errors such as abnormal dose, early refill, incorrect quantity, incorrect patient, and incorrect drug for improved accuracy;

(D) demonstrate how to assist pharmacists in recognizing issues that require intervention such as adverse drug events, drug utilization review (DUR), and use of equipment and devices; and

(E) demonstrate knowledge of medication errors such as near miss and adverse events and various reporting procedures such as MedWatch, vaccine adverse event reporting system (VAERS), and route-cause analysis (RCA).

(8) The student applies pharmacy workflow procedures according to federal, state, local, and facility guidelines. The student is expected to:

(A) describe the process for creating a prescription or medication order in compliance with pharmacy standards such as standards for patient rights, completeness of a prescription or medication order, and authorization;

(B) discuss the steps in verifying a prescription or medication order such as right patient, right drug, right dosage, right time, and right route;

(C) identify the proper procedures for entering a prescription or medication order, including procedures for workstation, use of technology, validation with drug enforcement administration (DEA) calculations, and transcribing such as using military time and Roman numerals;

(D) apply the proper techniques for filling a prescription or medication order such as techniques for use of technology, counting, and selecting the correct medication;

(E) explain the proper procedure for the administration of prescription or medication orders such as ear drops, eye drops, inhalations, parenteral, and enteral;

(F) demonstrate knowledge of the workflow process for prescriptions and medication orders such as creation of the order, order entry, adjudication, verification, filling, labeling, billing, dispensing, and administration; and

(G) describe the elements of third-party billing for outpatient dispensing, including prescription insurance ID cards, group numbers, BIN numbers, prior authorization, quantity limits, patient co-pays, maximum out-of-pocket costs, and deductibles.

(9) The student evaluates mathematical process standards related to the practice of pharmacy. The student is expected to:

(A) calculate dosage calculations for adults and special populations using conversions, ratios, and dimensional analysis to perform duties in a pharmacy setting;

(B) apply conversions to systems of measurements, including apothecary, metric, and household, to perform duties in a pharmacy setting;

(C) calculate the flow rate (or rate of administration) for an IV solution using ratios and conversions such as milliliters to drops, weight, or hours to minutes;

(D) calculate days supply for a prescription order given a dose and sig;

(E) calculate volume or mass of each of the total parenteral nutrition (TPN) components such as lipids, amino acids, dextrose, calcium, and magnesium;

(F) calculate volume or mass of ingredients needed for compounding both sterile and non-sterile products;

(G) calculate amount needed for percent of weight-to-volume, volume-to-volume, and weight-to-weight based on stock concentration; and

(H) use calculations related to business math in a pharmacy setting, including profit, net profit, discounts, mark-ups, dispensing fee, average wholesale price, depreciation, and third-party.

(10) The student demonstrates the use of technology in a pharmacy setting. The student is expected to:

(A) identify the types and uses of automated dispensing technology such as cabinets, units, and carousels;

(B) demonstrate knowledge and components of pharmacy dispensing software used in the out-patient setting, the in-patient setting, and in-office use dispensing;

(C) apply professional standards using communication technology such as telephone, emails, fax, electronic prescriptions, and social media appropriate for a pharmacy setting;

(D) apply knowledge of technology hardware devices for input and output such as computers, scanners, printers, interface devices, and other devices; and

(E) select and use appropriate technology tools to search for drug information such as pill identification, adverse events, and contraindications.

(11) The student uses critical thinking, scientific reasoning, research, or problem solving to make informed decisions and communicate within and outside the classroom. The student is expected to:

(A) critique the validity and reliability of scientific research such as assessing for bias, conflict of interest, and study design;

(B) demonstrate the ability to independently find valid and reliable sources such as primary, secondary, and tertiary literature;

(C) identify safe use of online resources that maintain the privacy and confidentiality of the user and patient;

(D) analyze online resources used in scientific research;

(E) describe the recent innovations and advances in pharmacy;

(F) identify opportunities for extended learning experiences such as community services, career and technical service organizations (CTSOs), and professional organizations; and

(G) evaluate scientific information extracted from various sources such as accredited scientific journals, institutions of higher learning, current events, news reports, published journal articles, and marketing and promotional materials.

(12) The student performs inventory procedures according to federal, state, local, and facility guidelines. The student is expected to:

(A) analyze proper storage for medications in regard to temperature, light sensitivity, product demand, cost, and restricted access;

(B) analyze therapeutic substitutions and product selection using the knowledge of formularies or preferred product list;

(C) practice procedures for inventory control such as removal of expired/recalled drug products, rotating inventory, performing a physical inventory, and ordering medications/supplies;

(D) explain how just-in-time or drop ship ordering and periodic automatic replenishment (PAR) levels are used to maintain pharmacy inventory;

(E) analyze how laws affect the procedures for purchasing or ordering medications, devices, and supplies; and

(F) analyze lot numbers, expiration dates, and National Drug Codes (NDC) on drug packaging for inventory accuracy.

(13) The student demonstrates knowledge of safety procedures in a pharmacy setting. The student is expected to:

(A) apply appropriate hygiene and cleaning standards, including hand washing and cleaning counting trays, countertops, and equipment;

(B) perform basic safety and emergency preparedness procedures such as basic life support (BLS) and first aid applicable to pharmacy services;

(C) explain the risks of drug diversion to employees, patients, and the community;

(D) explain the potential solutions to minimize drug diversion such as identifying red flags, controlling inventory, and monitoring the prescription drug monitoring program (PDMP);

(E) explain the types and uses of PPE and the steps for putting on (donning) and removing (doffing) PPE; and

(F) explain why collecting and documenting patient allergies are important steps in medication safety.

§127.485. Pharmacology (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a Level 2 or higher course from the health science career cluster. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Pharmacology course is designed to study how natural and synthetic chemical agents such as drugs affect biological systems. Knowledge of the properties of therapeutic agents is vital in providing quality health care. It is an ever-changing, growing body of information that continually demands greater amounts of time and education from healthcare workers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development

in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student applies professional standards/employability skills as required by the healthcare system. The student is expected to:

(A) apply appropriate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) apply appropriate adaptability skills such as problem solving and creative thinking;

(C) create and evaluate a career plan using methods such as educational pathways, career goals, and individual aptitudes;

(D) demonstrate teamwork;

(E) create an occupation-specific resume; and

(F) identify and apply soft skills desired by employers.

(2) The student explores the field and foundation of pharmacology. The student is expected to:

(A) differentiate between pharmacology subdivisions, including pharmacodynamics, pharmacokinetics, pharmaceutics, and pharmacotherapeutics;

(B) use common drug information materials such as accredited scientific journals, institutions of higher learning, current events, news reports, published journal articles, textbooks, and marketing materials;

(C) list examples of primary, secondary, and tertiary drug information references;

(D) research and describe the history of pharmacy and contributions of the field;

(E) draw inferences based on data from promotional materials for products and services;

(F) analyze the societal impact of medication costs; and

(G) evaluate the impact of scientific research on society, including drug development and the natural environment, including drug disposal.

(3) The student identifies careers associated with pharmacology. The student is expected to:

(A) evaluate career pathways utilizing pharmacology;

(B) define the role of the pharmacy team; and

(C) research and describe emerging opportunities within the pharmacy profession.

(4) The student explains the ethical and legal responsibilities associated with pharmacology. The student is expected to:

(A) explain the causes, effects, and consequences associated with medical errors, including medication errors;

(B) define legal terminology associated with medical errors such as negligence, product liability, contributory negligence, and regulatory law;

(C) analyze the principles of medical ethics, including beneficence, autonomy, maleficence, and justice; and

(D) evaluate professional liability.

(5) The student uses medical terminology to communicate effectively with other healthcare professionals, patients, and caregivers. The student is expected to:

(A) use the appropriate medical terminology to identify different classes of drugs;

(B) communicate using medical terminology associated with pharmacology;

(C) analyze unfamiliar terms using the knowledge of word roots, suffixes, and prefixes; and

(D) interpret medical terminology to communicate with patients and caregivers.

(6) The student demonstrates mathematical knowledge and skills to solve problems with systems of measurement used in the pharmacy. The student is expected to:

(A) calculate medication dosages using formulas, ratios, proportions, and allegations;

(B) convert a measurement expressed in one standard unit within a system to a measurement expressed in another unit within the same system;

(C) convert a measurement expressed in one system to a unit of the same measurement in a different system, including metric, apothecary, avoirdupois, and household systems; and

(D) evaluate statistical data and its limitations such as patient compliance, study design, and controls.

(7) The student evaluates pharmaceutical agents, their dosage form, and routes of administration. The student is expected to:

(A) analyze the availability of different dosage forms such as solid, liquid, patch, and IV solution;

(B) give examples of the brand or generic names of drugs such as the top 200 drugs in each dosage form and routes of drug administration;

(C) define medical terminology associated with drug dosage forms;

(D) explain the difference between therapeutic effects, side effects, and toxic effects;

(E) identify the mechanism of action of different drug classifications such as drug receptors, agonists, and antagonist relationships;

(F) explain the dose response relationship concept such as the difference between oral and IV administration of drugs and explain the relationship between drug dosage, drug response, and time; and

(G) explain drug safety practices such as monitoring expiration dates and drug disposal.

(8) The student demonstrates knowledge and use of appropriate equipment, instruments, and technology. The student is expected to:

(A) identify technology components used in the pharmacy workflow such as ordering, entering, filling, and dispensing;

(B) describe how technology applications improve efficiency in the pharmacy; and

(C) identify and demonstrate proper use and maintenance of equipment and instruments used in a pharmacy setting such as IV drop sets, scales, glucose supplies, dispensing units or cabinets, and other laboratory supplies.

(9) The student practices safe protocols in preventing personal and client illness or injury. The student is expected to:

(A) employ safety standards such as workplace standards;

(B) interpret and apply pharmacy standards according to the strictest local, state, or federal regulations to enhance safety;

(C) examine the consequences of unsafe practices; and

(D) demonstrate safe procedures in the administration of client care in a simulated or clinical setting.

§127.486. Medical Microbiology (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a course from the health science career cluster. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Medical Microbiology course is designed to explore the microbial world, studying topics such as pathogenic and non-pathogenic microorganisms, laboratory procedures, identifying microorganisms, drug-resistant organisms, and emerging diseases.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) demonstrate the ability to cooperate, contribute, and collaborate as a member of a team; and

(C) locate, evaluate, and interpret career options, opportunities, and postsecondary transitions relating to the field of microbiology.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as microscopes, slides, streak plates, inoculating loops, Bunsen burners, striker, hot plate, petri dish, agar and other growth mediums, reactive agents, personal protective equipment (PPE), disposable pipettes, lab glassware and instruments, bacterium and other live microbial agents, enzymes, computer software and probes, incubator, and autoclave;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using equipment such as graphing calculator, computer software and probes, graphic organizers;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) or health science field in order to investigate careers.

(6) The student examines the field of microbiology in relation to medical care. The student is expected to:

(A) examine the historical development of microbiology as it relates to health care of an individual in modern medicine; and

(B) compare the roles, functions, and responsibilities of agencies governing infectious disease control.

(7) The student is expected to perform and analyze results in the microbiology laboratory. The student is expected to:

(A) classify microorganisms using a dichotomous key;

(B) prepare slides and discuss the differences between Gram positive and Gram negative bacteria such as the bacterial cell wall and the use of oxygen;

(C) identify chemical processes such as enzyme catalyst and osmotic potential of microorganisms;

(D) identify and discuss technologies used in a laboratory setting such as polymerase chain reaction (PCR), serology, enzyme-linked immunoassay (ELISA), and electrophoresis;

(E) prepare plates or active mediums to differentiate the factors required for microbial reproduction and growth;

(F) identify the normal flora microorganisms of the human body;

(G) identify and differentiate between various pathogens, including opportunistic pathogens, hospital-acquired infections, community-acquired infections, and colonizing microorganisms;

(H) isolate colonies and describe the morphology of microorganisms; and

(I) interpret and explain the role of the culture and sensitivity report provided to the clinician.

(8) The student examines the role of microorganisms in infectious diseases. The student is expected to:

(A) outline and explain the infectious disease process, including how pathogenic microorganisms affect human body systems;

(B) categorize diseases caused by bacteria, including *Rickettsia*, fungi, viruses, protozoa, arthropods, and helminths;

(C) explain and interpret the body's immune responses and defenses against infection;

(D) prepare a bacterial colony and evaluate the effects of anti-microbial agents such as narrow and broad-spectrum antibiotics;

(E) examine the environmental and social causes of the emergence and reemergence of diseases such as corona viruses, Ebola, malaria, tuberculosis, and polio;

(F) research and discuss drug *aureus*-resistant microorganisms, including carbapenem-resistant *Enterobacteriaceae*, methicillin-resistant *Staphylococcus aureus*, vancomycin-intermedi-

ate/resistant *Staphylococci*, vancomycin-resistant enterococci, and emergent antibiotic-resistant superbugs; and

(G) outline the role of governing agencies in monitoring and establishing guidelines based on the spread of infectious diseases.

(9) The student recognizes the importance of maintaining a safe environment and eliminating hazardous situations. The student is expected to:

(A) identify and apply standard laboratory precautions;

(B) identify and apply microbiological safety practices in accordance with industry standards, including the proper handling, disinfection, and disposal of biological waste and maintenance of containment levels;

(C) identify and apply appropriate personal protection equipment (PPE) and transmission-based precautions, including precautions against droplet, contact, and airborne transmission;

(D) sterilize laboratory and medical equipment and instruments in accordance with industry standards; and

(E) define and select different mechanisms of decontamination such as antiseptics, disinfection, and sterilization.

§127.487. Health Informatics (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Medical Terminology. Recommended prerequisites: Principles of Health Science and Business Information Management I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Health Informatics course is designed to provide knowledge of one of the fastest growing areas in both academic and professional fields. Healthcare information technology has increased demand for information and health professionals who can effectively design, develop, and use technologies such as electronic medical records, patient monitoring systems, and digital libraries. This course will include a focus on billing and coding.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner;

(B) demonstrate adaptability skills such as problem solving and critical and creative thinking;

(C) develop a career plan;

(D) exhibit teamwork;

(E) create a job-specific resume; and

(F) exemplify professional work standards such as appearance, attire, time management, organizational skills, and responsibilities.

(2) The student interprets fundamental knowledge of concepts of health information systems technology and the tools for collecting, storing, and retrieving health care data. The student is expected to:

(A) discuss, define, and differentiate the common health information systems such as electronic medical records and electronic health records, practice management software, master patient index (MPI), patient portals, remote patient monitoring, and clinical decision support; and

(B) explain how various health information systems support the administrative, financial, clinical, and research needs of a health care enterprise.

(3) The student employs the various types of databases in relation to health informatics. The student is expected to:

(A) define the function of a database management system;

(B) identify the purpose of data modeling;

(C) define the customary steps in the data modeling process;

(D) differentiate between entities, attributes, and relationships in a data model; and

(E) explain various types of organizational databases.

(4) The student distinguishes between data and information. The student is expected to:

(A) discuss the importance of data security, accuracy, integrity, reliability, and validity; and

(B) demonstrate an understanding of data information concepts for health information systems, electronic health records, and patient registries.

(5) The student examines the evolution of the health information system. The student is expected to:

(A) evaluate the growing role of the electronic health record;

(B) review the progress of the development of the electronic health record;

(C) explain functional requirements for electronic health records; and

(D) explain the concept and importance of the interoperability of electronic health records and other health information systems.

(6) The student examines the process of medical diagnostic and coding concepts as well as current procedural practices. The student is expected to:

(A) examine Health Insurance Portability and Accountability Act (HIPAA) guidelines for confidentiality, privacy, and security of a patient's information within the medical record;

(B) differentiate between insurance fraud and insurance abuse;

(C) discuss the linkage between current procedural terminology (CPT) codes; International Classification of Diseases, 10th revision, Clinical Modification (ICD-10-CM) codes; and medical necessity for reimbursement for charges billed;

(D) search ICD-10-CM code system for correct diagnosis code using patient information;

(E) identify the two types of codes in the health care common procedure coding system (HCPCS); and

(F) explain how medical coding affects the payment process.

(7) The student identifies agencies involved in the health insurance claims process. The student is expected to:

(A) define fiscal intermediary;

(B) define Medicaid and Medicare;

(C) discuss health care benefit programs such as TRICARE and Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA);

(D) explain how to manage a worker's compensation case;

(E) complete a current health insurance claim form such as the Centers for Medicare and Medicaid Service (CMS-1500) form; and

(F) identify three ways to transmit electronic claims.

§127.488. Medical Billing and Coding (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Medical Terminology. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) Medical Billing and Coding familiarizes students with the process, language, medical procedure codes, requirements of Health Insurance Portability and Accountability Act (HIPAA), and skills they will need to make accurate records. Students will develop an understanding of the entire process of the revenue cycle and how to effectively manage it. The program is designed to prepare students for employment in a variety of health care settings as entry level coder, medical billing specialist, and patient access representative.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by the healthcare industry. The student is expected to:

(A) demonstrate the ability to communicate and use interpersonal skills effectively;

(B) compose written communication, including emails using correct spelling, grammar, formatting, and confidentiality;

(C) use appropriate medical terminology and abbreviations; and

(D) model courtesy and respect for patients and team members in the multi-disciplinary healthcare setting and maintain good interpersonal relationships.

(2) The student explores career opportunities in revenue cycle management. The student is expected to:

(A) identify professional opportunities within the medical billing and revenue cycle management professions;

(B) demonstrate ethical billing and coding practices as outlined by professional associations guidelines; and

(C) investigate professional associations applicable to the field of health informatics such as American Academy of Professional Coders (AAPC), American Health Information Management Association (AHIMA), Healthcare Billing and Management Association (HBMA), and American Association of Healthcare Administrative Management (AAHAM).

(3) The student explains the ethical and legal responsibilities of personnel in medical billing and coding. The student is expected to:

(A) identify major administrative agencies that affect billing and coding such as Centers for Medicare and Medicaid Services (CMS) and the Office of the Inspector General (OIG);

(B) identify major laws and regulations that impact health information, including HIPAA, the Stark Law, the Fair Debt Collection Practices Act, and the False Claims Act;

(C) analyze legal and ethical issues related to medical billing and coding, revenue cycle management, and documentation within the medical record;

(D) research compliance laws;

(E) identify appropriate documentation required for the release of patient information;

(F) differentiate between informed and implied consent;

(G) compare and contrast use of information and disclosure of information; and

(H) evaluate cases for insurance fraud and abuse.

(4) The student identifies the body systems to support proficiency in billing and coding. The student is expected to:

(A) explain the sections and organizations of the International Classification of Diseases and Related Health Problems, 10th Revision, Clinical Modification (ICD-10-CM) and Current Procedural Terminology (CPT) coding manuals by identifying the anatomy and physiology of body systems and how they apply to medical billing and coding, including:

(i) the integumentary system;

(ii) the skeletal system;

(iii) the muscular system;

(iv) the cardiovascular system;

(v) the respiratory system;

(vi) the digestive system;

(vii) the endocrine system;

(viii) the urinary system;

(ix) the reproductive system; and

(x) the nervous system and special senses; and

(B) identify mental, behavioral, and neurodevelopmental disorders and how they apply to medical billing and coding.

(5) The student demonstrates proficiency in the use of the ICD-10-CM, CPT, and Healthcare Common Procedure Coding System (HCPCS) coding systems. The student is expected to:

(A) apply coding conventions and guidelines for appropriate charge capture;

(B) describe the process to update coding resources;

(C) assign and verify diagnosis and procedure codes to the highest level of specificity, and, as applicable, HCPCS level II codes and modifiers in accordance with official guidelines;

(D) describe the concepts of disease groupings and procedure-code bundling; and

(E) identify coding compliance, including medical necessity.

(6) The student understands revenue cycle management. The student is expected to:

(A) define revenue cycle management;

(B) differentiate between various types of employer-sponsored and government-sponsored insurance models, including health maintenance organization (HMO), preferred-provider organization (PPO), Medicare, Medicaid, TRICARE, high deductible health plans, and workers' compensation;

(C) define Medicare Administrative Contractors (MACs) and investigate the administrative services provided by the MAC for Texas;

(D) describe the patient scheduling and check-in process, including verifying insurance eligibility, obtaining pre-authorization, and processing appropriate patient authorization and referral forms;

(E) describe the sections of the CMS-1500 form to prepare and submit mock clean claims electronically or manually;

(F) differentiate between primary and secondary insurance plans to initially process crossover claims;

(G) interpret remittance advice to determine financial responsibility of insurance company and patient, including a cash-paying patient;

(H) analyze reason for insurance company denials or rejections and determine corrections or appeals required; and

(I) analyze an aging report and how it relates to the revenue cycle.

§127.489. Medical Assistant (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite or corequisite: Anatomy and Physiology. Recommended prerequisite: Medical Terminology. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostics services, health informatics, support services, and biotechnology research and development.

(3) The Medical Assistant course provides students with the knowledge and skills to pursue a career as a medical assistant and to improve college and career readiness. Students will obtain communication skills, clinical ethics knowledge, safety awareness, and information related to medical assisting career opportunities.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student applies professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply appropriate verbal communication in a clear, concise, and effective manner;

(B) apply appropriate non-verbal communication in a clear, respectful, and effective manner;

(C) apply appropriate adaptability skills such as problem solving and creative thinking;

(D) create or evaluate a career plan using methods such as identifying educational pathways, professional organizations, career goals, continuing education opportunities, and individual aptitudes;

(E) demonstrate teamwork;

(F) create an occupation-specific resume; and

(G) identify and demonstrate soft skills desired by employers in health care.

(2) The student evaluates the roles and responsibilities of the medical assistant as a member of the healthcare team. The student is expected to:

(A) explain the role of the medical assistant in various healthcare settings;

(B) discuss the scope of practice, including responsibilities and limitations of a medical assistant;

(C) explain the level of authority within the healthcare professional hierarchy; and

(D) identify the members of an interdisciplinary healthcare team and their roles such as licensed vocation nurse, registered nurse, primary care provider, specialists, and other allied health professionals.

(3) The student applies professional communication skills to provide information to patients and team members in a healthcare setting. The student is expected to:

(A) demonstrate the ability to report abnormal results in writing and orally to the patient's provider;

(B) demonstrate how to communicate with patients, caregivers, and the interdisciplinary team to assist in the planning, delivery, and coordination of patient-centered care;

(C) evaluate different communication techniques for responding to the needs of individuals in a diverse society;

(D) practice conflict-resolution techniques such as cooperation, contribution, compromise, and collaboration in various situations; and

(E) practice providing patient education on health-related topics such as clean catch urine collection, the risks and benefits of vaccinations, use of a peak-flow, and nebulizer treatments.

(4) The student demonstrates knowledge of healthcare ethical principles in their practice of medical assisting. The student is expected to:

(A) evaluate principles of ethical behavior, including beneficence, non-maleficence, justice, and autonomy;

(B) debate ethical issues related to technological advances in health care such as stem cells, robotics, and immunologic therapies in health care;

(C) evaluate ethical issues and legal ramifications related to malpractice, negligence, and liability; and

(D) summarize legal and ethical standards, including Patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act (HIPAA).

(5) The student demonstrates knowledge of the administrative duties of a medical assistant in a healthcare setting. The student is expected to:

(A) identify considerations for scheduling a patient such as availability of test results, availability of staff, patient flow, triage, and coordination of care;

(B) discuss considerations related to managing an office schedule such as types of scheduling, under booking, over booking, cancellations, add-ons, and no-shows;

(C) define the terms used in medical billing such as diagnosis codes, billing codes, billing cycle, co-pay, deductibles, maximum out-of-pocket, and time of service;

(D) describe the elements of completing patient registration such as recording demographics, emergency contact, and insurance information;

(E) analyze different types of health insurance coverage, including Medicare, Medicaid, TRICARE, Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA), private insurance, employer-based insurance, and workers' compensation;

(F) identify the components of an insurance card such as plan name, group number, ID number, patient co-pay, co-insurance, and phone numbers;

(G) define insurance plan terminology such as prior authorization, formulary, explanation of benefits, denial, appeal, and referrals;

(H) define electronic health records systems and their components such as demographics, financial insurance information, orders and referrals, correspondence, and test results; and

(I) analyze the benefits and risks of electronic health records systems.

(6) The student uses appropriate medical terminology as a medical assistant. The student is expected to:

(A) use directional terms and anatomical planes related to body structure;

(B) use occupationally specific terms such as terms relating to the body systems, surgical and diagnostic procedures, diseases, and treatment; and

(C) apply knowledge of prefixes, suffixes, and root words to translate medical terms to conversational language to facilitate communication.

(7) The student practices or models patient intake skills as a medical assistant. The student is expected to:

(A) collect and document patient information during an intake interview, including chief complaint; patient care team; past medical, surgical, social, and family histories; patient allergies; and comprehensive medication list;

(B) explain how to use a medical chart to identify patient care needs;

(C) identify normal ranges for vital signs per age group, including blood pressure, temperature, heart rate, respiratory rate, and oxygen saturation;

(D) measure and record accurate vital signs, including manual blood pressure, temperature, heart rate, respiratory rate, and pain scale;

(E) measure and record accurate anthropometric measurements, including height, weight, and head circumference; and

(F) calculate accurate conversions between different units of measurement such as kilograms to pounds, centimeters to inches, and Fahrenheit to Celsius.

(8) The student demonstrates knowledge and application of point of care testing as a medical assistant. The student is expected to:

(A) define point of care testing;

(B) identify and correlate specimen types and collection methods, including throat swabs, capillary blood, and urine used in point of care testing;

(C) describe tests that might be performed as a point of care test in an office such as rapid strep, rapid flu, glucose, urine dip, urine pregnancy, vision screening, and electrocardiogram (EKG) tests;

(D) perform and document a vision screening using the Snellen eye chart; and

(E) locate landmarks for performing a 12-lead electrocardiogram (EKG).

(9) The student demonstrates knowledge of medication preparation and administration in a clinical setting specific to the role of a medical assistant. The student is expected to:

(A) apply the six rights of medication administration, including right patient, right medication, right dose, right time, right route, and right documentation;

(B) identify drug classifications and the indication for use;

(C) define drug-related terms, including adverse event, therapeutic response, side effect, drug interactions, and allergic reaction;

(D) calculate the amount of medication to administer based on the dosage ordered and the strength of medication supply on hand;

(E) evaluate a patient for known allergies and contraindications prior to administering any medication;

(F) identify routes of medication administration, including oral, buccal, sublingual, inhaled, intranasal, otic, ophthalmic, intravaginal, anal, topical, transdermal, intradermal, subcutaneous, intramuscular, intravenous, and intrathecal;

(G) use proper technique when preparing medications for administration, including injections, oral, sublingual, inhaled, otic, ophthalmic, and topical;

(H) use proper technique when administering medications, including injections, oral, sublingual, inhaled, otic, ophthalmic, and topical;

(I) identify appropriate muscle groups for intramuscular injections, including deltoid, vastus lateralis, and ventrogluteal;

(J) explain the factors that influence intramuscular injection site selection, including patient size, patient age, viscosity of medication, and muscular density;

(K) explain the factors that affect needle size and gauge selection, including medication viscosity, patient size, muscular density; and

(L) demonstrate knowledge of syringe styles and markings on various size syringes such as Luer Lock, oral, insulin, TB, 1ml, 3ml, 5ml, and 10ml syringes.

(10) The student demonstrates knowledge of collecting, labeling, storing, and transferring lab specimens. The student is expected to:

(A) identify how to properly store and transfer lab specimens such as blood, urine, fecal, and sputum samples;

(B) list the proper order of draw for blood collection tubes;

(C) select the proper collection tubes for specific types of blood tests such as complete blood count (CBC), comprehensive metabolic panel (CMP), and lipid panel;

(D) locate veins used for blood draws;

(E) demonstrate proper technique and post procedural care for veinous blood draws; and

(F) demonstrate proper labeling of lab specimens, including patient name, date of birth, source, date, time, and initials of collector.

(11) The student demonstrates knowledge of patient populations and their specific care considerations. The student is expected to:

(A) discuss and identify stages of development throughout a patient's lifespan;

(B) describe coping and defense mechanisms exhibited by patients such as emotion-focused behaviors, problem-focused behaviors, denial, displacement, intellectualization, projection, rationalization, and regression;

(C) identify and discuss end-of-life considerations such as advanced directives, power of attorney, stages of grief, and family support;

(D) practice appropriate methods of care for working with patients with mental, physical, and developmental disabilities;

(E) explain how socioeconomic factors such as income, transportation, access to community resources, employment, and education level can influence patient outcomes; and

(F) explain how various multicultural values can affect patient care decisions.

(12) The student demonstrates knowledge of safety practices and procedures as related to medical assisting. The student is expected to:

(A) employ standard precautions in a healthcare scenario;

(B) identify various modes of disease transmission, including vector borne, air borne, direct or indirect contact, and vehicle;

(C) distinguish between the types of isolation precaution signage used to address modes of disease transmission such as contact, droplet, and airborne;

(D) identify personal protective equipment (PPE);

(E) apply the knowledge of PPE used in various situations such as venipuncture, collecting a throat swab, or dipping urine;

(F) demonstrate proper putting on (donning) and removing (doffing) of PPE;

(G) define the use of a sharps container, biohazard container, shredding bin, and trash receptacle;

(H) practice safe handling of sharps such as not recapping after injection and prompt disposal in a sharps container;

(I) identify symptoms of anaphylaxis and the proper emergency response;

(J) explain storage requirements for medications, vaccines, and lab specimens;

(K) locate and use the safety data sheets (SDS) to retrieve information such as proper storage, clean up, and exposure response; and

(L) define and apply knowledge of medical asepsis.

§127.490. Respiratory Therapy I (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: At least one credit in a course from the health science career cluster. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) Respiratory Therapy I is a technical lab course that addresses knowledge and skills related to cardiopulmonary medicine. Respiratory therapists are specialized healthcare practitioners trained in cardiopulmonary medicine to work therapeutically with people suffering from cardiopulmonary diseases. Students will learn basic knowledge and skills performed by respiratory therapists using equipment such as: stethoscopes, sphygmomanometers, thermometers, pulse oximeters, oxygen delivery devices (nasal cannula, masks of various types), nebulizers, and airway clearance and hyperinflation therapy devices.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations, including:

(A) work-based experiences/learning; and

(B) volunteering/shadowing opportunities.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards and employability skills required by the respiratory therapy profession. The student is expected to:

(A) model professionalism associated with respiratory therapy such as adaptability, time management, punctuality, appreciation for diversity, decision-making, dedication, and organizational and leadership skills;

(B) demonstrate effective verbal and non-verbal communication in a clear and concise manner;

(C) demonstrate therapeutic communication appropriate to the situation, including communication with individuals with language differences/barriers and sensory loss;

(D) evaluate the effectiveness of conflict resolution techniques in various situations; and

(E) demonstrate the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social studies in respiratory therapy. The student is expected to:

(A) interpret complex technical material related to respiratory therapy;

(B) identify how race, culture, and religion impact patient care;

(C) solve mathematical calculations related to respiratory therapy; and

(D) summarize biological and chemical processes that maintain homeostasis.

(3) The student investigates the history and profession of respiratory therapy, including education and licensure. The student is expected to:

(A) analyze the advancement of respiratory therapy practices over time;

(B) summarize the roles of respiratory therapists in various settings; and

(C) identify academic requirements for respiratory therapist and professional advancement opportunities such as professional organizations, credentials, certifications, registrations, licensure, continuing education, and advanced degrees.

(4) The student applies regulatory and safety standards in a respiratory therapy setting. The student is expected to:

(A) identify and conform to regulations and guidelines from entities such as the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), Occupational Safety and Health Administration (OSHA), U.S. Food and Drug Administration (FDA), The Joint Commission, the National Institute of Health (NIH), Texas Commission on Environmental Quality (TCEQ), Texas Department of State and Health Services (DSHS), and American Association for Respiratory Care (AARC);

(B) identify infection control standard and transmission-based precautions in the patient care setting, including hand hygiene, equipment sterilization, and the use of personal protective equipment (PPE); and

(C) identify industry safety standards, including standards for body mechanics, fire prevention, electrical safety, oxygen safety, and the handling of hazardous materials.

(5) The student investigates the structure and function of cardiopulmonary anatomy. The student is expected to:

(A) analyze the cardiovascular system, including ventricles, atrium, valves, blood vessels, nerves, blood flow, and cardiac conduction system;

(B) explain the respiratory system, including airways, trachea, lungs, and pulmonary vessels that aid the body in the exchange of gases;

(C) trace the blood flow through the cardiopulmonary system; and

(D) examine a variety of human diseases and disorders affecting the cardiopulmonary system such as chronic obstructive pulmonary disease (COPD), asthma, pneumonia, cystic fibrosis, and lung cancer.

(6) The student develops knowledge pertaining to respiratory therapy procedures. The student is expected to:

(A) demonstrate the use of breathing exercises for patients with cardiopulmonary disease such as pursed lipped breathing and diaphragmatic breathing;

(B) explain the use of hyperinflation and airway clearance therapies;

(C) explain the use of tracheostomy and endotracheal tubes and oral and nasal airway devices for assisted breathing;

(D) identify anatomy of the heart and lungs and proper endotracheal tube placement on X-ray;

(E) explain the use of oximetry and arterial blood-gases for patient assessment;

(F) identify and explain the use of the equipment for oxygen therapies such as nasal cannula, high flow nasal cannula, simple masks, air-entrainment masks, partial rebreather masks, and non-rebreather masks; and

(G) demonstrate the administration of oxygen therapy using oxygen concentrators and portable cylinders.

(7) The student recognizes cardiopulmonary pharmaceutical agents and safety and protocol measures. The student is expected to:

(A) identify medications used in respiratory therapy, including bronchodilators and inhaled corticosteroids;

(B) summarize indications, contraindications, and side effects of respiratory medications;

(C) discuss delivery of respiratory medications such as nebulizers and meter dose inhalers (MDI); and

(D) assess the impact of cardiopulmonary agents on vital signs.

(8) The student implements the knowledge and skills of respiratory therapy professionals in a laboratory setting. The student is expected to:

(A) demonstrate patient assessment of vital signs, including blood pressure, pulse, respiratory rate, temperature, oxygenation, and ventilation status;

(B) demonstrate patient positioning for respiratory comfort and procedures;

(C) demonstrate patient care techniques used in high stress respiratory therapy situations such as non-compliant, combative, and distressed patients; and

(D) demonstrate correct cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) skills.

(9) The student evaluates ethical behavioral standards and legal responsibilities in the respiratory therapy profession. The student is expected to:

(A) examine legal and ethical behavior standards such as the Patient's Bill of Rights, advanced directives, and the Health Insurance Portability and Accountability Act (HIPAA);

(B) investigate and discuss the legal and ethical ramifications of unacceptable behavior in therapeutic practice;

(C) research and describe role of professional associations and regulatory agencies; and

(D) describe ethical dilemmas in health care.

§127.491. Respiratory Therapy II (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: Respiratory Therapy I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) Respiratory Therapy II is a technical lab course that addresses knowledge and skills related to critical care and cardiopulmonary medicine. Respiratory therapists are specialized healthcare practitioners trained in cardiopulmonary medicine to work therapeutically with people suffering from cardiopulmonary diseases. Students will learn advanced knowledge and skills performed by respiratory therapists using equipment such as stethoscopes, sphygmomanometers, thermometers, pulse oximeters and monitors, oxygen delivery devices (nasal cannula, masks of various types), nebulizers, airway clearance and hyperinflation therapy devices, spirometers, and intubation mannequin heads and equipment (endotracheal tubes, laryngoscopes, stylets).

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations, including:

(A) work-based experiences/learning; and

(B) volunteering/shadowing opportunities.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards and employability skills required by the respiratory therapy profession. The student is expected to:

(A) model professionalism associated with respiratory therapy such as adaptability, time management, punctuality, appreciation for diversity, decision-making, dedication, and organizational and leadership skills;

(B) demonstrate effective verbal and non-verbal communication in a clear and concise manner;

(C) demonstrate therapeutic communication appropriate to the situation, including communication with individuals with language differences or barriers and sensory loss;

(D) evaluate the effectiveness of conflict resolution techniques in various situations;

(E) demonstrate the ability to cooperate, contribute, and collaborate as a member of a team; and

(F) explore career options for respiratory therapy and preparation necessary for employment such as creating a cover letter and resume, completing an application, and conducting mock interviews.

(2) The student applies mathematics, science, English language arts, and social studies in respiratory therapy. The student is expected to:

(A) analyze complex technical material related to respiratory therapy;

(B) analyze how race, culture, and religion impact patient care;

(C) apply mathematical calculations related to respiratory therapy; and

(D) analyze biological and chemical processes that affect homeostasis in relation to cardiopulmonary diseases.

(3) The student applies safety standards for a respiratory therapy setting. The student is expected to:

(A) evaluate and apply standards and guidelines from entities, including the American Association for Respiratory Care (AARC), World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), U.S. Food and Drug Administration (FDA), and Texas Commission on Environmental Quality (TCEQ), as they apply to cardiopulmonary diseases;

(B) demonstrate infection control standard and transmission-based precautions in the laboratory setting, including hand hygiene, equipment sterilization, and the use of personal protective equipment (PPE); and

(C) model industry safety standards, including standards for body mechanics, fire prevention, electrical safety, oxygen safety, and the handling of hazardous materials.

(4) The student explains the interactions between the cardiopulmonary and other body systems as they relate to wellness and diseases. The student is expected to:

(A) analyze the role of the autonomic nervous system in the regulation of the cardiopulmonary system as it pertains to health and illness;

(B) analyze the role of the urinary system in the regulation of the acid-base and fluid balance and in cardiopulmonary health and illness;

(C) investigate the interactions between body systems and cardiopulmonary diseases and disorders such as Guillain-Barré syndrome, Myasthenia Gravis, SARS-CoV-2 (Covid), Idiopathic Pulmonary Fibrosis (IPF), adult respiratory distress syndrome (ARDS), and congestive heart failure (CHF);

(D) differentiate between normal heart rhythms and common cardiac dysrhythmias such as ventricular fibrillation, ventricular tachycardia, and asystole attributed to malfunctions in other body systems; and

(E) discuss the role of respiratory therapists in the use of mechanical systems, including non-invasive and invasive mechanical ventilators and extracorporeal membrane oxygenation (ECMO), when the cardiopulmonary system fails.

(5) The student implements the knowledge and skills of a respiratory therapy professional used in a laboratory setting. The student is expected to:

(A) demonstrate breathing exercises commonly used for patients with cardiopulmonary disease;

(B) demonstrate airway management skills in a laboratory setting using equipment for intubation and airway maintenance such as endotracheal and tracheostomy tubes, endotracheal/tracheal suction catheters, laryngoscopes, bag valve mask devices, oral and nasal airways, tube fasteners, or tape;

(C) demonstrate airway clearance and hyperinflation therapies in a laboratory setting using equipment such as oscillating positive end pressure devices, high frequency chest wall oscillation devices, and an incentive spirometer;

(D) differentiate between normal lung and pathology in a chest X-ray;

(E) recognize typical and atypical arterial blood-gas values related to patient oxygenation and ventilation status;

(F) demonstrate the use of the oxygen therapy equipment such as nasal cannula, high flow nasal cannula, simple masks, air-entrainment masks, partial rebreather masks, non-rebreather masks, and non-invasive ventilators;

(G) demonstrate patient assessment methods, including inspection, auscultation, palpitation, and percussion;

(H) interpret and create a basic care plan for asthma and chronic obstructive pulmonary disease (COPD);

(I) demonstrate the role of a respiratory therapist during simulated emergency situations such as situations requiring a rapid response team and advanced cardiac life support; and

(J) describe the respiratory therapists' role in patient education regarding the disease process and proper use of medication and respiratory equipment.

(6) The student understands cardiopulmonary pharmaceutical agents and safety. The student is expected to:

(A) research and identify the application of medications used in respiratory therapy, including bronchodilators, inhaled corticosteroids, mucolytics, biologics, inhaled antibiotics, inhaled pulmonary vasodilators, and antivirals;

(B) evaluate indications, contraindications, and side effects of respiratory medications;

(C) demonstrate delivery methods of medication such as nebulizers and meter dose inhalers (MDI); and

(D) evaluate patient response to therapy before, during, and after respiratory treatments such as heart rate, blood pressure, respiration, and breath sounds.

(7) The student evaluates ethical behavioral standards and legal responsibilities in the respiratory therapy profession. The student is expected to:

(A) analyze legal and ethical scenarios as it relates to the Patient's Bill of Rights and the Health Insurance Portability and Accountability Act (HIPAA);

(B) evaluate the legal and ethical ramifications of unacceptable behavior in therapeutic practice; and

(C) describe ethical dilemmas in respiratory therapy such as advanced directives, palliative care, hospice, and end-of-life care.

(8) The student identifies academic preparation and skills necessary for employment in the field of respiratory therapy. The student is expected to:

(A) research and identify academic requirements for professional advancement such as credentials, certifications, licensure, registration, continuing education, and advanced degrees; and

(B) research and identify the path to obtain and maintain entry level licensure and credentialing.

§127.492. Healthcare Administration and Management (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisites: Medical Terminology. Recommended prerequisites: Principles of Health Science and Business Information Management I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) Healthcare Administration and Management is designed to familiarize students with the concepts related to healthcare administration as well as the functions of management, including planning, organizing, staffing, leading, and controlling. Students will also demonstrate interpersonal and project-management skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by the healthcare industry. The student is expected to:

(A) role play examples of effective written and oral communication in various scenarios such as customer service, marketing, and public relations;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) comply with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student demonstrates an understanding of the healthcare management concept. The student is expected to:

(A) define the term healthcare management;

(B) explain the roles and responsibilities of healthcare professionals, including the management functions of planning, organizing, staffing, leading, and controlling;

(C) explain how organizational behavior and teamwork in healthcare impact patient outcomes and effective day-to-day operations;

(D) explore and discuss the factors that influence healthcare management such as governmental regulations, payment models, employee turnover, and workforce shortages;

(E) define ethical workplace behavior and role play how to make ethical decisions; and

(F) explain how socially responsible management policies such as healthcare equity access, inclusion, and diversity policies are initiated and implemented.

(3) The student recognizes the business functions of healthcare systems. The student is expected to:

(A) differentiate among the major healthcare delivery systems such as hospitals, outpatient care facilities, community-based organizations, insurance companies, and pharmaceutical companies;

(B) define and discuss healthcare quality and quality improvement;

(C) specify various types of health information technology and discuss barriers to health information technology adoption;

(D) investigate healthcare financing models;

(E) explain the difference between and provide examples of healthcare revenues and healthcare expenses;

(F) define revenue-cycle management; and

(G) describe the roles of customer service and marketing in health care.

(4) The student evaluates ethical behavioral standards and legal responsibilities. The student is expected to:

(A) research and describe the role of professional associations and regulatory agencies;

(B) examine legal and ethical behavior standards such as Patient Bill of Rights, Advanced Directives, and the Health Insurance Portability and Accountability Act (HIPAA);

(C) investigate the legal and ethical ramifications of unacceptable behavior;

(D) identify examples of conflicts of interest; and

(E) differentiate between the concepts of fraud, waste, and abuse.

§127.493. Leadership and Management in Nursing (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2022-2023 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a course from the health science career cluster. Recommended prerequisite: Science of Nursing. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) This course is designed to explore leadership and management in nursing, studying topics such as ethics, educational levels, career paths, regulatory bodies, and personal and professional leadership skills.

(4) Students are encouraged to participate in extended learning experiences such as Health Occupations Students of America (HOSA), Skills USA, career and technical student organizations, and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student understands the different educational levels of licensed nurses and applicable careers and career pathways. The student is expected to:

(A) compare the differences between the educational requirements and roles of a licensed vocational nurse and a registered nurse;

(B) diagram the educational requirements of a registered nurse, including diploma, associate degree, bachelor's degree, master's degree, and doctoral degree;

(C) identify the different specializations of a nurse with a master's degree such as family nurse practitioner, nurse informaticist, nurse midwife, and nurse educator;

(D) differentiate the roles of the Doctor of Philosophy (PhD) and the Doctor of Nursing Practice (DNP) prepared nurse; and

(E) develop a six-year career plan in nursing.

(3) The student understands the functions of leadership in nursing. The student is expected to:

(A) illustrate or diagram the relationship and progression within the hierarchy of nursing leadership;

(B) identify critical skills and competencies for each level in the hierarchy of nursing leadership;

(C) present and examine the impact of each level of nursing in the hierarchy of leadership; and

(D) investigate and analyze different leadership styles and how they are used in different situations.

(4) The student demonstrates personal and professional leadership qualities and competencies. The student is expected to:

(A) identify different personal growth practices such as self-reflection, introspection, self-care, and journaling;

(B) describe and demonstrate intrapersonal skills such as empathy, patience, risk-taking, confidence, integrity, personal values and ethics, punctuality, and goal setting;

(C) examine personal and professional values and ethics;

(D) research and develop a plan to coach and mentor others; and

(E) evaluate decision-making processes such as delegation, problem-solving processes such as conflict management, and processes to support patient satisfaction, patient safety, and patient advocacy.

(5) The student demonstrates the appropriate use of communication techniques. The student is expected to:

(A) examine communication platforms and apply the appropriate professional response in different mediums such as telephone, email, text, electronic health records, and face to face;

(B) demonstrate professional written and verbal communication skills for individuals and teams using communication tools such as Situation Background Assessment and Recommendation (SBAR) and Acknowledge Introduce Duration Explanation and Thank you (AIDET);

(C) determine appropriate communication methods for urgent, emergent, and non-urgent situations such as team strategies and tools to enhance performance and patient safety (TeamSTEPPS); and

(D) demonstrate receiving and giving constructive criticism.

(6) The student understands the definition and application of time management. The student is expected to:

(A) demonstrate how to create an agenda that prioritizes tasks, duties, and responsibilities that must be completed, including required meetings and communications;

(B) differentiate goals that advance professional growth and responsibility and non-professional goals;

(C) identify factors that inhibit the good use of time and apply strategies that mitigate the loss of time; and

(D) demonstrate how to manage long- and short-term personal and professional schedules by creating and updating a yearly calendar.

(7) The student understands how to build and manage interdisciplinary teams and facilitate teamwork. The student is expected to:

(A) define and explain the purpose of an interdisciplinary team and the role of each member;

(B) develop a plan for creating a team through team-building exercises, culture and climate awareness, and interpersonal skills;

(C) define and apply techniques to manage personal conflict within teams; and

(D) describe the stages of team evolution such as forming, storming, norming, performing, and transforming.

(8) The student understands regulatory agencies and boards and their related requirements. The student is expected to:

(A) identify the role and responsibility of the Board of Nursing, including establishing graduation and licensure requirements;

(B) identify federal, state, and local regulatory agencies such as local hospital boards, Health and Human Services, The Joint Commission, and Center for Medicare and Medicaid Services;

(C) define and identify the nursing scope of practice;

(D) compare the difference between a certification and licensure; and

(E) compare the role of the Board of Nursing and professional nursing organizations.

§127.553. Practicum in Health Science (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: Health Science Theory and Biology. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Practicum in Health Science course is designed to give students practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) To pursue a career in the health care industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health care industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students recognize the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science certification or licensure through further education and employment.

(6) Professional integrity in the health care industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner; and

(B) exhibit the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social sciences in health science. The student is expected to:

(A) interpret data from various sources in formulating conclusions;

(B) compile information from a variety of sources to create a technical report;

(C) plan, prepare, and deliver a presentation;

(D) examine the environmental factors that affect homeostasis;

(E) relate anatomical structure to physiological functions; and

(F) distinguish atypical anatomy and physiology in the human body systems.

(3) The student uses verbal and non-verbal communication skills. The student is expected to:

(A) accurately report information according to facility policies and procedures;

(B) demonstrate therapeutic communication skills to provide quality care; and

(C) employ therapeutic measures to minimize communication barriers.

(4) The student implements the knowledge and skills of a health care professional necessary to acquire and retain employment. The student is expected to:

(A) demonstrate proficiency in medical terminology and skills related to the health care of an individual;

(B) develop new problem-solving strategies based on previous knowledge and skills; and

(C) evaluate performance for continuous improvement and advancement in health care.

(5) The student employs ethical behavior standards and legal responsibilities. The student is expected to:

(A) identify individual ethical and legal behavior standards according to professional regulatory agencies; and

(B) research case studies related to unethical behavior in the health care industry.

(6) The student employs a safe environment to prevent hazardous situations. The student is expected to:

(A) integrate regulatory standards such as standard precautions and safe patient handling;

(B) evaluate hazardous materials according to the material safety data sheets; and

(C) apply principles of infection control and body mechanics in all aspects of the health care industry.

(7) The student explores the knowledge and skill levels necessary for advancing in the health science professions. The student is expected to:

(A) identify knowledge and skills that are transferable among health science professions; and

(B) research career pathways pertaining to the health care industry.

(8) The student implements skills in monitoring individual health status during therapeutic or diagnostic procedures. The student is expected to:

(A) identify care indicators of health status; and

(B) record health status according to facility protocol.

(9) The student recognizes the importance of participation in extended learning experiences. The student is expected to:

(A) participate in extended learning experiences such as community service, career and technical student organizations, and professional organizations; and

(B) create a plan of action targeting the career and technical student organization's community service goal.

§127.554. Extended Practicum in Health Science (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Health Science Career Cluster. Prerequisites: Health Science Theory and Biology. Corequisite: Practicum in Health Science. This course must be taken concurrently with Practicum in Health Science and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) The Extended Practicum in Health Science course is designed to give students practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) To pursue a career in the health science industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health science industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students should identify the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science career through further education and employment.

(6) Professional integrity in the health science industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to health science;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, commitment, leadership, appreciation for diversity, customer service, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) report information according to facility policies and procedures accurately;

(C) demonstrate therapeutic communication skills with increased fluency to provide quality care;

(D) analyze, interpret, and effectively communicate information, data, and observations;

(E) apply active listening skills to obtain and clarify information; and

(F) observe and interpret verbal and nonverbal cues and behaviors to enhance communication.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace to prevent hazardous situations. The student is expected to:

(A) demonstrate an understanding of and follow workplace safety rules and regulations;

(B) implement regulatory standards such as standard precautions and safe patient handling with increased fluency;

(C) evaluate hazardous materials according to the material safety data sheets in a consistent manner; and

(D) apply principles of infection control and body mechanics in all aspects of the health care industry.

(5) The student understands the professional, ethical, and legal responsibilities in health science. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) implement individual ethical and legal behavior standards according to professional regulatory agencies;

(C) show integrity by choosing the ethical course of action when making decisions; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student implements the knowledge and skills of a health care professional necessary to acquire and retain employment. The student is expected to demonstrate proficiency in medical terminology and skills related to the health care of an individual.

(7) The student participates in a supervised health science experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised health science experience;

(B) develop advanced technical knowledge and skills related to a personal occupational objective;

(C) evaluate strengths and weaknesses in technical skill proficiency; and

(D) collect representative work samples.

§127.555. Practicum in Nursing (Two Credits), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one course in a Level 2 or higher course in the nursing science program of study. Recommended prerequisites: Science of Nursing, Medical Terminology, and Anatomy and Physiology. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Health Science Career Cluster focuses on planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

(3) Practicum in Nursing is designed to give students practical applications of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) To pursue a career in the nursing industry, students should learn to reason, think critically, make decisions, solve problems, and communicate effectively. Students should recognize that quality health care depends on the ability to work well with others.

(5) The health care industry is comprised of diagnostic, therapeutic, health informatics, support services, and biotechnology research and development systems that function individually and collaboratively to provide comprehensive health care. Students recognize the employment opportunities, technology, and safety requirements of each system. Students are expected to apply the knowledge and skills necessary to pursue a health science certification or licensure through further education and employment.

(6) Professional integrity in the health care industry is dependent on acceptance of ethical and legal responsibilities. Students are expected to employ their ethical and legal responsibilities, recognize limitations, and understand the implications of their actions.

(7) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(8) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate verbal and non-verbal communication in a clear, concise, and effective manner; and

(B) demonstrate the ability to cooperate, contribute, and collaborate as a member of a team.

(2) The student applies mathematics, science, English language arts, and social sciences in nursing. The student is expected to:

(A) solve mathematical calculations appropriate to situations in a health-related environment;

(B) communicate using medical terminology;

(C) express ideas in writing and develop skills in documentation;

(D) interpret complex technical material related to the health science industry;

(E) summarize biological and chemical processes that maintain homeostasis;

(F) explain changes in body structure due to trauma and disease; and

(G) research the global impact of disease prevention and cost containment.

(3) The student models ethical behavior standards and legal responsibilities. The student is expected to:

(A) apply facility and industry standard policies and procedures, including the Health Insurance Portability and Accountability Act (HIPAA);

(B) research and present case studies related to legal and ethical issues in health care;

(C) recognize and analyze professional boundaries of patient relationships; and

(D) model safe practices, including infection control, proper body mechanics, and patient handling.

(4) The student explores the knowledge and skills of the nursing process for assessment. The student is expected to:

(A) perform and assess subjective data during a patient intake in a clinical or simulated setting by:

(i) performing a complete health history, including family and social data; and

(ii) assessing the chief complaint, history of present illness, past medical history, and a review of systems; and

(B) perform and assess objective data during a patient intake in a clinical or simulated setting by demonstrating:

(i) the skill of obtaining core vital signs;

(ii) the skill of obtaining and assessing height and weight and weight fluctuations; and

(iii) the performance of a head-to-toe physical assessment.

(5) The student explores the knowledge and skills of the nursing process for implementation or intervention. The student is expected to:

(A) demonstrate the proper use and application of medical equipment related to oxygen therapy, glucometers, pulse oximeters, catheters, incentive spirometers, mobility devices, patient handling devices, and electric hospital beds and chairs;

(B) demonstrate patient care, including care related to activities of daily living (ADL), patient positioning, patients' range of motion, basic first aid, patient transfers, and patient transport;

(C) demonstrate skills related to or acquire basic life support (BLS) certification as required by industry standards; and

(D) demonstrate the skills necessary to track nutrition and elimination such as input and output (I&O) and types of diets.

(6) The student explores the knowledge and skills of the nursing process of evaluation and re-evaluation. The student is expected to:

(A) compare normal and abnormal healthcare data;

(B) identify how to report trends and abnormal findings to appropriate personnel according to facility protocols; and

(C) explain the significance of abnormal findings.

(7) The student explores the knowledge and skills of the nursing process of documentation. The student is expected to:

(A) document objective data using medical terminology;

(B) document subjective data using medical terminology; and

(C) record documentation using various models such as Situation, Background, Assessment, and Recommendation (SBAR); Acknowledge, Introduce, Duration, Explanation, and Thank you (AIDET); and Subjective, Objective, Assessment Plan (SOAP).

(8) The student provides care for diverse populations such as persons from varying age groups and persons with physical limitations or mental health needs in clinical or simulated environment. The student is expected to:

(A) demonstrate appropriate usage of verbal and non-verbal communication techniques for providing care to persons from diverse populations; and

(B) apply appropriate techniques for assessments and care.

(9) The student is expected to provide culturally appropriate care. The student is expected to:

(A) use culturally appropriate verbal and non-verbal communication skills; and

(B) demonstrate patient interaction strategies for assessments and care.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500575

Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER K. HOSPITALITY AND TOURISM

19 TAC §§127.561 - 127.568, 127.600 - 127.603

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.561. Principles of Hospitality and Tourism (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Principles of Hospitality and Tourism introduces students to an industry that encompasses lodging, travel and tourism, recreation, amusements, attractions, and food/beverage operations. Students learn knowledge and skills focusing on communication, time management, and customer service that meet industry standards. Students will explore the history of the hospitality and tourism industry and examine characteristics needed for success in that industry.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) write effectively using standard English and correct grammar;

(B) use a variety of credible resources;

(C) recognize appropriate professional documents used in the hospitality and tourism industry;

(D) calculate accurate measurements, numerical concepts such as percentages, and estimations; and

(E) understand how scientific principles are used in the hospitality and tourism industry.

(2) The student uses verbal and nonverbal communication to provide a positive experience for guests and employees. The student is expected to:

(A) develop and execute formal and informal presentations; and

(B) practice customer service skills.

(3) The student understands that personal success depends on personal effort. The student is expected to:

(A) demonstrate self-responsibility and self-management;

(B) explain the characteristics of personal values, ethics, and fundamental principles;

(C) display positive attitudes and good work habits;

(D) develop strategies for achieving accuracy; and

(E) develop organizational skills.

(4) The student develops an understanding of time management, decision making, and prioritization. The student is expected to:

(A) identify and apply effective practices for managing time;

(B) analyze the benefits of balancing career and home life;

(C) learn and apply steps in the decision-making process; and

(D) work independently.

(5) The student researches, analyzes, and explores lifestyle and career goals. The student is expected to:

(A) prioritize career goals and ways to achieve those goals in the hospitality and tourism industry;

(B) compare and contrast education or training and certifications needed for careers in the hospitality and tourism industry;

(C) examine related community service opportunities; and

(D) describe the components and importance of a career portfolio.

(6) The student uses technology to gather information. The student is expected to:

(A) understand the need for computer applications to perform workplace tasks;

(B) recognize that types of computerized systems are used to manage operations and guest services in the hospitality and tourism industry; and

(C) discuss why computerized systems are used in operations and guest services in the hospitality and tourism industry.

(7) The student demonstrates leadership, citizenship, and teamwork skills required for success. The student is expected to:

(A) develop team-building skills;

(B) develop decision-making and problem-solving skills;

(C) conduct and participate in effective meetings;

(D) identify leadership and teamwork qualities that create a pleasant working atmosphere; and

(E) identify community service activities related to the hospitality and tourism industry.

(8) The student explains how resources (employees, guests, and property) are managed to minimize losses or liabilities in the hospitality and tourism industry. The student is expected to:

(A) identify and explain job safety and security practices;

(B) recognize and implement the basics of sanitation;

(C) understand and demonstrate procedures for cleaning, sanitizing, and storing equipment and tools; and

(D) determine how environmental issues and trends affect the hospitality and tourism industry.

(9) The student explores the history of the hospitality and tourism industry. The student is expected to:

(A) examine the varied operations required within the hospitality and tourism industry;

(B) understand the job qualifications for various careers in the hospitality and tourism industry; and

(C) differentiate amongst lodging, travel and tourism, recreation amusements, attractions and resorts, and food and beverage service.

(10) The student demonstrates research skills applicable to the hospitality and tourism industry. The student is expected to:

(A) develop technical vocabulary of the hospitality and tourism industry;

(B) design a customized product for the hospitality and tourism industry; and

(C) identify local and regional trends and issues in the hospitality and tourism industry.

(11) The student understands the importance of customer service. The student is expected to:

(A) determine ways to provide quality customer service;

(B) analyze how guests are affected by employee attitude, appearance, and actions; and

(C) examine different types of service across the industry.

§127.562. Introduction to Culinary Arts (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Recommended prerequisite: Principles of Hospitality and Tourism. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Introduction to Culinary Arts will emphasize the principles of planning, organizing, staffing, directing, and controlling the management of a variety of food service operations. The course will provide insight into the operation of a well-run restaurant. Introduction to Culinary Arts will provide insight into food production skills, various levels of industry management, and hospitality skills. This is an entry level course for students interested in pursuing a career in the food service industry. This course is offered as a classroom and laboratory-based course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) model effective oral and written communication;

(B) practice professional grooming and hygiene standards;

(C) exercise punctuality and time-management skills;

(D) demonstrate self-respect and respect for others;

(E) demonstrate effective teamwork and leadership; and

(F) employ initiative, adaptability, and problem-solving techniques in practical applications.

(2) The student gains academic knowledge and skills required to pursue the full range of career and postsecondary education opportunities within the restaurant food service industry. The student is expected to:

(A) organize oral and written information;

(B) compose a variety of written documents such as menus, presentations, and advertisements;

(C) calculate numerical concepts such as weights, measurements, and percentages;

(D) identify how scientific principles are used in the food service industry; and

(E) use mathematics and science knowledge and skills to produce quality food products.

(3) The student uses verbal and nonverbal communication skills to create, express, and interpret information to establish a positive work environment. The student is expected to:

(A) develop and deliver presentations;

(B) identify various marketing strategies used by the food service industry such as traditional and innovative marketing strategies;

(C) demonstrate proper techniques for answering restaurant phones;

(D) relate interpersonal communications such as verbal and nonverbal cues to enhance communication with coworkers, employers, customers, and clients; and

(E) demonstrate active listening skills to obtain and clarify information.

(4) The student solves problems using critical thinking, innovation, and creativity independently and in teams. The student is expected to:

(A) generate creative ideas to solve problems by brainstorming possible solutions; and

(B) employ critical-thinking and interpersonal skills to resolve conflicts with individuals such as coworkers, customers, clients, and employers.

(5) The student uses information technology tools specific to restaurant management to access, manage, integrate, and interpret information. The student is expected to:

(A) use information technology tools and applications to perform workplace responsibilities;

(B) demonstrate knowledge and use of point-of-sale systems; and

(C) evaluate Internet resources for information.

(6) The student understands roles within teams, work units, departments, organizations, and the larger environment of the food service industry. The student is expected to:

(A) explain the different types and functions of kitchen, front-of-the-house, and support roles;

(B) investigate quality-control standards and practices;

(C) differentiate between various styles of restaurant services such as table, buffet, fast food, fast casual, and quick service;

(D) illustrate various place settings using proper placement of dining utensils; and

(E) demonstrate the proper service techniques in food service operations.

(7) The student understands the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student is expected to:

(A) assess workplace conditions with regard to safety and health;

(B) analyze potential effects caused by common chemicals and hazardous materials;

(C) demonstrate first aid and cardiopulmonary resuscitation skills;

(D) apply safety and sanitation standards common to the workplace;

(E) research sources of food-borne illness and determine ways to prevent them;

(F) determine professional attire and personal hygiene for restaurant employees; and

(G) prepare for a state or national food sanitation certification or other appropriate certifications.

(8) The student uses leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives. The student is expected to:

(A) apply team-building skills;

(B) apply decision-making and problem-solving skills;

(C) determine leadership and teamwork qualities to aid in creating a pleasant working atmosphere; and

(D) participate in community leadership and teamwork opportunities to enhance professional skills.

(9) The student knows and understands the importance of professional ethics and legal responsibilities within the food service industry. The student is expected to:

(A) demonstrate ethical reasoning in a variety of workplace situations in order to make decisions;

(B) interpret and explain written organizational policies and procedures to help employees perform their jobs; and

(C) develop guidelines for professional conduct.

(10) The student demonstrates an understanding that personal success depends on personal effort. The student is expected to:

(A) demonstrate a proactive understanding of self-responsibility and self-management;

(B) identify behaviors needed to be employable and maintain employment such as positive work ethics and positive personal qualities;

(C) identify and evaluate the effects of exercise, nutritional dietary habits, and emotional factors such as stress, fatigue, or anxiety on job performance;

(D) implement stress-management techniques; and

(E) follow directions and procedures independently.

(11) The student develops principles in time management, decision making, effective communication, and prioritization. The student is expected to:

(A) apply effective practices for managing time and energy;

(B) analyze various steps in the career decision-making process; and

(C) discuss the importance of balancing a career, family, and leisure activities.

(12) The student knows and understands the importance of employability skills. The student is expected to:

(A) demonstrate skills related to seeking employment in the food service industry;

(B) identify the required training and educational requirements that lead toward appropriate career goals;

(C) select educational and work history highlights to include in a career portfolio;

(D) create and update a personal career portfolio;

(E) recognize required employment forms and their functions such as I-9, work visa, W-4, and licensures to meet employment requirements;

(F) research the local and regional labor workforce market to determine opportunities for advancement;

(G) investigate professional development training opportunities to keep current on relevant trends and information within the industry; and

(H) recognize entrepreneurship opportunities.

(13) The student understands the use of technical knowledge and skills required to pursue careers in the restaurant food service industry, including knowledge of design, operation, and maintenance of technological systems. The student is expected to:

(A) define job-specific technical vocabulary;

(B) analyze customer comments to formulate improvements in services and products and training of staff;

(C) detail ways to achieve high rates of customer satisfaction;

(D) use different types of payment options to facilitate customer payments for services; and

(E) demonstrate technical skills used in producing quality food service.

(14) The student understands factors that affect the food service industry. The student is expected to:

(A) outline the history and growth of the food service industry;

(B) identify an entrepreneur who has made significant contributions to the food service industry; and

(C) explain cultural globalization and its influence on food.

(15) The student evaluates and determines equipment, ingredients, and procedures in a professional food setting. The student is expected to:

(A) identify the role of mise en place;

(B) identify and use large and small equipment in the professional food service setting;

(C) identify the types of knives and proper usage in a commercial kitchen;

(D) demonstrate proper knife safety, handling, cleaning, and storage;

(E) differentiate between different types of produce and identify factors such as grading, purchasing, storage, and usage;

(F) differentiate between dry goods and identify factors such as purchasing and storage;

(G) differentiate between proteins and identify factors such as types, grades, purchasing, and storage;

(H) describe the methods of cooking, including dry heat, moist heat, and combination heat; and

(I) differentiate between common baking methods and identify common ingredients used in baking.

§127.563. Culinary Arts (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Hospitality and Tourism and Introduction to Culinary Arts. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Culinary Arts begins with the fundamentals and principles of the art of cooking and the science of baking and includes management and production skills and techniques. Students can pursue a national sanitation certification or other appropriate industry certifications. This course is offered as a laboratory-based course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) model effective oral and written communication;

(B) practice professional grooming and hygiene standards;

(C) exercise punctuality and time-management skills;

(D) demonstrate self-respect and respect for others;

(E) demonstrate effective teamwork and leadership; and

(F) employ initiative, adaptability, and problem-solving techniques in practical applications.

(2) The student applies advanced reading, writing, mathematics, and science skills for the food service industry. The student is expected to:

(A) compose industry appropriate documents such as purchasing specifications and purchase orders;

(B) comprehend a variety of texts such as operations and training manuals;

(C) calculate numerical concepts such as percentages and estimations in practical situations, including weight and measures;

(D) understand scientific principles used in culinary arts;

(E) read and comprehend standardized recipes;

(F) write and convert standardized recipes; and

(G) calculate and manage food costs.

(3) The student integrates listening, writing, and speaking skills using verbal and nonverbal communication to enhance operations, guest satisfaction, and professional development. The student is expected to:

(A) create formal or informal presentations;

(B) properly answer business phones;

(C) write instructions for a specific restaurant for a culinary procedure or the use of a piece of equipment; and

(D) attend and participate in an industry-focused staff meeting.

(4) The student demonstrates an understanding that personal success depends on personal effort. The student is expected to:

(A) demonstrate a proactive understanding of self-responsibility and self-management;

(B) explain the characteristics of personal values and principles;

(C) demonstrate positive attitudes and work habits;

(D) demonstrate exemplary appearance and personal hygiene; and

(E) identify and manage the effects of exercise, dietary habits, and emotional factors such as stress, fatigue, or anxiety on job performance.

(5) The student develops principles in time management, decision making, effective communication, and prioritization. The student is expected to:

(A) apply effective practices for managing time and energy; and

(B) analyze various steps in the decision-making process.

(6) The student researches, analyzes, and explores lifestyle and career goals. The student examines jobs available in the food service industry and accesses career opportunities. The student is expected to:

(A) research the major job duties and qualifications for various positions in the food service industry to facilitate selection of career choices in culinary arts;

(B) update a personal career portfolio;

(C) demonstrate proper interview techniques; and

(D) establish personal short- and long-term goals.

(7) The student understands factors that affect the food service industry. The student is expected to:

(A) research how historical and current trends in society affect the food service industry;

(B) identify global cultures and traditions related to food;

(C) research famous chefs from history; and

(D) summarize historical entrepreneurs who influenced food service in the United States.

(8) The student evaluates and determines equipment, ingredients, and procedures used in a professional food setting. The student is expected to:

(A) identify and demonstrate the role of mise en place in the professional food service setting;

(B) identify and use large and small equipment in a commercial kitchen;

(C) develop and practice food production and presentation techniques;

(D) identify and use the appropriate application of moist, dry, and combination cookery methods;

(E) demonstrate the preparation skills of items commonly prepared in food service operations such as breakfast cookery, salads and dressings, soups and sandwiches, stocks and sauces, appetizers, seafood, poultry, meat, pastas and grains, and fruits and vegetables; and

(F) demonstrate baking techniques such as yeast breads and rolls, quick breads, and desserts.

(9) The student understands the various food service operations such as quick service, fast casual, casual, fine dining, institutional, and beverage service. The student is expected to:

(A) explain quality customer service;

(B) demonstrate types of table setting, dining, and service skills;

(C) differentiate between service styles; and

(D) compare and contrast the roles of the front of the house and the back of the house in the various food service operations.

(10) The student uses technology and computer applications to manage food service operations. The student is expected to:

(A) use technology tools appropriate for the industry;

(B) operate technology applications to perform workplace tasks;

(C) explain and use point-of-sale systems in various food service operations;

(D) demonstrate knowledge in computer programs used for food management;

(E) evaluate information sources for culinary arts; and

(F) interpret data such as spreadsheets, databases, and sales reports.

(11) The student demonstrates leadership, citizenship, and teamwork skills required for success. The student is expected to:

(A) apply team-building skills;

(B) apply decision-making and problem-solving skills;

(C) determine leadership and teamwork qualities in creating a pleasant working atmosphere; and

(D) participate in community leadership and teamwork opportunities to enhance professional skills.

(12) The student explains how employees, guests, and property are protected to minimize losses or liabilities. The student is expected to:

(A) determine the basics of safety in culinary arts;

(B) assess workplace conditions and identify safety hazards;

(C) determine the basics of sanitation in a professional kitchen;

(D) determine proper receiving, storage, and distribution techniques;

(E) demonstrate proper cleaning of equipment and maintenance in the commercial kitchen;

(F) assess food hazards and determine ways to prevent food hazards; and

(G) prepare for a state or national food sanitation certification or other appropriate certifications.

(13) The student recognizes and models work ethics and legal responsibilities. The student is expected to:

(A) understand and comply with laws and regulations specific to the food service industry; and

(B) demonstrate a positive work ethic.

§127.564. Advanced Culinary Arts (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Culinary Arts. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Advanced Culinary Arts will extend content and enhance skills introduced in Culinary Arts by in-depth instruction of industry-driven standards in order to prepare students for success in higher education, certifications, and/or immediate employment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) model effective oral and written communication;

(B) practice professional grooming and hygiene standards;

(C) exercise punctuality and time-management skills;

(D) demonstrate self-respect and respect for others;

(E) demonstrate effective teamwork and leadership; and

(F) employ initiative, adaptability, and problem-solving techniques in practical applications.

(2) The student researches, analyzes, and designs a path to achieve career goals. The student examines jobs available in the food service industry and accesses career opportunities. The student is expected to:

(A) demonstrate major duties and qualifications for all staff and managerial positions to facilitate selection of career choices in the food service industry;

(B) model proper interview techniques;

(C) critique personal and short-term goals; and

(D) create and update a career portfolio.

(3) The student explains how employees, guests, and property are protected to minimize losses or liabilities. The student is expected to:

(A) determine the basics of safety in culinary arts;

(B) assess workplace conditions and identify safety hazards;

(C) determine the basics of sanitation in a professional kitchen;

(D) determine proper receiving, storage, and distribution techniques;

(E) explain and demonstrate proper cleaning of equipment and maintenance of the commercial kitchen;

(F) assess food hazards and determine ways to prevent food hazards; and

(G) prepare for a state or national food sanitation certification or other appropriate certifications.

(4) The student evaluates global cuisines, including the culture, history, and indigenous ingredients to create international recipes. The student is expected to:

(A) replicate advanced moist and dry cooking techniques from global cuisines such as American regional, Latin American, European, Mediterranean, Middle Eastern, and Asian;

(B) synthesize indigenous ingredients from global cuisine to create innovative dishes; and

(C) justify the connection of flavor, texture, visual appeal, taste, and customer satisfaction on product development.

(5) The student demonstrates an understanding of sustainability in the restaurant industry and its local and global effect. The student is expected to:

(A) evaluate practices for water and energy conservation across the food service industry;

(B) identify waste management options to promote sustainability; and

(C) evaluate current sustainable food practices.

(6) The student demonstrates comprehensive protein product knowledge as it relates to flavor, texture, visual appeal, taste, and customer satisfaction and establishes quality standards. The student is expected to:

(A) assess grading and classifications;

(B) identify primal, sub-primal, and retail cuts;

(C) demonstrate fabrication techniques on proteins;

(D) evaluate purchasing practices according to various food service operations;

(E) model appropriate cooking methods for proteins; and

(F) evaluate appropriate cooking methods in regard to various protein selections.

(7) The student demonstrates comprehensive fish and shellfish product knowledge as it relates to flavor, texture, visual appeal, taste, and customer satisfaction and establishes quality standards. The student is expected to:

(A) categorize classifications of fish and shellfish;

(B) evaluate factors that influence seafood purchasing such as freshness, flavor, sustainability, and market conditions;

(C) demonstrate the ability to clean and fabricate round, flat, fin fish, and shellfish;

(D) model appropriate cooking methods for fish and shellfish; and

(E) evaluate the effects of cooking methods on product presentation.

(8) The student demonstrates comprehensive knowledge of fruits, vegetables, grains, herbs, spices, and other dry goods as related to presentation, flavor, texture, visual appeal, taste, and customer satisfaction and establishes quality standards. The student is expected to:

(A) compare types of commonly available produce;

(B) identify factors contributing to cost and quality such as seasonality, market volatility, and transportation;

(C) compare and contrast forms and use of produce such as fresh, frozen, canned, dried, and other classifications;

(D) model appropriate cooking methods for produce; and

(E) evaluate the effects of cooking methods on produce.

(9) The student understands advanced baking and pastry principles. The student is expected to:

(A) use professional food preparation equipment such as commercial-grade mixers, food processors, and measuring tools;

(B) apply proper measuring and scaling techniques; and

(C) compose various plated desserts appropriate for various food service operations.

(10) The student demonstrates and practices the basic procedures for the production of yeast and quick bread products. The student is expected to:

(A) differentiate how various types of bread crusts are created through fermentation, proofing, baking temperatures, and humidity;

(B) prepare soft, hard, and artisanal breads through proper baking techniques; and

(C) differentiate between quick breads such as muffins, scones, and biscuits.

(11) The student demonstrates and practices the basic procedures for the production of pastry crust, pastry dough, and cookie. The student is expected to:

(A) compare different types of pastry crusts and usage in pies and tarts;

(B) prepare pie fillings such as fruit, soft, and custard fillings;

(C) prepare different types of pastry dough such as Pate a Choux, Pate Sucree, and laminated dough;

(D) differentiate between various cookie preparation methods;

(E) determine the causes of crispness, moistness, chewiness, and the spread of cookies; and

(F) bake, cook, and store cookies properly.

(12) The student demonstrates and practices the basic procedures for the production of cakes, frostings, fillings, and icings. The student is expected to:

(A) differentiate between cake preparation methods;

(B) differentiate the functions of icings and determine appropriate application;

(C) assemble and ice simple layer cakes, sheet cakes, and cupcakes;

(D) demonstrate the ability to identify criteria for evaluation of cake products;

(E) prepare various icings such as fondant, buttercreams, flat, royal, and glazes; and

(F) perform basic piping skills with a parchment cone and pastry bag with tips.

(13) The student demonstrates and practices the basic procedures for the production of custards, creams, and mousse. The student is expected to:

(A) compose desserts such as ice creams, custards, mousse, and other desserts; and

(B) identify the roles of desserts such as ice creams, custards, mousse, and other desserts.

(14) The student demonstrates and practices the basic procedures for the production of chocolate, sugars, confections, and sauces. The student is expected to:

(A) differentiate between the types of advanced confections;

(B) model methods of preparation in each type of confection;

(C) use chocolate as a major ingredient in dessert or food production;

(D) temper chocolate;

(E) use tempered chocolate in dessert preparation;

(F) cook sugar syrups to various stages of hardness;

(G) prepare dessert sauces such as custard, chocolate, caramel, fruit fillings, and coulis; and

(H) serve attractively plated desserts with appropriate sauces and garnishes.

(15) The student evaluates nutrition concepts as they affect health and wellness, marketing, and menu planning. The student is expected to:

(A) analyze the role of carbohydrates, vitamins, minerals, proteins, and fats as they relate to food choices; and

(B) research and develop menus for populations with dietary requirements or restrictions.

(16) The student analyzes the components of cost controls in a food service operation and develops a plan to manage cost. The student is expected to:

(A) differentiate between the major costs in food service such as food, beverage, and labor costs;

(B) validate the effect of controlling costs on the success of a food service operation;

(C) compare and contrast the concept of fixed costs, variable costs, and controllable costs; and

(D) compare and contrast the relationship between inventory management and cost control in food service operations.

§127.565. Food Science (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, and at least one credit in a Level 2 or higher course from the hospitality and tourism or agriculture, food, and natural resources career clusters. Recommended prerequisite: Principles of Hospitality and Tourism. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) In Food Science, students examine the nature and properties of foods, food microbiology, and the principles of science in food production, processing, preparation, and preservation; use scientific methods to conduct laboratory and field investigations; and make informed decisions using critical thinking and scientific problem solving. This course provides students a foundation for further study that leads to occupations in food and beverage services; the health sciences; agriculture, food, and natural resources; and human services.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Scientific hypotheses and theories. Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by the food service business and industry. The student is expected to:

(A) apply interpersonal communication skills in the food service business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics and professionalism in a job setting;

(E) describe problem-solving and critical-thinking skills used in the workplace; and

(F) explore careers and professions in food science.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, metric rulers, electronic balances, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, and models, diagrams, or samples of biological specimens or structures, vacuum sealer, oven, cook top, cookware, bakeware, cutlery, and measuring cups and spoons;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics or food science field.

(6) The student analyzes household and commercial sustainability and regulatory practices in food production. The student is expected to:

(A) research and investigate resource use, sustainability, and conservation in food production such as with water, land, and oceans;

(B) analyze the effect of food on the decomposition cycle, including composting, recycling, and disposal; and

(C) demonstrate appropriate methods for sorting and disposing of food waste, including fats and oils, and packaging waste from food production.

(7) The student analyzes the role of acids and bases in food science. The student is expected to:

(A) evaluate physical and chemical properties of acids and bases; and

(B) analyze the relationship of pH to the properties, safety, and freshness of food.

(8) The student evaluates the principles of microbiology and food safety practices. The student is expected to:

(A) investigate the properties of microorganisms that cause food spoilage;

(B) compare food intoxication and food infection;

(C) examine methods to destroy or inactivate harmful pathogens in foods;

(D) compare beneficial and harmful microorganisms, including lactic acid bacteria, acetic acid bacteria, various baking and brewing yeasts, *E. coli*, *Staphylococcus*, *Clostridium botulinum*, *Clostridium perfringens*, *Salmonella*, *Listeria*, and *Shigella*;

(E) analyze sanitary food-handling practices such as personal hygiene or equipment sanitation; and

(F) prepare for a state or national food manager sanitation certification or alternative credential within the field of food science technology.

(9) The student examines the chemical properties of food. The student is expected to:

(A) describe acids, bases, salts, carbohydrates, lipids, proteins and other elements, compounds, and mixtures related to food science;

(B) compare heterogeneous and homogeneous mixtures;

(C) analyze chemical and physical changes in food; and

(D) use chemical symbols, formulas, and equations in food science such as oxidation of sugars in a cut apple or fermentation in the production of yogurt.

(10) The student analyzes solutions, colloids, solids, gels, foams, and emulsions in food science. The student is expected to:

(A) identify the solvent and solute in various solutions such as brines;

(B) compare unsaturated, saturated, and supersaturated solutions, including their effects on boiling and freezing points in food preparation such as when making candy or ice cream;

(C) calculate the concentration of a solution using mass percent such as the concentration of sugar needed for crystallization;

(D) describe the properties of colloidal dispersions such as gelatin, mayonnaise, or milk;

(E) differentiate between and give examples of temporary, semi-permanent, and permanent emulsions;

(F) investigate the relationships between the three parts of a permanent emulsion; and

(G) create temporary, semi-permanent, and permanent food emulsions.

(11) The student analyzes the functions of enzymes in food science. The student is expected to:

(A) describe the role of enzymes as catalysts in chemical reactions of food, including cheese-making, the enzymatic tenderization of meat, and oxidation of sugars in fruit;

(B) explain the relationship between an enzyme and a substrate;

(C) analyze the functions of enzymes in digestion, including the factors that influence enzyme activity, and relate enzymatic activity in digestion to dietary restrictions; and

(D) analyze enzyme reactions in food preparation, including cheese-making, the enzymatic tenderization of meat, and oxidation of sugars in fruit.

(12) The student evaluates the role of fermentation in food science. The student is expected to:

(A) analyze modern and historical reasons food is fermented;

(B) describe the conditions under which bacterial fermentation of food occurs and use chemical equations to describe the products of fermentation; and

(C) prepare various fermented food products.

(13) The student assesses the reaction of leavening agents in baked products. The student is expected to:

(A) describe the physical and chemical changes that occur in leavening;

(B) identify various leavening agents and describe their functions in food production;

(C) use chemical equations to describe how acids act as leavening agents;

(D) conduct laboratory experiments with various types and amounts of leavening agents to compare the doughs and batters produced; and

(E) create baked products using various leavening agents.

(14) The student explores the roles of food additives. The student is expected to:

(A) evaluate the various types of food additives such as incidental, intentional, natural, and artificial;

(B) investigate the various functions of food additives such as preserving food, increasing nutritive value, and enhancing sensory characteristics; and

(C) research local, state, national, and international agencies involved in regulating food additives.

(15) The student analyzes the effects of heat energy transfer in food production. The student is expected to:

(A) analyze the relationship between molecular motion and temperature;

(B) compare heat transfer processes, including conduction, convection, and radiation;

(C) investigate the role of phase changes in food production, including crystallization, coagulation, and reduction; and

(D) demonstrate rates of reaction using various temperatures and describe the effects of temperature on the characteristics of food products.

(16) The student evaluates the properties of carbohydrates in food and their effects on food production. The student is expected to:

(A) identify the physical properties and chemical structures of simple and complex carbohydrates;

(B) describe the functions of carbohydrates such as caramelization, crystallization, and thickening agents in food production;

(C) describe the processes of gelatinization and retrogradation in food production; and

(D) create food products using simple and complex carbohydrates.

(17) The student evaluates the properties of fats in food and their effects on food production. The student is expected to:

(A) identify the physical properties and chemical structures of saturated and unsaturated fats;

(B) describe the functions of different types of fats in food production;

(C) demonstrate methods for controlling fat oxidation;

(D) analyze the effects of temperature on fats in food preparation;

(E) conduct laboratory experiments using the scientific processes to explore the functions of fats in food production; and

(F) create food products using saturated and unsaturated fats.

(18) The student evaluates the properties of proteins and their effects on food production. The student is expected to:

(A) identify the physical properties and chemical structures of proteins;

(B) explain the processes of protein denaturation, coagulation, and syneresis;

(C) describe the functions and uses of proteins such as in emulsions, foams, and gluten formation;

(D) analyze the effects of moisture and temperature on protein in food production such as moist and dry heat methods for preparation; and

(E) create food products using protein.

(19) The student evaluates the properties of vitamins and minerals and their interrelationships in food production. The student is expected to compare the effects of food production on water- and fat-soluble vitamins and minerals.

(20) The student evaluates the properties of water and their effects on food production. The student is expected to:

(A) identify the properties of water, including as a solvent or medium, and its effects on food production; and

(B) compare the effects of hard and soft water on food production.

(21) The student explains nutritional aspects of food production. The student is expected to:

(A) describe how variations in human digestion and metabolism affect dietary modifications;

(B) identify common and special dietary modifications such as for food allergies, intolerances, or medical conditions;

(C) develop and modify recipes for dietary differences such as allergies and intolerances or for personal health preferences such as low-fat or sugar-free; and

(D) plan and create a dining experience using the most recent USDA dietary guidelines.

(22) The student analyzes processes that manage bacteria to safe levels during food production. The student is expected to investigate processes that manage food bacteria such as dehydration, pasteurization, and food irradiation.

(23) The student examines packaging and labeling guidelines. The student is expected to:

(A) research and evaluate federal food packaging regulations, including the information required on a food label;

(B) compare global food packaging regulations to those of the United States; and

(C) analyze the effectiveness of commercial food packaging for specific foods.

(24) The student analyzes food preservation processes. The student is expected to:

(A) describe the benefits of food preservation;

(B) compare various methods of household and commercial dehydration, canning, and freezing; and

(C) create a food product using a selected preservation method.

§127.566. Travel and Tourism Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Hospitality and Tourism. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events and travel-related services.

(3) Travel and Tourism Management incorporates management principles and procedures of the travel and tourism industry as well as destination geography, airlines, international travel, cruising, travel by rail, lodging, recreation, amusements, attractions, and resorts. Employment qualifications and opportunities are also included in this course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) formulate and organize oral and written information;

(B) compose a variety of written documents used in travel and tourism such as itineraries, thank you letters, presentations, and advertisements;

(C) differentiate and deliver different types of presentations such as informative, instructional, persuasive, and decision making;

(D) calculate basic math and percentages;

(E) investigate geography and factors that affect the travel and tourism industry; and

(F) summarize how to use the state of the economy to plan products and services.

(2) The student uses oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) select and employ verbal skills when obtaining and conveying information;

(B) use verbal and nonverbal communication skills effectively with diverse constituents; and

(C) develop and deliver presentations using appropriate technology such as to engage, inform, and persuade audiences.

(3) The student solves problems independently and in teams using critical-thinking skills. The student is expected to:

(A) generate creative ideas by brainstorming possible solutions;

(B) guide individuals through the process of making informed travel decisions;

(C) interpret and use industry standards for principles of budgeting and forecasting to maximize profit and growth; and

(D) analyze customer comments to formulate improvements in services and products.

(4) The student uses information technology tools specific to the travel and tourism industry to access, manage, integrate, and create information. The student is expected to:

(A) operate and use technological applications to communicate within a workplace and perform a task;

(B) distinguish among the different modes of travel such as airline, cruise line, road travel, and rail;

(C) differentiate among recreation such as amusement, attractions, and resort venues;

(D) research travel arrangement systems used for booking reservations; and

(E) create basic multimedia publications.

(5) The student understands roles within teams, work units, departments, organizations, inter-organization systems, and the larger environment of the travel and tourism industry. The student is expected to:

(A) explain the functions and interactions of various departments within a travel and tourism business;

(B) research quality-control systems and practices;

(C) develop plans to accomplish organizational goals; and

(D) formulate collaborative plans with other related industries such as lodging, food and beverage service, and transportation agencies to provide an all-inclusive product for the customer.

(6) The student understands the importance of health, safety, and environmental systems in the travel and tourism industry and their importance to organizational performance and regulatory compliance. The student is expected to:

(A) identify hazards common to workplaces such as safety, health, and environmental hazards;

(B) use industry standards to implement safety precautions to maintain a safe worksite;

(C) research and relate first aid and cardiopulmonary resuscitation skills;

(D) describe environmental procedures that ensure a facility is in compliance with health codes;

(E) describe how to train others for emergency situations;

(F) analyze potential effects caused by common chemicals and hazardous materials; and

(G) compare and contrast security measures to protect the guests, staff, and property.

(7) The student uses leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives. The student is expected to:

(A) apply team-building skills;

(B) apply decision-making and problem-solving skills;

(C) apply teamwork qualities in creating a pleasant work environment;

(D) determine the impact of cultural diversity on teamwork; and

(E) participate in community service opportunities.

(8) The student knows and understands the importance of professional ethics and legal responsibilities. The student is expected to:

(A) discuss ethical reasoning to a variety of workplace situations in order to make decisions; and

(B) research information on organizational policies in handbooks and manuals.

(9) The student knows and understands the importance of employability skills and is able to explore and effectively plan for managing travel and tourism careers. The student is expected to:

(A) identify and demonstrate behaviors and skills necessary to be employable;

(B) identify the training and education requirements that lead toward an appropriate certification for employment;

(C) demonstrate proper interview techniques;

(D) update or create a career portfolio;

(E) investigate continuing education opportunities within the industry;

(F) examine appropriate credentialing requirements to maintain compliance with industry requirements;

(G) compare and contrast the effect of stress, fatigue, and anxiety on job performance;

(H) complete required employment forms such as I-9, work visa, W-4, and licensures to meet employment requirements; and

(I) explore entrepreneurship opportunities within the travel and tourism industry.

(10) The student develops principles in time management, decision making, effective communication, and prioritizing. The student is expected to:

(A) apply effective practices for time management;

(B) analyze various steps in the decision-making process for prioritizing effectively; and

(C) discuss the importance of balancing a career, a family, and leisure activities.

(11) The student uses technical knowledge and skills required in the travel and tourism industry. The student is expected to:

(A) develop job-specific technical vocabulary;

(B) use marketing techniques to sell products and services;

(C) evaluate current and emerging technologies to improve guest services;

(D) explain different types of payment options;

(E) analyze customer service concepts and scenarios;

(F) describe how customer service affects a company's bottom line;

(G) develop an awareness of cultural diversity to enhance travel planning such as differences in social etiquette, dress, and behaviors;

(H) demonstrate an understanding of tourism sales and the impact on distribution systems; and

(I) demonstrate knowledge of destination, attraction planning, and development, including the use of organizations such as convention and visitor's bureaus and state tourist boards.

§127.567. Hotel Management (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Hospitality and Tourism. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Hotel Management focuses on the knowledge and skills needed to pursue staff and management positions available in the hotel industry. This in-depth study of the lodging industry includes departments within a hotel such as front desk, food and beverage, housekeeping, maintenance, human resources, and accounting. This course will focus on, but not be limited to, professional communication, leadership, management, human resources, technology, and accounting.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) organize oral and written information;

(B) compose and present individually and in teams a variety of written documents such as agendas, thank you letters, presentations, and advertisements;

(C) calculate correctly using numerical concepts such as percentage and estimation in practical situations; and

(D) examine and apply how scientific principles are used in the hotel industry.

(2) The student uses verbal and nonverbal communication skills to create, express, and interpret information for providing a positive experience for guests and employees. The student is expected to:

(A) develop, deliver, and critique presentations;

(B) analyze various marketing strategies for a lodging property and available services;

(C) demonstrate proper techniques for using telecommunications equipment;

(D) interpret verbal and nonverbal cues to enhance communication with individuals such as coworkers, guests, and clients;

(E) locate written information used to communicate with individuals such as coworkers and guests;

(F) apply and model active listening skills to obtain and clarify information; and

(G) follow directions and procedures independently and in teams.

(3) The student solves problems independently and in teams using critical thinking, innovation, and creativity. The student is expected to:

(A) generate creative ideas to solve problems by brainstorming possible solutions;

(B) employ critical-thinking and interpersonal skills to resolve conflicts with individuals such as coworkers, employers, guests, and clients; and

(C) interpret and use industry standards for principles of budgeting and forecasting to maximize profit and growth.

(4) The student demonstrates an understanding that personal success depends on personal effort. The student is expected to:

(A) demonstrate an understanding of self-responsibility and self-management;

(B) identify and demonstrate both positive and negative work behaviors and personal qualities for employability; and

(C) evaluate the effects of health and wellness on employee performance.

(5) The student develops principles in time management, decision making, effective communication, and prioritization. The student is expected to:

(A) apply effective practices for managing time and energy;

(B) develop and implement stress-management techniques;

(C) assemble and analyze the various steps in the decision-making process; and

(D) evaluate the importance of balancing a career, family, and leisure activities and develop various techniques to reduce conflict.

(6) The student understands the importance of employability skills. The student is expected to:

(A) assemble the required training or education requirements that lead to an appropriate industry certification;

(B) comprehend and model skills related to seeking employment;

(C) assemble and/or update an electronic personal career portfolio;

(D) complete a job application in written and electronic format;

(E) examine and model proper interview techniques in applying for employment;

(F) complete required employment forms such as I-9, work visa, W-4, and licensures to meet employment requirements;

(G) research the local labor workforce market to determine opportunities for lodging employment; and

(H) investigate professional lodging organizations and development training opportunities to keep current on relevant trends and information within the lodging industry.

(7) The student understands roles within teams, work units, departments, organizations, and the larger environment of the lodging industry. The student is expected to:

(A) identify lodging departments and distinguish among the duties and responsibilities within each department;

(B) implement quality-control standards and practices;

(C) compare and contrast duties and responsibilities from each department to the larger lodging environment, including food and beverage services;

(D) identify, compare, and contrast all types of lodging properties;

(E) compare and contrast lodging revenue and support centers;

(F) compare and contrast chain and franchise lodging properties;

(G) create, design, and present lodging entrepreneurship opportunities; and

(H) comprehend and model professional attire.

(8) The student uses information technology tools specific to lodging management to access, manage, integrate, and create information. The student is expected to:

(A) use information technology tools to evaluate lodging work responsibilities;

(B) evaluate technology tools to perform workplace tasks;

(C) understand and evaluate the hotel/guest cycle with applicable technology;

(D) prepare and present complex multimedia publications;

(E) demonstrate knowledge and use of point-of-sale systems;

(F) evaluate Internet resources for industry information; and

(G) evaluate current and emerging technologies to improve guest services.

(9) The student uses leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives. The student is expected to:

(A) differentiate types of effective leadership and management styles and select which management style is effective for the lodging industry;

(B) apply team-building skills;

(C) apply decision-making and problem-solving skills;

(D) apply leadership and teamwork qualities in creating a pleasant working atmosphere; and

(E) participate in community leadership and teamwork opportunities to enhance professional skills.

(10) The student understands the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. The student is expected to:

(A) assess workplace conditions with regard to safety and health;

(B) apply safety and sanitation standards common to the workplace;

(C) analyze potential effects caused by common chemical and hazardous materials;

(D) demonstrate first aid and cardiopulmonary resuscitation skills;

(E) research sources of food-borne illness and determine ways to prevent them; and

(F) evaluate the need for personal hygiene and correlate this to the importance of health, safety, and environmental management systems in the organization.

(11) The student knows and understands the importance of professional ethics and legal responsibilities within the lodging industry. The student is expected to:

(A) demonstrate professional and ethical standards;

(B) compare and contrast the rights of the innkeeper and the rights of the guest; and

(C) interpret and explain written organizational policies and procedures to help employees perform their jobs.

(12) The student understands the knowledge and skills required for careers in the lodging industry. The student is expected to:

(A) develop job-specific technical vocabulary;

(B) explain procedures to meet guest needs, including guest registration, rate assignment, room assignment, and determination of payment methods;

(C) differentiate the functions of meeting and event planning and how they correlate to the individual lodging property; and

(D) understand the importance of check-out procedures to ensure guest satisfaction and verify settlement of account.

§127.568. Hospitality Services (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Recommended prerequisites: Principles of Hospitality and Tourism, Hotel Management, and Travel and Tourism Management. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Hospitality Services provides students with the academic and technical preparation to pursue high-demand and high-skill careers in hospitality related industries. The knowledge and skills are acquired within a sequential, standards-based program that integrates hands-on and project-based instruction. Standards included in the Hospitality Services course are designed to prepare students for nationally recognized industry certifications, postsecondary education, and entry-level careers. In addition, Hospitality Services is designed so that performance standards meet employer expectations, enhancing the employability of students. Instruction may be delivered through laboratory training or through internships, mentoring, or job shadowing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply advanced reading, writing, and mathematical skills necessary in the hospitality industry; and

(B) understand and develop marketing techniques.

(2) The student uses communication skills in the creation, expression, and interpretation of information and ideas. The student is expected to:

(A) interpret communication such as verbal and nonverbal;

(B) recognize and respond to guest needs;

(C) develop listening skills to accurately process messages for guests;

(D) exhibit public relations skills; and

(E) recognize alternate communication services to assist customers with specialized needs.

(3) The student researches career opportunities and qualifications to broaden awareness of careers available in the hospitality industry. The student is expected to:

(A) outline a plan for an effective job search, including developing a resume;

(B) demonstrate flexibility to learn new knowledge and skills;

(C) prioritize work responsibilities and life responsibilities;

(D) develop an electronic career portfolio;

(E) compare and contrast personal strengths and weaknesses that may determine individual potential for growth within the hospitality industry;

(F) explain what is needed to achieve job advancement;

(G) understand the role of professional organizations or industry associations;

(H) research the procedures for licensure, certification, or credentials for a chosen occupation;

(I) analyze future employment outlooks;

(J) demonstrate appropriate business and personal etiquette;

(K) develop a written organizational policy to ensure successful hospitality operations such as guest satisfaction and employee success; and

(L) research the major duties and qualifications for hospitality managerial positions.

(4) The student reviews ethical and legal responsibilities or related conduct toward guests and employees within the establishment to maintain high industry standards. The student is expected to:

(A) examine laws regarding hiring, harassment, and safety issues;

(B) compare and contrast legal responsibilities and employer policies; and

(C) discuss ethical dilemmas.

(5) The student uses information technology tools specific to hospitality service careers to access, manage, integrate, or create information. The student is expected to:

(A) examine types of technology used to manage hospitality service operations;

(B) research website information on hospitality service operations; and

(C) evaluate current and emerging technologies provided by the hospitality industry.

(6) The student applies leadership, teamwork, and critical-thinking skills in collaboration with others to accomplish organizational goals or objectives. The student is expected to:

(A) demonstrate qualities that contribute to employee retention;

(B) formulate staff training plans to create an effective working team;

(C) evaluate methods of conflict-management skills to facilitate appropriate solutions;

(D) resolve unexpected situations in customer service;

(E) understand diverse employee cultures and customs; and

(F) value cultural diversity of guests.

(7) The student applies marketing strategies independently and in teams. The student is expected to:

(A) select and assemble effective marketing strategies;

(B) develop promotional packages;

(C) devise strategies for maximizing profit; and

(D) create a business plan.

(8) The student reviews the importance of management systems such as health, safety, and environmental and their function in performance and regulatory compliance. The student is expected to:

(A) determine local safety and sanitation requirements;

(B) explain how guests and property are protected to minimize losses or liabilities;

(C) outline safety and security issues and analyze solutions for individuals or groups in multiple environments to minimize risks;

(D) recognize potential, real, or perceived emergency situations such as a natural disaster or terrorist threat in order to respond appropriately;

(E) evaluate equipment for elements such as safety, functionality, and durability; and

(F) determine most appropriate sources of assistance such as self, coworkers, guests, the Federal Emergency Management Agency (FEMA), or first responders to use in varied emergency situations.

(9) The student understands roles within teams, work units, departments, organizations, inter-organizational systems, or the larger environment. The student is expected to:

(A) implement a set of operating procedures that results in profitable operations;

(B) create a detailed customer service plan or process to provide maximum customer service;

(C) prepare a staffing guide to schedule various staff positions;

(D) evaluate inventory management systems used in the hospitality industry to result in profitable operations;

(E) describe current industry collaborations or trends that provide more inclusive products or services to customers; and

(F) compare and contrast organizational structures of operations such as lodging, food and beverage, travel, and recreation.

(10) The student uses technological knowledge and skills required in food and beverage service. The student is expected to:

(A) evaluate prepared foods for quality and presentation to set quality standards in accordance with company standards;

(B) practice basic nutrition skills by planning, preparing, and presenting quality foods; and

(C) evaluate types of kitchen equipment to match equipment with correct cooking methodology.

(11) The student uses technological knowledge and skills required in hotel services. The student is expected to:

(A) describe the necessary information collected during the registration process;

(B) explain how room rates are established;

(C) explain how standard operating guidelines such as availability, room status, and guest satisfaction are used to assign rooms to arriving guests;

(D) examine the account settlement procedures on different methods of payment;

(E) explain how a hotel's computer system is used to create guest accounts; and

(F) summarize correct check-out procedures to prevent oversights or errors.

(12) The student uses technological knowledge and skills required in travel and tourism. The student is expected to:

(A) develop technical vocabulary for lodging, food and beverage service, recreation, and travel;

(B) compare and contrast diverse transportation options;

(C) integrate various or diverse elements of the travel and tourism industry to create a personalized travel experience for a customer; and

(D) compare and contrast products and services from related industries.

§127.600. Practicum in Culinary Arts (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Culinary Arts. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit

provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Practicum in Culinary Arts is a unique practicum that provides occupationally specific opportunities for students to participate in a learning experience that combines classroom instruction with actual business and industry career experiences. Practicum in Culinary Arts integrates academic and career and technical education; provides more interdisciplinary instruction; and supports strong partnerships among schools, businesses, and community institutions with the goal of preparing students with a variety of skills in a fast-changing workplace.

(4) Students are taught employability skills to prepare for college and career success, which include job-specific skills applicable to their training plan, job interview techniques, communication skills, financial and budget activities, human relations, and portfolio development.

(5) Instructions may be delivered through school-based laboratory training or through work-based delivery arrangement such as cooperative education, mentoring, and job shadowing.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) model effective oral and written communication;

(B) practice professional grooming and hygiene standards;

(C) exercise punctuality and time-management skills;

(D) demonstrate self-respect and respect for others;

(E) demonstrate effective teamwork and leadership; and

(F) employ initiative, adaptability, and problem-solving techniques in practical applications.

(2) The student uses employability skills to gain an entry-level job in a high-skill, high-wage, or high-demand field. The student is expected to:

(A) identify employment opportunities;

(B) demonstrate the application of essential workplace skills in the career acquisition process;

(C) complete employment-related documents such as job applications, I-9 and W-4 forms, and job descriptions; and

(D) demonstrate proper interview techniques in various situations.

(3) The student develops skills for success in the workplace. The student is expected to:

(A) comprehend and model appropriate grooming and appearance for the workplace;

(B) demonstrate dependability, punctuality, and initiative;

(C) develop positive interpersonal skills, including respect for diversity;

(D) demonstrate appropriate business and personal etiquette in the workplace;

(E) exhibit productive work habits, ethical practices, and a positive attitude;

(F) demonstrate knowledge of personal and occupational health and safety practices in the workplace;

(G) demonstrate the ability to work with the other employees to support the organization and complete assigned tasks;

(H) prioritize work to fulfill responsibilities and meet deadlines;

(I) evaluate the relationship of good physical and mental health to job success and personal achievement;

(J) demonstrate effective verbal, non-verbal, written, and electronic communication skills; and

(K) apply effective listening skills used in the workplace.

(4) The student demonstrates work ethics, employer expectations, interaction with diverse populations, and communication skills in the workplace. The student is expected to:

(A) relate how personal integrity affects human relations on the job;

(B) demonstrate characteristics of successful working relationships such as teamwork, conflict resolution, self-control, and the ability to accept criticism;

(C) implement employer expectations;

(D) demonstrate respect for the rights of others;

(E) demonstrate ethical standards; and

(F) comply with organizational policies.

(5) The student applies academics and job-readiness skills. The student is expected to:

(A) apply mathematical skills to business transactions;

(B) develop a personal budget based on career choice;

(C) interpret data from documents such as tables, charts, and graphs to estimate and find solutions to problems; and

(D) organize and compose workplace documents.

(6) The student applies ethical behavior standards and legal responsibilities within the workplace. The student is expected to:

(A) compare workplace policies reflecting various business establishments;

(B) apply responsible and ethical behavior;

(C) summarize provisions of the Fair Labor Standards Act;

(D) describe the consequences of breach of confidentiality; and

(E) research and model laws related to culinary arts professions.

(7) The student applies the use of interpersonal skills to accomplish objectives. The student is expected to:

(A) identify and practice effective interpersonal and team-building skills involving situations with coworkers, managers, and customers; and

(B) apply leadership and career development skills through participation in activities such as career and technical student organizations.

(8) The student uses concepts and skills related to safety in the workplace. The student is expected to:

(A) identify and apply safe working practices;

(B) solve problems related to unsafe work practices and attitudes;

(C) explain Occupational Safety and Health Administration regulations in the workplace;

(D) analyze health and wellness practices that influence job performance; and

(E) prepare for a state or national food sanitation certification or other appropriate certification.

(9) The student evaluates personal attitudes and work habits that support career retention and advancement. The student is expected to:

(A) analyze the future employment outlook in the occupational area;

(B) describe entrepreneurial opportunities in the area of culinary arts;

(C) evaluate nontraditional food service careers such as food photographer, food stylist, corporate research and development chef, food writer, and independent consultant;

(D) identify all of the aspects of a specific career path, including salary, skills level, and advancement opportunities;

(E) evaluate strategies for career retention and advancement in response to the changing hospitality industry;

(F) compare and contrast the rights and responsibilities of employers and employees; and

(G) determine effective money management and financial planning techniques.

(10) The student identifies skills and attributes necessary for professional advancement. The student is expected to:

(A) evaluate employment options, including salaries and benefits;

(B) determine factors that affect career choices such as personal interests, abilities, priorities, and family responsibilities;

(C) determine continuing education opportunities that enhance career advancement and promote lifelong learning; and

(D) demonstrate effective methods to secure, maintain, and terminate employment.

(11) The student demonstrates proper culinary techniques and knowledge of the professional kitchen. The student is expected to:

(A) use large and small equipment in a commercial kitchen;

(B) develop food production and presentation techniques;

(C) demonstrate moist, dry, and combination cookery methods;

(D) demonstrate food preparation skills used in commercial food service preparations such as breakfast cookery, salads and dressings, soups and sandwiches, stocks and sauces, appetizers, seafood, poultry cookery, meat cookery, pastas and grains, and fruits and vegetables;

(E) demonstrate baking techniques such as yeast breads and rolls, quick breads, and desserts;

(F) demonstrate proper receiving and storage techniques;

(G) demonstrate proper cleaning of equipment and maintenance of the commercial kitchen; and

(H) compare and contrast the pairing of cuisine and service styles in food service operations.

(12) The student determines how successful marketing impacts a food service operation. The student is expected to:

(A) explain marketing, product, service, presentation, and communication mixes;

(B) generate a marketing plan for multiple food service operations;

(C) evaluate the marketing plans based on various demographics;

(D) conduct market analysis and predict impact on current economy;

(E) identity marketing communication formats across multiple platforms; and

(F) design the menu as a marketing tool.

(13) The student documents technical knowledge and skills. The student is expected to:

(A) complete a professional career portfolio to include items such as an updated resume, documentation of technical skill competencies, licensures or certifications, recognitions, awards and scholarships, community service hours, participation in student and professional organizations, abstract of key points of the practicum, and practicum supervisor evaluations; and

(B) present the portfolio to interested stakeholders.

§127.601. Extended Practicum in Culinary Arts (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Hospitality and Tourism Career Cluster. Prerequisite: Culinary Arts. Corequisite: Practicum in Culinary Arts. This course must be taken concurrently with Practicum in Culinary Arts and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Extended Practicum in Culinary Arts is a unique practicum that provides occupationally specific opportunities for students to participate in a learning experience that combines classroom instruction with actual business and industry career experiences. Extended Practicum in Culinary Arts integrates academic and career and technical education; provides more interdisciplinary instruction; and supports strong partnerships among schools, businesses, and community institutions with the goal of preparing students with a variety of skills in a fast-changing workplace.

(4) Students are taught employability skills to prepare for college and career success, which include job-specific skills applicable to their training plan, job interview techniques, communication skills, financial and budget activities, human relations, and portfolio development.

(5) Instruction may be delivered through school-based laboratory training or through work-based delivery arrangements such as cooperative education, mentoring, and job shadowing.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to culinary arts;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) present information formally and informally in an effective manner;

(C) apply active listening skills to obtain and clarify information; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) comply with Occupational Safety and Health Administration regulations in the workplace;

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents;

(C) analyze health and wellness practices that influence job performance; and

(D) understand and follow workplace safety rules and regulations.

(5) The student understands the professional, ethical, and legal responsibilities in culinary arts. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) show integrity by choosing the ethical course of action when making decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student demonstrates proper culinary techniques and knowledge of the professional kitchen. The student is expected to:

(A) demonstrate proper use of large and small equipment in a commercial kitchen with increased proficiency;

(B) demonstrate advanced food production and presentation techniques;

(C) demonstrate moist, dry, and combination cookery methods;

(D) demonstrate advanced food preparation skills used in commercial food service preparations;

(E) demonstrate advanced baking techniques;

(F) demonstrate proper receiving and storage techniques; and

(G) demonstrate proper cleaning of equipment and maintenance of the commercial kitchen.

§127.602. Practicum in Hospitality Services (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Hospitality Services. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Practicum in Hospitality Services is a unique practicum experience to provide opportunities for students to participate in a learning experience that combines classroom instruction with actual business and industry career experiences. Practicum in Hospitality Services integrates academic and career and technical education; provides more interdisciplinary instruction; and supports strong partnerships among schools, businesses, and community institutions with the goal of preparing students with a variety of skills in a fast-changing workplace. Students are taught employability skills, including job-specific skills applicable to their training plan, job interview techniques, communication skills, financial and budget activities, human relations, and portfolio development. Practicum in Hospitality Services is relevant and rigorous, supports student attainment of academic and technical standards, and effectively prepares students for college and career success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) research and produce a variety of relevant employment opportunities;

(B) differentiate the essential workplace skills in the career acquisition process;

(C) practice and complete employment-related documents such as job applications (written and electronic formats) and I-9 and W-4 forms;

(D) model proper interview techniques in various situations;

(E) formulate verbal, nonverbal, and written communication skills;

(F) develop and properly use appropriate electronic communication tools; and

(G) display effective listening skills used in the workplace.

(2) The student develops skills for success in the workplace. The student is expected to:

(A) formulate and model appropriate grooming and appearance for the workplace;

(B) model dependability, punctuality, and initiative;

(C) display positive interpersonal skills such as respect for diversity;

(D) differentiate types of diversity from both the employer and customer perspective;

(E) exhibit appropriate business and personal etiquette in the workplace;

(F) exhibit productive work habits, ethical practices, and a positive attitude;

(G) integrate knowledge of personal and occupational safety practices in the workplace;

(H) collaborate with others to support the organization and complete assigned tasks as a team;

(I) organize work to fulfill responsibilities and meet deadlines; and

(J) compare and contrast the relationship of good physical and mental health strategies for job success and work-life balance.

(3) The student compares and contrasts the importance of work ethics, employer expectations, interaction with diverse populations, and communication skills in the workplace. The student is expected to:

(A) defend personal integrity as it affects human relations on the job;

(B) study and develop characteristics of successful working relationships such as teamwork, conflict resolution, self-control, and ability to accept criticism;

(C) analyze and defend employer expectations;

(D) demonstrate respect for the rights of others;

(E) compare and contrast the hospitality code of ethics and ethical standards; and

(F) support organizational policies and procedures.

(4) The student applies academics with career-readiness skills. The student is expected to:

(A) apply mathematical skills to business transactions;

(B) interpret data from documents such as tables, charts, and graphs to estimate and find solutions to problems; and

(C) organize and compose workplace business documents.

(5) The student applies ethical behavior standards, safety procedures, and legal responsibilities within the workplace. The student is expected to:

(A) compare and contrast published workplace policies;

(B) apply responsible and ethical behavior;

(C) evaluate provisions of state and federal labor laws; and

(D) evaluate the employer's and employee's fiduciary responsibilities to customers such as breach of confidentiality, safety, and privacy.

(6) The student models strategies and technique to develop interpersonal skills. The student is expected to:

(A) model effective interpersonal and team-building skills involving situations with diverse individuals; and

(B) model leadership through participation in activities such as career and technical student organizations.

(7) The student evaluates advancement opportunities and career paths in the industry. The student is expected to:

(A) analyze future employment in occupational areas;

(B) develop an entrepreneurial opportunity in the hospitality services area;

(C) compare and contrast salaries, industry demands, and challenges for various jobs in hospitality services; and

(D) evaluate the changing global workplace and future trends using governmental and other resources.

(8) The student identifies skills and attributes necessary for professional advancement. The student is expected to:

(A) evaluate continuing education opportunities that enhance career advancement and promote lifelong learning; and

(B) formulate effective strategies to secure, maintain, and terminate employment.

(9) The student understands roles within teams, work units, departments, organizations, and the larger environment of the hospitality services industry. The student is expected to:

(A) explain the different types and functions of all departments such as food and beverage to understand their impact on customer service;

(B) illustrate proficiency with duties in each of the departments of a hotel or tourism venue;

(C) compare and contrast lodging properties;

(D) analyze the differences between chain and franchise lodging operations; and

(E) explore the job duties in travel and tourism, recreation, and amusement and attraction venues.

(10) The student understands the knowledge and skills required for careers in the lodging industry. The student is expected to:

(A) examine, understand, and articulate job-specific technical vocabulary;

(B) explain technical procedures needed to meet guest needs such as registration, rate assignment, room assignment, and determination of payment methods;

(C) research and create a meeting/event company;

(D) evaluate current and emerging technologies to improve guest services; and

(E) determine the correct procedures for the traditional hotel guest cycle.

(11) The student documents in manual and electronic format acquired technical knowledge and skills from coherent plan of study. The student is expected to:

(A) produce a professional portfolio to include information such as:

(i) a current resume;

(ii) official documentation of attainment of technical skill competencies;

(iii) recognitions, awards, and scholarships;

(iv) community service activities;

(v) student organization participation;

(vi) practicum supervisor evaluations;

(vii) letters of recommendation;

(viii) cover letters;

(ix) documentation of preparation for state or national industry certification such as food sanitation certification; and

(x) any other supporting documents;

(B) present the portfolio to interested stakeholders;

(C) evaluate employment options, including salaries and benefits;

(D) determine effective money management and financial planning techniques to manage:

(i) insurance and benefits;

(ii) taxes;

(iii) retirement;

(iv) relocation costs;

(v) a budget;

(vi) housing costs; and

(vii) transportation costs; and

(E) develop a personal budget based on career choice using effective money management and financial planning techniques.

§127.603. Extended Practicum in Hospitality Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Hospitality and Tourism Career Cluster. Recommended prerequisite: Hospitality Services. Corequisite: Practicum in Hospitality Services.

This course must be taken concurrently with Practicum in Hospitality Services and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Hospitality and Tourism Career Cluster focuses on the management, marketing, and operations of restaurants and other food/beverage services, lodging, attractions, recreation events, and travel-related services.

(3) Extended Practicum in Hospitality Services is a unique practicum experience that provides opportunities for students to participate in a learning experience that combines classroom instruction with actual business and industry career experiences. Extended Practicum in Hospitality Services integrates academic and career and technical education; provides more interdisciplinary instruction; and supports strong partnerships among schools, businesses, and community institutions with the goal of preparing students with a variety of skills in a fast-changing workplace.

(4) Students are taught employability skills, including job-specific skills applicable to their training plan, job interview techniques, communication skills, financial and budget activities, human relations, and portfolio development. Extended Practicum in Hospitality Services is relevant and rigorous, supports student attainment of academic and technical standards, and effectively prepares students for college and career success.

(5) Instruction may be delivered through school-based laboratory training or through work-based delivery arrangement such as cooperative education, mentoring, and job shadowing.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(7) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to hospitality services;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as leadership, appreciation for diversity, conflict management, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) present information formally and informally in an effective manner;

(C) analyze, interpret, and effectively communicate information;

(D) apply active listening skills to obtain and clarify information; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in hospitality services. The student is expected to:

(A) practice ethical conduct when interacting with others such as maintaining client confidentiality and maintaining privacy of sensitive content;

(B) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(C) show integrity by choosing the ethical course of action when making decisions;

(D) demonstrate proper etiquette and knowledge of acceptable-use policies when using networks, especially resources on the Internet and intranet; and

(E) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised hospitality experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised hospitality experience;

(B) practice technical procedures such as registration, rate assignment, room assignment, and determination of payment methods needed to meet guest needs;

(C) examine, understand, and articulate job-specific technical vocabulary;

(D) demonstrate proficiency in the duties for an appropriate department of a hotel or tourism venue; and

(E) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
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SUBCHAPTER L. HUMAN SERVICES

19 TAC §§127.611 - 127.622, 127.665, 127.666

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.611. Principles of Human Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Principles of Human Services is a laboratory course that will enable students to investigate careers in the Human Services Career Cluster, including counseling and mental health, early childhood development, family and community, personal care, and consumer services. Each student is expected to complete the knowledge and skills essential for success in high-skill, high-wage, or high-demand human services careers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics/professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student demonstrates personal characteristics for success in high-skill, high-wage, or high-demand careers. The student is expected to:

(A) explain and practice responsible decision making consistent with personal needs, wants, values, and priorities;

(B) develop measurable short- and long-term goals for personal and professional life;

(C) demonstrate personal-management skills needed for productivity;

(D) practice ethical and appropriate methods of conflict resolution;

(E) investigate the significance of grooming, appearance, and appropriate apparel selection in personal and professional settings;

(F) analyze the relationship of wellness to personal and professional productivity;

(G) determine personal and professional implications of substance abuse;

(H) demonstrate apparel maintenance and repair skills that enhance appearance in personal and professional settings;

(I) practice leadership skills such as participation in career and technical student organizations; and

(J) demonstrate effective communication skills.

(3) The student demonstrates the skills necessary to enhance personal and career effectiveness in consumer services. The student is expected to:

(A) apply the decision-making process in planning the allocation and use of finances;

(B) use technology to manage resources;

(C) examine sustainable consumer buying techniques that promote effective use of resources;

(D) describe rewards, demands, and future trends in consumer service careers; and

(E) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(4) The student demonstrates the skills necessary to enhance personal and career effectiveness in counseling and mental health services. The student is expected to:

(A) identify types of crises;

(B) determine appropriate responses, management strategies, and available technology to meet individual and family needs;

(C) determine effects of crisis on individuals and families;

(D) predict crises typical of various stages of the life cycle;

(E) identify the contributing factors of stress and how those factors impact individuals and relationships;

(F) investigate causes, prevention, and treatment of domestic violence;

(G) describe rewards, demands, and future trends in counseling and mental health services; and

(H) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(5) The student demonstrates the skills necessary to enhance personal and career effectiveness in early childhood development and services. The student is expected to:

(A) identify the basic needs of children;

(B) analyze the responsibilities of caregivers for promoting the safety and development of children;

(C) determine developmentally appropriate guidance techniques for children;

(D) investigate causes, preventions, and treatment of child abuse;

(E) describe rewards, demands, and future trends in early childhood development and services; and

(F) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(6) The student demonstrates the skills necessary to enhance personal and career effectiveness in family and community services. The student is expected to:

(A) identify the basic functions of the family, including roles and responsibilities;

(B) investigate societal, cultural, demographic, and economic factors affecting the responsibilities of family members;

(C) analyze the multiple roles and responsibilities assumed by individuals within the family;

(D) investigate community service opportunities;

(E) analyze dietary practices across the life span;

(F) explain the impact of nutrition on development, wellness, and productivity over the life span;

(G) prepare nutritious snacks or meals that contribute to wellness and productivity through the life span;

(H) describe rewards, demands, and future trends in family and community services; and

(I) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(7) The student demonstrates the skills necessary to enhance personal and career effectiveness in fashion design. The student is expected to:

(A) describe factors influencing apparel selection;

(B) analyze apparel selection practices that accommodate personal needs, including age, lifestyle, special needs, and career;

(C) interpret and use information on apparel care labels;

(D) demonstrate safety practices when using and caring for apparel construction tools and equipment;

(E) demonstrate simple clothing repair and alteration techniques;

(F) describe rewards, demands, and future trends in fashion design; and

(G) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(8) The student demonstrates the skills necessary to enhance personal and career effectiveness in interior design. The student is expected to:

(A) describe priorities and needs that influence interior design decisions;

(B) identify the elements and principles of design used in interiors;

(C) describe safe use and care of interior furnishings and equipment;

(D) identify maintenance and safety practices that affect interiors;

(E) discuss cultural, demographic, societal, and economic factors that influence interior design trends;

(F) describe rewards, demands, and future trends in interior design; and

(G) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

(9) The student demonstrates the skills necessary to enhance personal and career effectiveness in personal care services. The student is expected to:

(A) explore new and emerging technologies that may affect personal care services;

(B) investigate the specific state requirements for licensure in personal care services;

(C) create records, including electronic records, of client services to retrieve personal care client information;

(D) examine different types of media to achieve maximum impact on targeted client populations;

(E) describe rewards, demands, and future trends in personal care services; and

(F) identify employment and entrepreneurial opportunities and preparation requirements in the areas of personal interest.

§127.612. Principles of Cosmetology Design and Color Theory (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Recommended prerequisite: Principles of Human Services. Students may begin to earn Texas Department of Licensing and Regulation (TDLR) hours toward a Cosmetology Operator License. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) In Principles of Cosmetology Design and Color Theory, students coordinate integration of academic, career, and technical knowledge and skills in this laboratory instructional sequence course designed to provide job-specific training for employment in cosmetology careers. Students will attain academic skills and knowledge as well as technical knowledge and skills related to cosmetology design and color theory. Students will develop knowledge and skills regarding various cosmetology design elements such as form, lines, texture, structure and illusion or depth as they relate to the art of cosmetology. Instruction includes sterilization and sanitation procedures, hair care, nail care, and skin care and meets the TDLR requirements for licensure upon passing the state examination. Analysis of career opportunities, license requirements, knowledge and skills expectations, and development of workplace skills are included.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;

(B) employ the ability to be trustworthy by complying with an ethical course of action;

(C) comply with all applicable rules, laws, and regulations;

(D) use conflict-management skills to avoid potential or perceived conflict;

(E) investigate employment opportunities, including entrepreneurship;

(F) evaluate data or outcome of a broad range of personal care services;

(G) demonstrate effective oral and written communication skills with diverse individuals, including coworkers, management, and customers;

(H) develop skill in handling multiple tasks simultaneously such as prioritizing tasks, managing workflow under pressure, and completing work-related activities in a timely manner;

(I) exercise personal ownership over the quantity and quality of individual performance and team assignments; and

(J) employ leadership skills within a classroom or community setting to maintain positive relationships.

(2) The student applies academic skills to the field of cosmetology design and color theory. The student is expected to:

(A) recognize elements of hair design such as line, form, space, texture, and color;

(B) investigate and identify lines that create width and length;

(C) explain the position of diagonal and curved lines to emphasize or minimize facial features;

(D) identify different facial shapes and their importance to hair design;

(E) explore the significance and function of parallel lines in hair design;

(F) judge the relevance of contrasting and transitional lines in hair design;

(G) explain the importance of knowledge of color theory as it applies to the cosmetology field;

(H) document the scope of client services affected by basic color theory such as artificial hair color services, facial makeup application, eyebrow color, and eyelash tint services;

(I) explain the theories of color illusion such as light and dark colors and tones that may create an illusion of more or less volume in the hair design;

(J) justify the selection of color process as it pertains to skin tone and eye color;

(K) create a logical structure for color; and

(L) make use of primary, secondary, and tertiary colors as they relate to the field of cosmetology.

(3) The student demonstrates knowledge of the rules and regulations established by the TDLR. The student is expected to:

(A) apply health and safety policies and procedures;

(B) recognize risks and potentially hazardous situations in compliance with the TDLR;

(C) navigate the TDLR website for exam eligibility, exam results, and student hours; and

(D) identify licensure and renewal requirements of the licensee or licensed cosmetology establishment or school.

(4) The student demonstrates proficiency in the use of tools, equipment, technologies, and materials used in color theory and elements of design in cosmetology. The student is expected to:

(A) create a digital portfolio of design elements that are relevant to the cosmetology field;

(B) use ergonomically designed equipment to promote professional efficiency;

(C) use available technology sources effective in a professional salon setting; and

(D) apply universal precautions in disposal of hazardous materials.

(5) The student applies the academic knowledge and practical skills to simulated and actual work situations. The student is expected to:

(A) apply client consultation skills to guide individuals in recognizing concerns and making informed decisions;

(B) document client satisfaction with procedures and products to facilitate ease of consultation in future appointments;

(C) locate and compare vendors to maximize benefits for personal care clients, businesses, or organizations;

(D) demonstrate understanding and proficiency working with complementary colors;

(E) execute application procedure of artificial hair color such as virgin tint to darken, bleach retouch, virgin tint to lighten, and dimensional color services such as cap highlighting, foil highlighting, and low-lighting;

(F) explore the use of different types of hair colors such as demi-permanent color, permanent color, semi-permanent color, temporary color, toners, and fillers;

(G) make use of products designed to increase the vibrancy of a color formula or to neutralize unwanted tones such as concentrates, intensifiers, pigments, or drabbers; and

(H) use natural products to color the hair such as henna or vegetable dyes.

(6) The student analyzes career paths within the cosmetology industry. The student is expected to:

(A) explore marketing techniques when selecting and using multimedia to attract and retain clientele;

(B) formulate a salon service menu based upon current industry trends;

(C) consolidate various methods of obtaining feedback from clients to understand their expectations and promote high-quality standards;

(D) create an employment portfolio containing content such as certifications, samples of work, achievements, and supervisor or instructor evaluations; and

(E) analyze the role of professional organizations in cosmetology professions.

§127.613. Dollars and Sense (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Principles of Human Services. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Dollars and Sense focuses on consumer practices and responsibilities, money-management processes, decision-making skills, impact of technology, and preparation for human services careers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics and professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student demonstrates management of individual and family resources such as finances, food, clothing, shelter, health care, recreation, transportation, time, and human capital. The student is expected to:

(A) analyze the economic rights and responsibilities of individuals as consumers;

(B) apply management, planning skills, and processes to organize tasks and responsibilities;

(C) develop and apply multiple strategies for individuals and families to make choices to satisfy needs and wants;

(D) analyze the consequences of an economic decision made by an individual consumer such as the decisions to provide safe and nutritious food, clothing, housing, health care, recreation, and transportation; and

(E) analyze the impact of media and technological advances on family and consumer decisions.

(3) The student demonstrates management of financial resources to meet the goals of individuals and families across the life span. The student is expected to:

(A) evaluate the need for personal and family financial planning, including maintaining a budget, expense records, and economic self-sufficiency;

(B) compare types of loans available to consumers and distinguish criteria for becoming a low-risk borrower;

(C) connect mathematics to the understanding of interest, including avoiding and eliminating credit card debt;

(D) collect evidence and data related to implementing a savings program, the time value of money, and retirement planning;

(E) explore how to be a prudent investor in the stock market and other investment options;

(F) investigate the benefits of charitable giving;

(G) compare types of banks, credit unions, and virtual banks available to consumers and the benefits of maintaining financial accounts;

(H) demonstrate the ability to maintain financial records;

(I) investigate bankruptcy laws, including ways to avoid bankruptcy;

(J) apply management principles to decisions about insurance for individuals and families;

(K) evaluate personal and legal documents related to managing individual and family finances such as birth certificates, medical records, social security cards, financial records, and property records; and

(L) demonstrate the ability to use calculators, spreadsheets, computers, and software in data analysis relating to finance.

(4) The student demonstrates effective consumer skills related to housing needs. The student is expected to:

(A) explain consumer rights and responsibilities associated with renting or buying a home;

(B) analyze legal and financial aspects of purchasing and leasing housing; and

(C) propose money-management skills necessary to make the transition from renting to home ownership.

(5) The student analyzes the relationship of the environment to family and consumer resources. The student is expected to:

(A) analyze individual and family responsibilities in relation to environmental trends and issues;

(B) summarize environmental trends and issues affecting families and future generations;

(C) demonstrate behaviors that conserve, reuse, and recycle resources to maintain the environment; and

(D) explain governmental regulations for conserving natural resources.

(6) The student analyzes relationships between the economic system and consumer actions. The student is expected to:

(A) analyze economic effects of laws and regulations that pertain to consumers and providers of services; and

(B) identify types of taxes at the local, state, and national levels and the economic importance of each.

(7) The student identifies skills and attributes necessary for sustaining a chosen lifestyle. The student is expected to:

(A) evaluate and compare employment options, including salaries and benefits;

(B) compare rewards and demands for various levels of employment in a variety of careers;

(C) determine how interests, abilities, personal priorities, and family responsibilities affect career choices;

(D) determine continuing education opportunities that enhance career advancement and promote lifelong learning; and

(E) use presentation skills to communicate and apply knowledge of careers in consumer services.

(8) The student integrates knowledge, skills, and practices required for careers in consumer services. The student is expected to:

(A) explain the roles and functions of individuals engaged in consumer services careers;

(B) analyze opportunities for employment and entrepreneurial endeavors;

(C) summarize education and training requirements for consumer services careers; and

(D) investigate professional organizations for consumer services.

§127.614. Lifetime Nutrition and Wellness (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Human Services, Principles of Hospitality and Tourism, or Principles of Health Science. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Lifetime Nutrition and Wellness is a laboratory course that allows students to use principles of lifetime wellness and nutrition to help them make informed choices that promote wellness as well as pursue careers related to hospitality and tourism, education and training, human services, and health sciences.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics and professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student understands the role of nutrients in the body. The student is expected to:

(A) classify nutrients and their functions and food sources and compare the nutritive value of various foods;

(B) assess the effects of nutritional intake on health, appearance, effective job performance, and personal life;

(C) analyze and apply various dietary guidelines throughout the life cycle, including pregnancy, infancy, childhood, and late adulthood; and

(D) compare personal food intake to recommended dietary guidelines.

(3) The student understands the principles of digestion and metabolism. The student is expected to:

(A) describe the processes of digestion and metabolism;

(B) calculate and explain basal and activity metabolisms and factors that affect each;

(C) apply knowledge of digestion and metabolism when making decisions related to food intake and physical fitness;

(D) locate community resources that promote physical activity and fitness; and

(E) explain the relationship of activity levels and caloric intake to health and wellness, including weight management.

(4) The student demonstrates knowledge of nutritionally balanced diets. The student is expected to:

(A) research the long-term effects of food choices;

(B) outline strategies for prevention, treatment, and management of diet-related diseases such as diabetes, hypertension, childhood obesity, anorexia, and bulimia;

(C) determine the effects of food allergies and intolerances on individual and family health;

(D) plan diets based on life cycle, activity level, nutritional needs, portion control, and food budget;

(E) develop examples of therapeutic diets;

(F) analyze advertising claims and fad diets with the recommendations of the Recommended Dietary Allowances;

(G) analyze current lifestyle habits that may increase health risks;

(H) identify community programs that provide nutrition and wellness services;

(I) examine the nutritional value of fast foods and convenience foods;

(J) read and interpret food labels;

(K) examine and explain nutritional serving sizes;

(L) compare organic and green food choices; and

(M) determine sustainable food choices and their impact on society.

(5) The student understands safety and sanitation. The student is expected to:

(A) demonstrate safe and sanitary practices in the use, care, and storage of food and equipment;

(B) explain types and prevention of food-borne illnesses; and

(C) practice appropriate dress and personal hygiene in food preparation.

(6) The student demonstrates knowledge of food-management principles. The student is expected to:

(A) read and comprehend standard recipes;

(B) correctly use standard measuring techniques and equipment;

(C) demonstrate correct food-preparation techniques, including nutrient retention;

(D) use food-buying strategies such as calculating food costs, planning food budgets, and creating grocery lists;

(E) demonstrate food-preparation techniques to reduce overall fat and calories;

(F) practice etiquette, food presentation, and table service appropriate for specific situations; and

(G) apply food-storage principles.

(7) The student demonstrates effective work habits. The student is expected to:

(A) participate as an effective team member by demonstrating cooperation and responsibility;

(B) apply effective practices for managing time and energy to complete tasks on time;

(C) practice problem solving using leadership and teamwork skills; and

(D) use presentation skills to communicate and apply knowledge about careers in consumer services.

(8) The student investigates careers in nutrition. The student is expected to:

(A) compare and contrast education or training needed for careers in nutrition;

(B) establish personal short- and long-term career goals;

(C) analyze entrepreneurial opportunities in nutrition; and

(D) apply a problem-solving approach to a business challenge or opportunity to improve sustainability efforts while maintaining or increasing profits and/or organizational health.

§127.615. Interpersonal Studies (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Human Services, Principles of Hospitality and Tourism, Principles of Health Science, or Principles of Education and Training. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Interpersonal Studies examines how the relationships between individuals and among family members significantly affect the quality of life. Students use knowledge and skills in family studies and human development to enhance personal development, foster quality relationships, promote wellness of family members, manage multiple adult roles, and pursue careers related to counseling and mental health services.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics and professionalism in a job setting; and

(E) use problem-solving and critical-thinking skills.

(2) The student evaluates factors related to personal development. The student is expected to:

(A) investigate factors that affect personal identity, personality, and self-esteem;

(B) analyze how the family influences the development of personal identity and self-esteem of all family members, including those with special needs; and

(C) propose strategies that promote physical, emotional, intellectual, and social development.

(3) The student determines short- and long-term implications of personal decisions. The student is expected to:

(A) summarize the decision-making process;

(B) discuss consequences and responsibilities of decisions; and

(C) evaluate the effect of decisions on health, well-being, family, interpersonal relationships, employment, and society as a whole.

(4) The student analyzes considerations related to the transition to independent adulthood. The student is expected to:

(A) analyze adjustments related to achieving independence; and

(B) explore responsibilities of living as an independent adult.

(5) The student analyzes the family's role in relationship development. The student is expected to:

(A) examine the development of relationships;

(B) investigate the family's role in fostering the abilities of its members to develop healthy relationships; and

(C) analyze effects of cultural patterns on family relationships.

(6) The student analyzes relationship development outside the family. The student is expected to:

(A) explore ways to promote positive friendships;

(B) assess the influence of peers on the individual;

(C) determine appropriate responses to authority figures; and

(D) propose ways to promote an appreciation of diversity.

(7) The student determines factors related to marital success. The student is expected to:

(A) discuss reasons for dating and the impact of social media on dating;

(B) analyze components of a successful marriage; and

(C) examine communication skills and behaviors that strengthen marriage.

(8) The student determines methods that promote an effective family unit. The student is expected to:

(A) describe diverse family structures;

(B) identify the function of individuals within the family;

(C) compare functions of families in various cultures;

(D) predict the effects of societal, demographic, and economic trends on individuals and the family;

(E) determine procedures for meeting individual and family needs through resource management;

(F) explain how technology such as social media influences family functions and relationships; and

(G) determine the impact of effective family functioning on community and society.

(9) The student determines how changes occurring throughout the family life cycle impact individuals and families. The student is expected to:

(A) describe the stages of the family life cycle;

(B) examine roles and responsibilities of individuals and family members throughout the family life cycle;

(C) analyze financial considerations related to the family life cycle;

(D) predict the impact of technological advances on families throughout the family life cycle; and

(E) formulate a plan for effective management of technology on families throughout the family life cycle.

(10) The student analyzes types of needs and crises experienced by individuals and families. The student is expected to:

(A) categorize types of crises and their effect on individuals and families;

(B) determine strategies for prevention and management of individual and family problems and crises;

(C) identify resources and support systems that provide assistance to families in crisis;

(D) assess management strategies and technology available to meet special needs of family members; and

(E) summarize laws and public policies related to the family.

(11) The student determines stress-management techniques effective for individuals and families. The student is expected to:

(A) describe the impact of stress on individuals and relationships;

(B) identify factors contributing to stress;

(C) practice creative techniques for managing stress; and

(D) implement positive strategies for dealing with change.

(12) The student determines opportunities and preparation requirements for his or her chosen careers. The student is expected to:

(A) determine employment and entrepreneurial opportunities and preparation requirements for careers in his or her chosen field;

(B) determine how interests, abilities, and personal priorities affect career choice; and

(C) propose short- and long-term career goals.

(13) The student develops professional skills and behavior. The student is expected to:

(A) practice effective verbal, nonverbal, written, and electronic communication skills;

(B) analyze the influence of cultural background on patterns of communication;

(C) practice positive interpersonal skills, including conflict resolution, negotiation, teamwork, and leadership;

(D) determine ethical practices in the workplace; and

(E) use leadership and team member skills in problem-solving situations.

(14) The student analyzes management practices to help an individual assume multiple family, community, and wage-earner roles. The student is expected to:

(A) determine the impact of career choice on family life;

(B) describe the effect of family life on workplace productivity;

(C) determine employment practices and trends that support families; and

(D) explain how technology impacts career options and family roles.

§127.616. Counseling and Mental Health (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Principles of Human Services. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) In Counseling and Mental Health, students model the knowledge and skills necessary to pursue a counseling and mental health career through simulated environments. Students are expected to apply knowledge of ethical and legal responsibilities, limitations, and the implications of their actions. Professional integrity in counseling and mental health care is dependent on acceptance of ethical and legal responsibilities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards or employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics and professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student applies mathematics, science, English language arts, and social studies in human services. The student is expected to:

(A) evaluate the use of verbal and nonverbal language in a variety of mental health situations;

(B) explain the nervous system of the human body;

(C) identify societal perspectives related to mental health;

(D) explain the physiological effects of stress and aging;

(E) distinguish the psychological aspects of health and wellness across the life span;

(F) identify socioeconomic factors that influence mental health and care;

(G) compare social services such as drug dependency rehabilitation centers; and

(H) differentiate maladaptive conditions such as paranoia, schizophrenia, and aggression.

(3) The student demonstrates verbal and nonverbal communication skills. The student is expected to:

(A) interpret verbal and nonverbal messages and adapt communication to the needs of the individual;

(B) demonstrate listening skills and techniques to minimize communication barriers; and

(C) implement communication skills that are responsive rather than reactive.

(4) The student researches career options and the preparation necessary for employment in mental health. The student is expected to:

(A) identify career opportunities related to mental health;

(B) research the role of the multidisciplinary team;

(C) justify the consequences of decisions;

(D) demonstrate techniques of peer mediation, problem solving, and negotiation;

(E) interpret, transcribe, and communicate mental health vocabulary; and

(F) investigate treatment options.

(5) The student models the ethical behavior standards and legal responsibilities related to mental health. The student is expected to:

(A) display ethical practices and the principles of confidentiality;

(B) research and describe legal aspects and issues of malpractice, negligence, and liability;

(C) examine a designated scope of practice of professionals;

(D) recognize client rights and choices and circumstances that alter client rights;

(E) dramatize case studies related to client rights and choices;

(F) review legislation that affects standards of client care; and

(G) describe regulatory agencies such as the Department of State Health Services and Department of Aging and Disability Services.

(6) The student maintains a safe environment to prevent hazardous situations. The student is expected to:

(A) recognize abusive situations;

(B) anticipate and adapt to changing situations;

(C) demonstrate appropriate actions in emergency situations; and

(D) practice personal and client safety.

(7) The student analyzes the technology related to information services. The student is expected to:

(A) review the processes for collection and dissemination of health care data;

(B) classify equipment used in the delivery of mental health services; and

(C) employ technology consistent with the student's level of training.

§127.617. Family and Community Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Human Services. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Family and Community Services is a laboratory-based course designed to involve students in realistic and meaningful community-based activities through direct service or service-learning experiences. Students are provided opportunities to interact with and provide services to individuals, families, and the community through commu-

nity or volunteer services. Emphasis is placed on developing and enhancing organizational and leadership skills and characteristics.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics/professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student explores careers in family and community services. The student is expected to:

(A) research family and community services such as agencies, organizations, and faith-based services;

(B) investigate career options available that focus on families and communities;

(C) analyze demographics that may affect community needs;

(D) analyze future trends in family and community services; and

(E) analyze the role socialization plays in human development and behavior.

(3) The student demonstrates organizational and leadership skills in a community service environment. The student is expected to:

(A) demonstrate management practices to help an individual assume multiple family, community, and wage-earner roles;

(B) identify personal leadership characteristics;

(C) develop a plan for enhancing personal leadership characteristics;

(D) demonstrate positive interpersonal skills, including conflict resolution, negotiation, teamwork, and leadership;

(E) identify and apply effective strategies and skills necessary for collaborative relationships with others in community service settings;

(F) plan and deliver family and community services presentations; and

(G) practice leadership skills such as participation in career and technical student organizations.

(4) The student develops and implements community and service-learning activities. The student is expected to:

(A) identify service projects that benefit a community;

(B) integrate student interests, abilities, and skills into community and service-learning projects;

(C) plan, develop, implement, and evaluate community and service-learning activities that benefit individuals, families, or the community;

(D) demonstrate safety practices when participating in community service and service-learning activities;

(E) document personal development through participation in community and service-learning activities;

(F) demonstrate appropriate grooming, appearance, and etiquette for community and service-learning activities;

(G) demonstrate ethical practices when participating in community service and service-learning activities; and

(H) design a public relations campaign promoting community and service-learning activities.

§127.618. Introduction to Cosmetology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grade 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) In Introduction to Cosmetology, students explore careers in the cosmetology industry. To prepare for success, students must have academic and technical knowledge and skills relative to the industry. Students may begin to earn hours toward state licensing requirements.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;

(B) employ the ability to be trustworthy by complying with an ethical course of action;

(C) comply with all applicable rules, laws, and regulations;

(D) use conflict-management skills to avoid potential or perceived conflict;

(E) identify employment opportunities, including entrepreneurship;

(F) evaluate data or outcome of a broad range of personal care services; and

(G) demonstrate effective oral and written communication skills with diverse individuals, including coworkers, management, and customers.

(2) The student applies academic skills to the field of cosmetology. The student is expected to:

(A) appraise safe and effective personal care products and services;

(B) model leadership skills within a classroom or community setting to maintain positive relationships;

(C) recognize the importance of a thorough client consultation;

(D) investigate the principles and practices of infection control such as bacterial disorders, classification of pathogens, and diseases and/or viruses; and

(E) explore the chemistry of materials as they relate to the eyelash extension application service.

(3) The student demonstrates knowledge of rules and regulations established by the Texas Department of Licensing and Regulation (TDLR). The student is expected to:

(A) implement policies and procedures regarding health and safety;

(B) recognize risks and potentially hazardous situations in compliance with the TDLR;

(C) navigate the TDLR website for exam eligibility, exam results, and student hours; and

(D) identify licensure and renewal requirements.

(4) The student identifies and describes the function of tools, equipment, and technologies used in cosmetology. The student is expected to:

(A) explore safe use of tools to enhance client services;

(B) describe ergonomically correct use of equipment to promote professional efficiency; and

(C) summarize available technology sources that could be used in a professional salon setting.

(5) The student develops professional skills needed to make appropriate career plans. The student is expected to:

(A) define what is expected of an employee such as ethical conduct, team building skills, principles of selling, and building a clientele;

(B) examine personal conduct in the salon to comply with professional liability;

(C) research the elements of successful salon operations such as recordkeeping, inventory, and business plan development;

(D) distinguish different types of salon categories such as commission based, hourly, and independent contractor; and

(E) prepare an employment portfolio that may include professional resume and evidence of accomplishments.

§127.619. Cosmetology I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10 and 11. Recommended prerequisite: Introduction to Cosmetology. Recommended corequisite: Cosmetology I Lab. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) In Cosmetology I, students coordinate integration of academic, career, and technical knowledge and skills in this laboratory instructional sequence course designed to provide job-specific training for employment in cosmetology careers. Instruction includes sterilization and sanitation procedures, hair care, nail care, and skin care and meets the Texas Department of Licensing and Regulation (TDLR) requirements for licensure upon passing the state examination. Analysis of career opportunities, license requirements, knowledge and skills expectations, and development of workplace skills are included.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;

(B) employ the ability to be trustworthy by complying with an ethical course of action;

(C) comply with all applicable rules, laws, and regulations;

(D) use conflict-management skills to avoid potential or perceived conflict;

(E) investigate employment opportunities, including entrepreneurship;

(F) evaluate data or outcome of a broad range of personal care services;

(G) demonstrate effective oral and written communication skills with diverse individuals, including coworkers, management, and customers;

(H) develop skill in handling multiple tasks simultaneously such as prioritizing tasks, managing workflow under pressure, and completing work-related activities in a timely manner;

(I) exercise personal ownership over the quantity and quality of individual performance and team assignment;

(J) employ leadership skills within a classroom or community setting to maintain positive relationships; and

(K) demonstrate knowledge of practical skills such as manicure, pedicure, or hairstyling.

(2) The student applies academic skills to the field of cosmetology. The student is expected to:

(A) explain the importance of anatomy and physiology to the cosmetology profession;

(B) identify body tissue, body systems, and their functions;

(C) explain the structure, composition, and growth of skin, nails, and hair;

(D) apply the principles of organic and inorganic chemistry;

(E) classify solutions, suspensions, and emulsions that may be used during cosmetology services;

(F) apply an understanding of pH and the pH scale to cosmetology services;

(G) explain the principles and practices of infection control, including bacterial disorders and diseases and viruses; and

(H) explore the nature of electricity by defining types of electric current and the electric modalities used in cosmetology.

(3) The student demonstrates knowledge of rules and regulations established by the TDLR. The student is expected to:

(A) apply health and safety policies and procedures;

(B) recognize risks and potentially hazardous situations in compliance with the TDLR;

(C) navigate the TDLR website for exam eligibility, exam results, and student hours; and

(D) identify licensure and renewal requirements of the licensee or licensed cosmetology establishment or school.

(4) The student demonstrates an understanding in the use of tools, equipment, technologies, and materials used in cosmetology. The student is expected to:

(A) employ safe and effective use of tools to enhance client services;

(B) use ergonomically designed equipment to promote professional efficiency;

(C) use available technology sources effective in a professional salon setting; and

(D) apply universal precautions in disposal of hazardous materials.

(5) The student applies the academic knowledge and practical skills to simulated and actual work situations. The student is expected to:

(A) apply client consultation skills to guide individuals in recognizing concerns and making informed decisions;

(B) document client satisfaction, procedures, and products to facilitate ease of consultation in future appointments;

(C) locate and compare vendors to maximize benefits for personal care clients, businesses, or organizations;

(D) demonstrate understanding and proficiency of basic haircuts such as zero degree, forty-five degree, ninety degree, and one hundred eighty degree;

(E) perform basic manicure, facial, and mock chemical service application as required for the state practical exam; and

(F) execute shampooing, permanent waving, curl demonstration, blow drying, and thermal curling service as required for the state practical exam.

§127.620. Cosmetology I Lab (One Credit), Adopted 2018.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10 and 11. Recommended prerequisite: Introduction to Cosmetology. This course must be taken concurrently with Cosmetology I and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Cosmetology I to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as early childhood development and services, counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Cosmetology I Lab provides instruction and content directly aligned to the licensure requirements as established by the Texas Department of Licensing and Regulation (TDLR).

(4) Careers in cosmetology include all aspects of sterilization and sanitation procedures and personal care services, including hair care, nail care, and skin care. Students will be expected to develop an understanding of the technical knowledge and skills needed for success in the personal care services industry.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in selecting appropriate attire for the profession and work site;

(B) demonstrate effective oral and written communication with diverse individuals, including coworkers, management, and clients;

(C) demonstrate personal ownership over the quality of individual performance;

(D) explore employment opportunities, including entrepreneurship; and

(E) create appropriate document information for employment such as a resume.

(2) The student demonstrates knowledge of rules and regulations related to sanitation, disinfection, and health and safety as established by TDLR. The student is expected to:

(A) apply knowledge of health and safety policies and procedures in a work setting in compliance with TDLR requirements;

(B) demonstrate cleaning and disinfecting of the work environment, including implements and equipment;

(C) demonstrate techniques to avoid risks and potentially hazardous situations in compliance with TDLR requirements; and

(D) demonstrate industry best practices when disposing of hazardous materials in compliance with TDLR requirements.

(3) The student demonstrates knowledge of appropriate use of tools, equipment, technologies, and materials used in cosmetology. The student is expected to:

(A) demonstrate safe and effective use of tools to enhance client services;

(B) practice and promote professional efficiency by using ergonomically designed equipment; and

(C) critique, select, and operate effective technology resources in a professional salon as available.

(4) The student applies the practical management skills in simulated and actual work situations. The student is expected to:

(A) apply client consultation skills to guide individuals in recognizing concerns and making future appointments;

(B) select and implement a client management system appropriate for a professional work situation; and

(C) document client satisfaction, procedures, and products to facilitate ease of consultation in future appointments.

(5) The student demonstrates proficiency in executing basic cosmetology services as required for the state practical examination. The student is expected to:

(A) demonstrate proficiency of basic haircuts such as zero degree, forty-five degree, ninety degree, and one hundred eighty degree;

(B) demonstrate basic manicure skills and techniques;

(C) demonstrate basic facial service skills and techniques;

(D) demonstrate basic chemical service applications;

(E) demonstrate basic shampooing techniques;

(F) demonstrate basic permanent waving techniques;

(G) demonstrate basic curling techniques;

(H) demonstrate basic blow drying techniques; and

(I) demonstrate basic thermal styling techniques.

§127.621. Cosmetology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Cosmetology I. Recommended corequisite: Cosmetology II Lab. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) In Cosmetology II, students will demonstrate proficiency in academic, technical, and practical knowledge and skills. The content is designed to provide the occupational skills required for licensure. Instruction includes advanced training in professional standards/employability skills; Texas Department of Licensing and Regulation (TDLR) rules and regulations; use of tools, equipment, technologies and materials; and practical skills.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;

(B) employ the ability to be trustworthy by complying with an ethical course of action;

(C) comply with all applicable rules, laws, and regulations;

(D) use conflict-management skills to avoid potential or perceived conflict;

(E) investigate employment opportunities, including entrepreneurship;

(F) evaluate data or outcome of a broad range of personal care services;

(G) demonstrate effective oral and written communication skills with diverse individuals, including coworkers, management, and customers;

(H) develop skill in handling multiple tasks simultaneously such as prioritizing tasks, managing workflow under pressure, and completing work-related activities in a timely manner;

(I) exercise personal ownership over the quantity and quality of individual performance and team assignment;

(J) employ leadership skills within a classroom or community setting to maintain positive relationships; and

(K) demonstrate knowledge of practical skills such as manicure, pedicure, or hairstyling.

(2) The student applies academic skills to the field of cosmetology. The student is expected to:

(A) defend the importance of anatomy and physiology to the cosmetology profession;

(B) summarize the structure, composition, and growth of skin, nails, and hair;

(C) test the principles of organic and inorganic chemistry;

(D) evaluate solutions, suspensions, and emulsions that may be used during cosmetology services such as shampoos, conditioners, and nail care products;

(E) select chemical services to maintain a normal pH of hair and skin;

(F) describe the chemistry and main ingredients of nail enhancements such as polymer powder, monomer liquid, and ultraviolet (UV) gels and how they work;

(G) explain how to prepare the hair for application and removal of extensions such as human or artificial hair; and

(H) formulate a salon infection control plan to maintain health and safety of employees and clients.

(3) The student demonstrates knowledge of rules and regulations established by the TDLR. The student is expected to:

(A) apply health and safety policies and procedures;

(B) recognize risks, including potentially hazardous situations, in compliance with the TDLR;

(C) navigate the TDLR website for exam eligibility, exam results, and student hours; and

(D) identify licensure and renewal requirements of the licensee or licensed cosmetology establishment or school.

(4) The student demonstrates proficiency in the use of tools, equipment, technologies, and materials used in cosmetology. The student is expected to:

(A) employ safe and effective use of tools to enhance client services;

(B) use ergonomically designed equipment to promote professional efficiency;

(C) use available technology sources effectively in a professional salon setting;

(D) apply universal precautions in disposal of hazardous and non-hazardous materials; and

(E) formulate client services based on the correct quality and quantity of materials.

(5) The student applies the academic knowledge and practical skills to simulated and actual work situations. The student is expected to:

(A) appraise client desires to assist with formulation of personal care services;

(B) judge client satisfaction by recording solutions, procedures, and products to enhance future services and client interactions;

(C) use vendor resources to provide maximum benefit for clients, service providers, businesses, or organizations;

(D) demonstrate mastery of basic haircuts such as zero degree, forty-five degree, ninety degree, one hundred eighty degree, and men's clipper cut;

(E) display proficiency of a manicure, facial, and mock chemical service application as required for the state practical exam; and

(F) master the technique of shampooing, permanent waving, curl demonstration, blow drying, and thermal curling service as required for the state practical exam.

(6) The student analyzes career paths within the cosmetology industry. The student is expected to:

(A) explore marketing techniques when selecting and using multimedia to attract and retain clientele;

(B) formulate a salon service menu based upon current industry trends;

(C) consolidate various methods of obtaining feedback from clients to understand their expectations and promote high-quality standards;

(D) create an employment portfolio containing content such as certifications, samples of work, achievements, and supervisor or instructor evaluations; and

(E) analyze the role of professional organizations in cosmetology professions.

§127.622. Cosmetology II Lab (One Credit), Adopted 2018.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and12. Prerequisite: Cosmetology I. This course must be taken concurrently with Cosmetology II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Cosmetology II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as early childhood development and services, counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Cosmetology II Lab provides instruction and content directly aligned to the licensure requirements as established by the Texas Department of Licensing and Regulation (TDLR).

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate professionalism in selecting appropriate attire for the profession and work site;

(B) demonstrate professionalism by practicing the use of effective oral and written communication with diverse individuals, including coworkers, management, and clients;

(C) demonstrate personal ownership over the quality of individual performance;

(D) explore employment opportunities, including entrepreneurship; and

(E) collect and compile mastery-level work samples and evaluations to be included in an employment portfolio as appropriate.

(2) The student demonstrates knowledge of rules and regulations related to sanitation, disinfection, and health and safety as established by TDLR. The student is expected to:

(A) apply knowledge of health and safety policies and procedures in a work setting in compliance with TDLR requirements;

(B) demonstrate cleaning and disinfecting of the work environment, including implements and equipment;

(C) demonstrate techniques to avoid risks and potentially hazardous situations in compliance with TDLR requirements; and

(D) demonstrate industry best practices when disposing hazardous materials in compliance with TDLR requirements.

(3) The students demonstrates mastery in the use of tools, equipment, technologies, and materials used in cosmetology. The student is expected to:

(A) apply with increased fluency proficient, safe, and effective use of tools in a simulated or actual work setting to enhance client services;

(B) demonstrate with increased fluency professional efficiency by using ergonomically designed equipment; and

(C) demonstrate with increased fluency effective integration of technology sources in a professional salon as available.

(4) The student executes proficient managerial and practical skills in diverse work and professional situations with minimal direction. The student is expected to:

(A) resolve client concerns with little to no guidance by using appropriate consultation skills;

(B) practice consultation skills to guide individuals in selecting future appointments and services;

(C) assess and document client satisfaction in a simulated and actual work situation;

(D) assess and document client products to inform future client consultations; and

(E) operate a client management system in diverse work and professional situations.

(5) The student performs cosmetology services with increased fluency as required for the state practical examination in a simulated and/or work setting with minimal guidance. The student is expected to:

(A) demonstrate mastery-level haircut skills and techniques;

(B) demonstrate mastery-level manicure skills and techniques;

(C) demonstrate mastery-level facial skills and techniques;

(D) demonstrate mastery-level knowledge of chemical applications;

(E) demonstrate mastery-level shampooing techniques;

(F) demonstrate mastery-level permanent waving techniques;

(G) perform curling services while demonstrating mastery-level curling techniques;

(H) perform blow drying services while demonstrating mastery-level blow drying techniques; and

(I) perform thermal styling services while demonstrating mastery-level thermal styling techniques.

§127.665. Practicum in Human Services (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Practicum in Human Services provides background knowledge and occupation-specific training that focuses on the development of consumer services, early childhood development and services, counseling and mental health services, and family and community-services careers. Content for Practicum in Human Services is designed to meet the occupational preparation needs and interests of students and should be based upon the knowledge and skills selected from two or more courses in a coherent sequence in the human services cluster.

(4) Instruction may be delivered through school-based laboratory training or through work-based delivery arrangements such as cooperative education, mentoring, and job shadowing.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) apply interpersonal communication skills in business and industry settings;

(B) explain and recognize the value of collaboration within the workplace;

(C) examine the importance of time management to succeed in the workforce;

(D) identify work ethics/professionalism in a job setting; and

(E) develop problem-solving and critical-thinking skills.

(2) The student analyzes career paths within the human services industries. The student is expected to:

(A) review careers within the Human Services Career Cluster;

(B) complete a resume;

(C) create, maintain, and present an employment portfolio with content such as licensures or certifications, samples of work, and evaluation from a supervisor for use during practicum experience in human services careers;

(D) demonstrate appropriate interviewing skills to seek employment or job shadowing experiences;

(E) analyze the effects of the human services industry on local, state, national, and global economies; and

(F) analyze the role of professional organizations in human-services professions.

(3) The student uses oral and written communication skills and solves problems using critical-thinking skills. The student is expected to:

(A) practice effective verbal, nonverbal, written, and electronic communication skills;

(B) use effective communication skills such as ability to empathize, motivate, listen attentively, and speak courteously and respectfully when working with clients;

(C) apply appropriate customer service techniques to complete transactions;

(D) investigate client resources and risk tolerance levels such as evaluating client resources versus cost, educating client about most beneficial choices, and recommending best products, plans, or services for the client; and

(E) consult with supervisor when needed to expedite solutions to client problems.

(4) The student uses business tools or procedures to create human services information and facilitate client interactions. The student is expected to:

(A) evaluate numerical information and perform complex calculations accurately;

(B) use appropriate electronic resources to access current information;

(C) use word-processing, database, spreadsheet, or presentation software to accurately prepare needed documents; and

(D) discuss and practice appropriate workplace communication etiquette.

(5) The student identifies how organizational systems affect performance and the quality of products and services. The student is expected to:

(A) examine global factors that affect the performance and quality of products and services in the industry;

(B) apply principles of planning, design, development, and evaluation to accomplish long-range goals; and

(C) implement quality-control systems and practices that ensure quality products and services.

(6) The student determines a healthy environment that inspires client confidence in services provided. The student is expected to:

(A) identify appropriate locations to safely offer human services;

(B) examine a functional work environment, equipment needs, and required utilities for offering human services;

(C) describe elements of a non-threatening workplace environment;

(D) identify appropriate social skills necessary for interacting with a diverse population;

(E) discuss and employ procedures necessary to provide emergency aid for workplace accidents; and

(F) explore components of a disaster and emergency response plan and use when directed.

(7) The student uses leadership and teamwork skills in collaborating with others. The student is expected to:

(A) collaborate with others to accomplish organizational goals and objectives;

(B) establish and maintain working relationships with all levels of personnel; and

(C) propose organizational priorities to ensure quality.

(8) The student describes and observes ethical and legal responsibilities associated with providing human services. The student is expected to:

(A) investigate situations requiring client advocacy and advocate when necessary;

(B) describe and practice ethical behaviors when working with human services clients; and

(C) comply with laws and regulations related to retail, governmental, or private services.

(9) The student selects and uses appropriate business procedures and equipment to produce satisfying client outcomes and business success. The student is expected to:

(A) manage funds using appropriate technology;

(B) place orders for customers and supplies using sound business practices;

(C) respond to client questions appropriately; and

(D) advise clients using appropriate and relevant information.

§127.666. Extended Practicum in Human Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Human Services Career Cluster. Corequisite: Practicum in Human Services. This course must be taken concurrently with Practicum in Human Services and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Human Services Career Cluster focuses on preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care services, and consumer services.

(3) Extended Practicum in Human Services provides background knowledge and occupation-specific training that focuses on the development of consumer services, early childhood development and services, counseling and mental health services, and family and community-services careers. Content for Extended Practicum in Human Services is designed to meet the occupational preparation needs and interests of students and should be based upon the knowledge and skills selected from two or more courses in a coherent sequence in the human services cluster.

(4) Instruction may be delivered through school-based laboratory training or through work-based delivery arrangements such as cooperative education, mentoring, and job shadowing.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to human services;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) demonstrate use of personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications for relevant projects with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) present information formally and informally in an effective manner;

(C) analyze, interpret, and effectively communicate information;

(D) apply active listening skills to obtain and clarify information; and

(E) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow workplace safety rules and regulations;

(B) identify appropriate locations to safely offer human services;

(C) employ procedures necessary to provide emergency aid for workplace accidents; and

(D) demonstrate an understanding of components of a disaster and emergency response plan and use when directed.

(5) The student understands the professional, ethical, and legal responsibilities in human services. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) describe and practice ethical and legal responsibilities associated with providing human services;

(C) show integrity by choosing the ethical course of action when making decisions;

(D) address situations requiring client advocacy appropriately and advocate when necessary; and

(E) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised human services experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised human services experience;

(B) implement quality-control systems and practices that ensure quality products and services with increased fluency;

(C) identify a functional work environment, equipment needs, and required utilities for offering human services;

(D) employ appropriate social skills necessary for interacting with a diverse population; and

(E) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
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For further information, please call: (512) 475-1497

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SUBCHAPTER M. INFORMATION TECHNOLOGY

19 TAC §§127.671 - 127.688, 127.720 - 127.727, 127.735 - 127.738

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.671. Principles of Information Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9 and 10. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Principles of Information Technology, students will develop computer literacy skills to adapt to emerging technologies used in the global marketplace. Students will implement personal and interpersonal skills to prepare for a rapidly evolving workplace environment. Students will enhance reading, writing, computing, communication, and reasoning skills and apply them to the information technology environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors and qualities that enhance employability and job advancement such as regular attendance, attention to proper attire, maintenance of a clean and safe work environment, pride in work, flexibility, and initiative;

(B) employ effective verbal and nonverbal communication skills;

(C) employ effective reading and writing skills;

(D) solve problems and think critically;

(E) demonstrate leadership skills and function effectively as a team member;

(F) identify and implement proper safety procedures; and

(G) demonstrate planning and time-management skills such as storyboarding and project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) identify job opportunities and accompanying job duties and tasks;

(B) research careers of personal interest along with the education, job skills, and experience required to achieve personal career goals; and

(C) describe the functions of resumes and portfolios.

(3) The student uses evolving and emerging technologies to exchange information. The student is expected to:

(A) identify and describe functions of various evolving and emerging technologies;

(B) send and receive text information and file attachments using electronic methods such as email, electronic bulletin boards, and instant message services;

(C) demonstrate effective Internet search strategies, including keywords and Boolean logic, using various available search engines;

(D) identify the various components of a Uniform Resource Locator;

(E) demonstrate ability to effectively test acquired information from the Internet for accuracy, relevance, and validity;

(F) explain issues concerning computer-based threats such as computer viruses, malware, and hacking; and

(G) explain issues concerning Internet safety such as identity theft, online predators, cyber-bullying, and phishing.

(4) The student demonstrates knowledge of the hardware components associated with information systems. The student is expected to:

(A) identify major hardware components and their functions;

(B) use available reference tools as appropriate; and

(C) connect and use a variety of peripheral devices such as mouse, keyboard, microphone, digital camera, and printer.

(5) The student demonstrates knowledge of the different software associated with information systems. The student is expected to:

(A) differentiate between systems and application software;

(B) identify and explain major operating system fundamentals and components such as disk operations, graphical user interface components, and hardware drivers;

(C) explain the purpose of file types across software products;

(D) demonstrate use of computer numbering systems and internal data representation such as identifying the hexadecimal value of a color;

(E) compare and contrast open source and proprietary software;

(F) explain use of system management tools;

(G) apply proper file management techniques such as creating, naming, organizing, copying, moving, and deleting files;

(H) use appropriate file protection and security; and

(I) explain the process for discovering, quarantining, and removing viruses from a computer system.

(6) The student analyzes network systems. The student is expected to:

(A) identify hardware associated with telecommunications and data networking such as servers, routers, switches, and network connectors;

(B) identify and describe various types of networks such as peer-to-peer, local area networks, wide area networks, wireless, and Ethernet;

(C) identify functions of network operating systems; and

(D) explain troubleshooting techniques for various network connection issues.

(7) The student applies word-processing technology. The student is expected to:

(A) identify the terminology associated with word-processing software;

(B) edit a variety of text documents using functions such as pagination, appropriate white space, tab settings, and font style, size, and color; and

(C) create professional documents such as memorandums, technical manuals, or proposals using advanced word-processing features.

(8) The student applies spreadsheet technology. The student is expected to:

(A) identify the terminology associated with spreadsheet software;

(B) use numerical content to perform mathematical calculations;

(C) use student-created and preprogrammed functions to produce documents such as budget, payroll, statistical tables, and personal checkbook register;

(D) identify, generate, and describe the function of comma separated value files;

(E) create and analyze spreadsheets incorporating advanced features such as lookup tables, nested IF statements, subtotals, cell protection conditional formatting, charts, and graphs; and

(F) perform sorting, searching, and data filtering in documents.

(9) The student explores computer programming concepts. The student is expected to:

(A) identify the function of compilers and interpreters;

(B) explain the difference between the operation of compilers and interpreters;

(C) identify various computer languages and how the languages are used in software development;

(D) recognize data representation in software development such as string, numeric, character, integer, and date;

(E) identify and explain the concept of algorithms; and

(F) describe the flow of a structured algorithm, including linear and iterative instructions such as using a flow chart.

(10) The student explores database technology. The student is expected to:

(A) identify the terminology associated with database software and database functions;

(B) explore the application of databases;

(C) identify and explain the purpose and elements of a query language;

(D) identify and explain the purpose of fields and records; and

(E) describe the process of constructing a query, including multiple search parameters.

(11) The student applies presentation management technology. The student is expected to:

(A) identify the terminology and functions of presentation software; and

(B) create, save, edit, and produce presentations incorporating advanced features such as links, hyperlinks, audio, and graphics.

(12) The student applies design and web publishing techniques. The student is expected to:

(A) identify the terminology associated with web page development and interactive media;

(B) identify and explain design elements such as typeface, color, shape, texture, space, and form;

(C) identify and explain design principles such as unity, harmony, balance, scale, and contrast;

(D) identify and explain common elements of Hyper Text Markup Language (HTML) such as tags, stylesheets, and hyperlinks; and

(E) create a web page containing links, graphics, and text using appropriate design principles.

(13) The student understands and demonstrates legal and ethical procedures as they apply to the use of information technology. The student is expected to:

(A) explain and demonstrate ethical use of technology and online resources;

(B) adhere to intellectual property laws;

(C) explain the concept of intellectual property laws, including copyright, trademarks, and patents and consequences of violating each type of law;

(D) examine the consequences of plagiarism;

(E) identify and explain unethical practices such as hacking, online piracy, and data vandalism; and

(F) demonstrate ethical use of online resources, including citation of source.

§127.672. Fundamentals of Computer Science (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12.Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Fundamentals of Computer Science is intended as a first course for those students just beginning the study of computer science. Students will learn about the computing tools that are used every day. Students will foster their creativity and innovation through opportunities to design, implement, and present solutions to real-world problems. Students will collaborate and use computer science concepts to access, analyze, and evaluate information needed to solve problems. Students will learn computational thinking, problem-solving, and reasoning skills that are the foundation of computer science. By using computer science knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will learn digital citizenship by researching current laws, regulations, and best practices and by practicing integrity and respect. Students will gain an understanding of the principles of computer science through the study of technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability. The student identifies various employment opportunities in the computer science field. The student is expected to:

(A) identify job and internship opportunities and accompanying job duties and tasks and contact one or more companies or organizations to explore career opportunities;

(B) examine the role of certifications, resumes, and portfolios in the computer science profession;

(C) employ effective technical reading and writing skills;

(D) employ effective verbal and non-verbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) demonstrate an understanding of legal and ethical responsibilities in relation to the field of computer science;

(H) demonstrate planning and time-management skills; and

(I) compare university computer science programs.

(2) Creativity and innovation. The student develops products and generates new knowledge, understanding, and skills. The student is expected to:

(A) investigate and explore various career opportunities within the computer science field and report findings through various media;

(B) create algorithms for the solution of various problems;

(C) discuss methods and create and publish web pages using a web-based language such as HTML, Java Script, or XML; and

(D) use generally accepted design standards for spacing, fonts, and color schemes to create functional user interfaces, including static and interactive screens.

(3) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) seek and respond to advice or feedback from peers, educators, or professionals when evaluating problem solutions;

(B) debug and solve problems using reference materials and effective strategies; and

(C) publish information in a variety of ways such as print, monitor display, web pages, or video.

(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) demonstrate the ability to insert external standalone objects such as scripts or widgets into web pages;

(B) communicate an understanding of binary representation of data in computer systems, perform conversions between decimal and binary number systems, and count in binary number systems;

(C) identify a problem's description, purpose, and goals;

(D) demonstrate coding proficiency in a programming language by developing solutions that create stories, games, and animations;

(E) identify and use the appropriate data type to properly represent the data in a program problem solution;

(F) communicate an understanding of and use variables within a programmed story, game, or animation;

(G) use arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(H) communicate an understanding of and use sequence within a programmed story, game, or animation;

(I) communicate an understanding of and use conditional statements within a programmed story, game, or animation;

(J) communicate an understanding of and use iteration within a programmed story, game, or animation;

(K) use random numbers within a programmed story, game, or animation; and

(L) test program solutions by investigating intended outcomes.

(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:

(A) discuss privacy and copyright laws and model ethical acquisition of digital information by citing sources using established methods;

(B) compare various non-copyright asset sharing options such as open source, freeware, and public domain;

(C) demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks;

(D) explain the value of strong passwords and virus detection and prevention for privacy and security;

(E) discuss and give examples of the impact of computing and computing-related advancements on society; and

(F) analyze how electronic media can affect reliability of information.

(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:

(A) identify and explain the function of basic computer components, including a central processing unit (CPU), storage, and peripheral devices;

(B) use system tools, including appropriate file management;

(C) compare different operating systems;

(D) describe the differences between an application and an operating system; and

(E) use various input, processing, output, and primary/secondary storage devices.

§127.673. Computer Science I (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Prerequisite or corequisite: Algebra I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Computer Science I will foster students' creativity and innovation by presenting opportunities to design, implement, and present meaningful programs through a variety of media. Students will collaborate with one another, their instructor, and various electronic communities to solve the problems presented throughout the course. Through computational thinking and data analysis, students will identify task requirements, plan search strategies, and use computer science concepts to access, analyze, and evaluate information needed to solve problems. By using computer science knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will learn digital citizenship by researching current laws, regulations, and best practices and by practicing integrity and respect. Students will gain an understanding of the principles of computer science through the study of technology operations, systems, and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability. The student identifies various employment opportunities in the computer science field. The student is expected to:

(A) identify job and internship opportunities and accompanying job duties and tasks and contact one or more companies or organizations to explore career opportunities;

(B) examine the role of certifications, resumes, and portfolios in the computer science profession;

(C) employ effective technical reading and writing skills;

(D) employ effective verbal and non-verbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) communicate an understanding of legal and ethical responsibilities in relation to the field of computer science;

(H) demonstrate planning and time-management skills; and

(I) compare university computer science programs.

(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) participate in learning communities as a learner, initiator, contributor, and teacher/mentor; and

(B) seek and respond to advice from peers, educators, or professionals when evaluating quality and accuracy of the student's product.

(3) Programming style and presentation. The student utilizes proper programming style and develops appropriate visual presentation of data, input, and output. The student is expected to:

(A) create and properly label and display output;

(B) create interactive input interfaces, with relevant user prompts, to acquire data from a user such as console displays or Graphical User Interfaces (GUIs);

(C) write programs with proper programming style to enhance the readability and functionality of a code by using descriptive identifiers, internal comments, white space, spacing, indentation, and a standardized program style;

(D) format data displays using standard formatting styles; and

(E) display simple vector graphics using lines, circles, and rectangles.

(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) use program design problem-solving strategies such as flowchart or pseudocode to create program solutions;

(B) create a high-level program plan using a visual tool such as a flowchart or graphic organizer;

(C) identify the tasks and subtasks needed to solve a problem;

(D) identify the data types and objects needed to solve a problem;

(E) identify reusable components from existing code;

(F) design a solution to a problem;

(G) code a solution from a program design;

(H) identify error types, including syntax, lexical, run time, and logic;

(I) test program solutions with valid and invalid test data and analyze resulting behavior;

(J) debug and solve problems using error messages, reference materials, language documentation, and effective strategies;

(K) create and implement common algorithms such as finding greatest common divisor, finding the biggest number out of three, finding primes, making change, and finding the average;

(L) create program solutions that address basic error handling such as preventing division by zero and type mismatch;

(M) select the most appropriate construct for a defined problem;

(N) create program solutions by using the arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(O) create program solutions to problems using available mathematics library functions or operators, including absolute value, round, power, square, and square root;

(P) develop program solutions that use assignment;

(Q) develop sequential algorithms to solve non-branching and non-iterative problems;

(R) develop algorithms to decision-making problems using branching control statements;

(S) develop iterative algorithms and code programs to solve practical problems;

(T) demonstrate the appropriate use of the relational operators;

(U) demonstrate the appropriate use of the logical operators; and

(V) generate and use random numbers.

(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:

(A) discuss and explain intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements;

(B) practice ethical acquisition and use of digital information;

(C) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies;

(D) investigate privacy and security measures, including strong passwords, pass phrases, and other methods of authentication and virus detection and prevention; and

(E) investigate computing and computing-related advancements and the social and ethical ramifications of computer usage.

(6) Technology operations, systems, and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:

(A) identify and describe the function of major hardware components, including primary and secondary memory, a central processing unit (CPU), and peripherals;

(B) differentiate between current programming languages, discuss the general purpose for each language, and demonstrate knowledge of specific programming terminology and concepts and types of software development applications;

(C) differentiate between a high-level compiled language and an interpreted language;

(D) identify and use concepts of object-oriented design;

(E) differentiate between local and global scope access variable declarations;

(F) encapsulate data and associated subroutines into an abstract data type;

(G) create subroutines that do not return values with and without the use of arguments and parameters;

(H) create subroutines that return typed values with and without the use of arguments and parameters;

(I) create calls to processes passing arguments that match parameters by number, type, and position;

(J) compare data elements using logical and relational operators;

(K) identify and convert binary representation of numeric and nonnumeric data in computer systems using American Standard Code for Information Interchange (ASCII) or Unicode;

(L) identify finite limits of numeric data such as integer wrap around and floating point precision;

(M) perform numerical conversions between the decimal and binary number systems and count in the binary number system;

(N) choose, identify, and use the appropriate data types for integer, real, and Boolean data when writing program solutions;

(O) analyze the concept of a variable, including primitives and objects;

(P) represent and manipulate text data, including concatenation and other string functions;

(Q) identify and use the structured data type of one-dimensional arrays to traverse, search, and modify data;

(R) choose, identify, and use the appropriate data type or structure to properly represent the data in a program problem solution; and

(S) compare strongly typed and un-typed programming languages.

§127.674. Computer Science II (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisites: Algebra I and Computer Science I or AP Computer Science Principles. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Computer Science II will foster students' creativity and innovation by presenting opportunities to design, implement, and present meaningful programs through a variety of media. Students will collaborate with one another, their instructor, and various electronic communities to solve the problems presented throughout the course. Through computational thinking and data analysis, students will identify task requirements, plan search strategies, and use computer science concepts to access, analyze, and evaluate information needed to solve problems. By using computer science knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will gain an understanding of computer science through the study of technology operations, systems, and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability. The student identifies various employment opportunities in the computer science field. The student is expected to:

(A) identify job and internship opportunities and accompanying job duties and tasks and contact one or more companies or organizations to explore career opportunities;

(B) examine the role of certifications, resumes, and portfolios in the computer science profession;

(C) employ effective technical reading and writing skills;

(D) employ effective verbal and non-verbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify legal and ethical responsibilities in relation to the field of computer science;

(H) demonstrate planning and time-management skills; and

(I) compare university computer science programs.

(2) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) use program design problem-solving strategies to create program solutions;

(B) read, analyze, and modify programs and their accompanying documentation such as an application programming interface (API), internal code comments, external documentation, or readme files;

(C) follow a systematic problem-solving process that identifies the purpose and goals, the data types and objects needed, and the subtasks to be performed;

(D) compare design methodologies and implementation techniques such as top-down, bottom-up, and black box;

(E) trace a program, including inheritance and black box programming;

(F) choose, identify, and use the appropriate abstract data type, advanced data structure, and supporting algorithms to properly represent the data in a program problem solution; and

(G) use object-oriented programming development methodology, including data abstraction, encapsulation with information hiding, inheritance, and procedural abstraction in program development.

(3) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) use the principles of software development to work in software design teams;

(B) break a problem statement into specific solution requirements;

(C) create a program development plan;

(D) code part of a solution from a program development plan while a partner codes the remaining part;

(E) collaborate with a team to test a solution, including boundary and standard cases; and

(F) develop presentations to report the solution findings.

(4) Data literacy and management. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) use programming file structure and file access for required resources;

(B) acquire and process information from text files, including files of known and unknown sizes;

(C) manipulate data using string processing;

(D) manipulate data values by casting between data types;

(E) use the structured data type of one-dimensional arrays to traverse, search, modify, insert, and delete data;

(F) identify and use the structured data type of two-dimensional arrays to traverse, search, modify, insert, and delete data;

(G) identify and use a list object data structure to traverse, search, insert, and delete data; and

(H) differentiate between categories of programming languages, including machine, assembly, high-level compiled, high-level interpreted, and scripted.

(5) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) develop sequential algorithms using branching control statements, including nested structures, to create solutions to decision-making problems;

(B) develop choice algorithms using selection control statements based on ordinal values;

(C) demonstrate the appropriate use of short-circuit evaluation in certain situations;

(D) use Boolean algebra, including De Morgan's Law, to evaluate and simplify logical expressions;

(E) develop iterative algorithms using nested loops;

(F) identify, trace, and appropriately use recursion in programming solutions, including algebraic computations;

(G) trace, construct, evaluate, and compare search algorithms, including linear searching and binary searching;

(H) identify, describe, trace, evaluate, and compare standard sorting algorithms, including selection sort, bubble sort, insertion sort, and merge sort;

(I) measure time and space efficiency of various sorting algorithms, including analyzing algorithms using "big-O" notation for best, average, and worst-case data patterns;

(J) develop algorithms to solve various problems such as factoring, summing a series, finding the roots of a quadratic equation, and generating Fibonacci numbers;

(K) test program solutions by investigating boundary conditions; testing classes, methods, and libraries in isolation; and performing stepwise refinement;

(L) identify and debug compile, syntax, runtime, and logic errors;

(M) compare efficiency of *search and sort algorithms* by using informal runtime comparisons, exact calculation of statement execution counts, and theoretical efficiency values using "big-O" notation, including worst-case, best-case, and average-case time/space analysis;

(N) count, convert, and perform mathematical operations in the decimal, binary, octal, and hexadecimal number systems;

(O) identify maximum integer boundary, minimum integer boundary, imprecision of real number representations, and round-off errors;

(P) create program solutions to problems using a mathematics library;

(Q) use random number generator algorithms to create simulations;

(R) use composition and inheritance relationships to identify and create class definitions and relationships;

(S) explain and use object relationships between defined classes, abstract classes, and interfaces;

(T) create object-oriented class definitions and declarations using variables, constants, methods, parameters, and interface implementations;

(U) create adaptive behaviors using polymorphism;

(V) use reference variables for object and string data types;

(W) use value and reference parameters appropriately in method definitions and method calls;

(X) implement access scope modifiers;

(Y) use object comparison for content quality;

(Z) duplicate objects using the appropriate deep or shallow copy;

(AA) apply functional decomposition to a program solution;

(BB) create objects from class definitions through instantiation; and

(CC) examine and mutate the properties of an object using accessors and modifiers.

§127.675. Computer Science III (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Computer Science II, Advanced Placement (AP) Computer Science A, or International Baccalaureate (IB) Computer Science Standard Level or IB Computer Science Higher Level. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Computer Science III will foster students' creativity and innovation by presenting opportunities to design, implement, and present meaningful programs through a variety of media. Students will collaborate with one another, their instructor, and various electronic communities to solve the problems presented throughout the course. Through computational thinking and data analysis, students will identify task requirements, plan search strategies, and use computer science concepts to access, analyze, and evaluate information needed to solve problems. By using computer science knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will gain an understanding of advanced computer science data structures through the study of technology operations, systems, and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(6) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(d) Knowledge and skills.

(1) Employability. The student identifies various employment opportunities in the computer science field. The student is expected to:

(A) identify job and internship opportunities and accompanying job duties and tasks and contact one or more companies or organizations to explore career opportunities;

(B) examine the role of certifications, resumes, and portfolios in the computer science profession;

(C) employ effective technical reading and writing skills;

(D) employ effective verbal and non-verbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) demonstrate an understanding of legal and ethical responsibilities in relation to the field of computer science;

(H) demonstrate planning and time-management skills; and

(I) compare university computer science programs.

(2) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) apply object-oriented programming, including data abstraction, encapsulation, inheritance, and polymorphism, to manage the complexity of a project;

(B) design and implement a class hierarchy;

(C) read and write class specifications using visual organizers, including Unified Modeling Language;

(D) identify, describe, evaluate, compare, and implement standard sorting algorithms that perform sorting operations on data structures, including quick sort and heap sort; and

(E) identify and use the appropriate abstract data type, advanced data structure, and supporting algorithms to properly represent the data in a program problem solution.

(3) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) use networked tools for file management and collaboration; and

(B) work in software design teams.

(4) Data literacy and management. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) identify and use two-dimensional ragged arrays to traverse, search, modify, insert, and delete data;

(B) describe and demonstrate proper linked list management, including maintaining the head and safe addition and deletion of linked objects;

(C) create or trace program solutions using a linked-list data structure, including unordered single, ordered single, double, and circular linked;

(D) describe composite data structures, including a linked list of linked lists;

(E) create or trace program solutions using stacks, queues, trees, heaps, priority queues, graph theory, and enumerated data types;

(F) create or trace program solutions using sets, including hash and tree-based data structures;

(G) create or trace program solutions using map style data structures; and

(H) write and modify text file data.

(5) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) evaluate expressions using bitwise operators;

(B) evaluate expressions using the ternary operator;

(C) identify, trace, and appropriately use recursion in programming solutions, including processing binary trees;

(D) create or trace program solutions using hashing;

(E) explore common algorithms such as matrix addition and multiplication, fractals, Towers of Hanoi, and magic square; and

(F) create program solutions that exhibit robust behavior by recognizing and avoiding runtime errors and handling anticipated errors.

(6) Testing and documentation. The student demonstrates appropriate documentation and testing practices. The student is expected to:

(A) use appropriate formatting and write documentation to support code maintenance, including pre- and post-condition statements;

(B) write program assumptions in the form of assertions;

(C) write a Boolean expression to test a program assertion; and

(D) construct assertions to make explicit program invariants.

(7) Practical application of technology. The student utilizes technology concepts, systems, and operations as they apply to computer science. The student is expected to:

(A) analyze and create computer program workflow charts and basic system diagrams, documenting system functions, features, and operations;

(B) gather requirements, design, and implement a process by which programs can interact with each other such as using interfaces;

(C) create simple programs using a low-level language such as assembly;

(D) create discovery programs in a high-level language;

(E) create scripts for an operating system;

(F) explore industry best practices for secure programming; and

(G) explore emerging industry or technology trends.

§127.676. Foundations of Cybersecurity (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12.Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry and relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services and research and development services.

(3) Cybersecurity is a critical discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the expansion of a globally connected society. As computing has become more sophisticated, so too have the abilities of adversaries looking to penetrate networks and access systems and sensitive information. Cybersecurity professionals prevent, detect, and respond to minimize disruptions to governments, organizations, and individuals.

(4) In the Foundations of Cybersecurity course, students will develop the knowledge and skills needed to explore fundamental concepts related to the ethics, laws, and operations of cybersecurity. Students will examine trends and operations of cyberattacks, threats,

and vulnerabilities. Students will review and explore security policies designed to mitigate risks. The skills obtained in this course prepare students for additional study in cybersecurity. A variety of courses are available to students interested in this field. Foundations of Cybersecurity may serve as an introductory course in this field of study.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability skills. The student demonstrates necessary skills for career development and successful completion of course outcomes. The student is expected to:

(A) identify and demonstrate employable work behaviors such as regular attendance, punctuality, maintenance of a professional work environment, and effective written and verbal communication;

(B) identify and demonstrate positive personal qualities such as authenticity, resilience, initiative, and a willingness to learn new knowledge and skills;

(C) solve problems and think critically;

(D) demonstrate leadership skills and function effectively as a team member; and

(E) demonstrate an understanding of ethical and legal responsibilities and ramifications in relation to the field of cybersecurity.

(2) Professional awareness. The student identifies various employment opportunities and requirements in the cybersecurity field. The student is expected to:

(A) identify job and internship opportunities and accompanying job duties and tasks;

(B) research careers in cybersecurity and information security and develop professional profiles that match education and job skills required for obtaining a job in both the public and private sectors;

(C) identify and discuss certifications for cybersecurity-related careers; and

(D) explain the different types of services and roles found within a cybersecurity functional area such as a security operations center (SOC).

(3) Ethics and laws. The student understands ethical and current legal standards, rights and restrictions governing technology, technology systems, digital media, and the use of social media. The student is expected to:

(A) demonstrate and advocate for ethical and legal behaviors both online and offline among peers, family, community, and employers;

(B) investigate and analyze local, state, national, and international cybersecurity laws such as the USA PATRIOT Act of 2001, General Data Protection Regulation, Digital Millennium Copyright Act, Computer Fraud and Abuse Act, and Health Insurance Portability and Accountability Act of 1996 (HIPAA);

(C) investigate and analyze noteworthy incidents or events regarding cybersecurity;

(D) communicate an understanding of ethical and legal behavior when presented with various scenarios related to cybersecurity activities;

(E) define and identify tactics used in an incident such as social engineering, malware, denial of service, spoofing, and data vandalism; and

(F) identify and use appropriate methods for citing sources.

(4) Ethics and laws. The student differentiates between ethical and malicious hacking. The student is expected to:

(A) identify motivations and perspectives for hacking;

(B) distinguish between types of threat actors such as hacktivists, criminals, state-sponsored actors, and foreign governments;

(C) identify and describe the impact of cyberattacks on the global community, society, and individuals;

(D) differentiate between industry terminology for types of hackers such as black hats, white hats, and gray hats; and

(E) determine and describe possible outcomes and legal ramifications of ethical versus malicious hacking practices.

(5) Ethics and laws. The student identifies and defines cyberterrorism and counterterrorism. The student is expected to:

(A) define cyberterrorism, state-sponsored cyberterrorism, and hacktivism;

(B) compare and contrast physical terrorism and cyberterrorism, including domestic and foreign actors;

(C) define and explain intelligence gathering;

(D) explain the role of cyber defense in protecting national interests and corporations;

(E) explain the role of cyber defense in society and the global economy; and

(F) explain the importance of protecting public infrastructures such as electrical power grids, water systems, pipelines, transportation, and power generation facilities from cyberterrorism.

(6) Digital citizenship. The student understands and demonstrates the social responsibility of end users regarding significant issues related to digital technology, digital hygiene, and cyberbullying. The student is expected to:

(A) identify and understand the nature and value of privacy;

(B) analyze the positive and negative implications of a digital footprint and the maintenance and monitoring of an online presence;

(C) discuss the role and impact of technology on privacy;

(D) identify the signs, emotional effects, and legal consequences of cyberbullying and cyberstalking; and

(E) identify and discuss effective ways to deter and report cyberbullying.

(7) Digital citizenship. The student understands the implications of sharing information and access with others. The student is expected to:

(A) define personally identifiable information (PII);

(B) evaluate the risks and benefits of sharing PII;

(C) describe the impact of granting applications unnecessary permissions such as mobile devices accessing camera and contacts;

(D) describe the risks of granting third parties access to personal and proprietary data on social media and systems; and

(E) describe the risks involved with accepting Terms of Service (ToS) or End User License Agreements (EULA) without a basic understanding of the terms or agreements.

(8) Cybersecurity skills. The student understands basic cybersecurity concepts and definitions. The student is expected to:

(A) define cybersecurity and information security;

(B) identify basic risk management and risk assessment principles related to cybersecurity threats and vulnerabilities, including the Zero Trust model;

(C) explain the fundamental concepts of confidentiality, integrity, and availability (CIA triad);

(D) describe the trade-offs between convenience and security;

(E) identify and analyze cybersecurity breaches and incident responses;

(F) identify and analyze security challenges in domains such as physical, network, cloud, and web;

(G) define and discuss challenges faced by cybersecurity professionals such as internal and external threats;

(H) identify indicators of compromise such as common risks, warning signs, and alerts of compromised systems;

(I) explore and discuss the vulnerabilities of network-connected devices such as Internet of Things (IoT);

(J) use appropriate cybersecurity terminology;

(K) explain the concept of penetration testing, including tools and techniques; and

(L) explore and identify common industry frameworks such as MITRE ATT&CKTM, MITRE Engage TM, and Cyber Kill Chain, and the Diamond Model.

(9) Cybersecurity skills. The student understands and explains various types of malicious software (malware). The student is expected to:

(A) define malware, including spyware, ransomware, viruses, and rootkits;

(B) identify the transmission and function of malware such as trojan horses, worms, and viruses;

(C) discuss the impact of malware and the model of "as a service";

(D) explain the role of reverse engineering for the detection of malware and viruses; and

(E) describe free and commercial antivirus and anti-malware software also known as Endpoint Detection and Response software.

(10) Cybersecurity skills. The student understands and demonstrates knowledge of techniques and strategies to prevent a system from being compromised. The student is expected to:

(A) define system hardening;

(B) use basic system administration privileges;

(C) explain the importance of patching operating systems;

(D) explain the importance of software updates;

(E) describe standard practices to configure system services;

(F) explain the importance of backup files;

(G) research and explain standard practices for securing computers, networks, and operating systems, including the concept of least privilege; and

(H) identify vulnerabilities caused by a lack of cybersecurity awareness and training such as weaknesses posed by individuals within an organization.

(11) Cybersecurity skills. The student understands basic network operations. The student is expected to:

(A) identify basic network devices, including routers and switches;

(B) define network addressing;

(C) analyze incoming and outgoing rules for traffic passing through a firewall;

(D) identify well known ports by number and service provided, including port 22 (Secure Shell Protocol/ssh), port 80 (Hypertext Transfer Protocol/http), and port 443 (Hypertext Transfer Protocol Secure/https);

(E) identify commonly exploited ports and services, including ports 20 and 21 (File Transfer Protocol/ftp), port 23 (telnet protocol), and port 3389 (Remote Desktop Protocol/rdp); and

(F) identify common tools for monitoring ports and network traffic.

(12) Cybersecurity skills. The student identifies standard practices of system administration. The student is expected to:

(A) define what constitutes a secure password;

(B) create a secure password policy, including length, complexity, account lockout, and rotation;

(C) identify methods of password cracking such as brute force and dictionary attacks; and

(D) examine and configure security options to allow and restrict access based on user roles.

(13) Cybersecurity skills. The student demonstrates necessary steps to maintain user access on the system. The student is expected to:

(A) identify different types of user accounts and groups on an operating system;

(B) explain the fundamental concepts and standard practices related to access control, including authentication, authorization, and auditing;

(C) compare methods for single- and multi-factor authentication such as passwords, biometrics, personal identification numbers (PINs), secure tokens, and other passwordless authentication methods;

(D) define and explain the purpose and benefits of an air-gapped computer; and

(E) explain how hashes and checksums may be used to validate the integrity of transferred data.

(14) Cybersecurity skills. The student explores the field of digital forensics. The student is expected to:

(A) explain the importance of digital forensics to organizations, private citizens, and the public sector;

(B) identify the role of chain of custody in digital forensics;

(C) explain the four steps of the forensics process, including collection, examination, analysis, and reporting;

(D) identify when a digital forensics investigation is necessary;

(E) identify information that can be recovered from digital forensics investigations such as metadata and event logs; and

(F) analyze the purpose of event logs and identify suspicious activity.

(15) Cybersecurity skills. The student explores the operations of cryptography. The student is expected to:

(A) explain the purpose of cryptography and encrypting data;

(B) research historical uses of cryptography;

(C) review and explain simple cryptography methods such as shift cipher and substitution cipher;

(D) define and explain public key encryption; and

(E) compare and contrast symmetric and asymmetric encryption.

(16) Vulnerabilities, threats, and attacks. The student understands vulnerabilities, threats, and attacks. The student is expected to:

(A) explain how computer vulnerabilities leave systems open to cyberattacks;

(B) explain how users are the most common vehicle for compromising a system at the application level;

(C) define and describe vulnerability, payload, exploit, port scanning, and packet sniffing;

(D) identify internal threats to systems such as logic bombs and insider threats;

(E) define and describe cyberattacks, including man-in-the-middle, distributed denial of service, spoofing, and back-door attacks;

(F) differentiate types of social engineering techniques such as phishing; web links in email, instant messaging, social media, and other online communication with malicious links; shoulder surfing; and dumpster diving; and

(G) identify various types of application-specific attacks such as cross-site scripting and injection attacks.

(17) Vulnerabilities, threats, and attacks. The student evaluates the vulnerabilities of networks. The student is expected to:

(A) compare vulnerabilities associated with connecting devices to public and private networks;

(B) explain device vulnerabilities and security solutions on networks such as supply chain security and counterfeit products;

(C) compare and contrast protocols such as HTTP versus HTTPS;

(D) debate the broadcasting or hiding of a wireless service set identifier (SSID); and

(E) research and discuss threats such as mandatory access control (MAC) spoofing and packet sniffing.

(18) Vulnerabilities, threats, and attacks. The student analyzes threats to computer applications. The student is expected to:

(A) define application security;

(B) identify methods of application security such as secure development policies and practices;

(C) explain the purpose and function of vulnerability scanners;

(D) explain how coding errors may create system vulnerabilities such as buffer overflows and lack of input validation; and

(E) analyze the risks of distributing insecure programs.

(19) Risk assessment. The student understands risk and how risk assessment and risk management defend against attacks. The student is expected to:

(A) define commonly used risk assessment terms, including risk, asset, and inventory;

(B) identify risk management strategies, including acceptance, avoidance, transference, and mitigation; and

(C) compare and contrast risks based on an industry accepted rubric or metric such as Risk Assessment Matrix.

§127.677. Digital Forensics (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 9-12. Prerequisite: Foundations of Cybersecurity. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, such as laboratory and testing services and research and development services.

(3) Digital forensics is a critical discipline concerned with analyzing anomalous activity on computers, networks, programs, and

data. As a discipline, it has grown with the expansion of a globally connected digital society. As computing has become more sophisticated, so too have the abilities to access systems and sensitive information. Digital forensics professionals investigate and craft appropriate responses to disruptions to governments, organizations, and individuals. Whereas cybersecurity takes a proactive approach to information assurance to minimize harm, digital forensics takes a reactive approach to incident response.

(4) Digital Forensics introduces students to the knowledge and skills of digital forensics. The course provides a survey of the field of digital forensics and incident response.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability skills. The student identifies necessary skills for career development and employment opportunities. The student is expected to:

(A) investigate the need for digital forensics;

(B) research careers in digital forensics along with the education and job skills required for obtaining a job in both the public and private sector;

(C) identify job and internship opportunities and accompanying job duties and tasks and contact one or more companies or organizations to explore career opportunities;

(D) identify and discuss certifications for digital forensics careers;

(E) explain ethical and legal responsibilities in relation to the field of digital forensics;

(F) identify and describe businesses and government agencies that use digital forensics;

(G) identify and describe the kinds of crimes investigated by digital forensics specialists; and

(H) solve problems and think critically.

(2) Employability skills. The student communicates and collaborates effectively. The student is expected to:

(A) apply effective teamwork strategies;

(B) collaborate with a community of peers and professionals;

(C) create, review, and edit a report summarizing technical findings; and

(D) present technical information to a non-technical audience.

(3) Ethics and laws. The student recognizes and analyzes ethical and current legal standards, rights, and restrictions related to digital forensics. The student is expected to:

(A) develop a plan to advocate for ethical and legal behaviors both online and offline among peers, family, community, and employers;

(B) research and discuss local, state, national, and international law such as the Electronic Communications Privacy Act of 1986, Title III (Pen Register Act); USA PATRIOT Act of 2001; and Digital Millennium Copyright Act;

(C) research and discuss historic cases or events regarding digital forensics or cybersecurity;

(D) analyze ethical and legal behavior when presented with confidential or sensitive information in various scenarios related to cybersecurity activities;

(E) analyze case studies of computer incidents;

(F) use the findings of a computer incident investigation to reconstruct a computer incident;

(G) identify and discuss intellectual property laws, issues, and use;

(H) contrast legal and illegal aspects of information gathering;

(I) contrast ethical and unethical aspects of information gathering;

(J) analyze emerging legal and societal trends affecting digital forensics; and

(K) discuss how technological changes affect applicable laws.

(4) Digital citizenship. The student understands and demonstrates the social responsibility of end users regarding digital technology, safety, digital hygiene, and cyberbullying. The student is expected to:

(A) identify and use digital information responsibly;

(B) use digital tools responsibly;

(C) identify and use valid and reliable sources of information; and

(D) gain informed consent prior to investigating incidents.

(5) Digital forensics skills. The student locates, processes, analyzes, and organizes data. The student is expected to:

(A) identify sources of data;

(B) analyze and report data collected;

(C) discuss how to maintain data integrity such as by enabling encryption;

(D) examine and describe metadata of a file; and

(E) examine and describe how multiple data sources can be used for digital forensics, including investigating malicious software (malware) and email threats.

(6) Digital forensics skills. The student understands software concepts and operations as they apply to digital forensics. The student is expected to:

(A) compare software applications as they apply to digital forensics;

(B) describe the purpose of various application types such as email, web, file sharing, security applications, and data concealment tools;

(C) identify the different purposes of data formats such as pdf, wav, jpeg, and exe;

(D) describe how application logs and metadata are used for investigations such as Security Information and Event Management (SIEM) reports;

(E) describe digital forensics tools;

(F) select the proper software tool based on appropriateness, effectiveness, and efficiency for a given digital forensics scenario;

(G) describe components of applications such as configurations settings, data, supporting files, and user interface; and

(H) describe how the "as a service" model applies to incident response.

(7) Digital forensics skills. The student understands operating systems concepts and functions as they apply to digital forensics. The student is expected to:

(A) compare various operating systems;

(B) describe file attributes, including access and creation times;

(C) describe how operating system logs are used for investigations;

(D) compare and contrast the file systems of various operating systems;

(E) compare various primary and secondary storage devices; and

(F) differentiate between volatile and non-volatile memory.

(8) Digital forensics skills. The student understands networking concepts and operations as they apply to digital forensics. The student is expected to:

(A) examine networks, including Internet Protocol (IP) addressing and subnets;

(B) describe the Open Systems Interconnection (OSI) model;

(C) describe the Transmission Control Protocol/Internet Protocol (TCP/IP) model;

(D) use network forensic analysis tools to examine network traffic data from sources such as firewalls, routers, intrusion detection systems (IDS), and remote access logs; and

(E) identify malicious or suspicious network activities such as mandatory access control (MAC) spoofing and rogue wireless access points.

(9) Digital forensics skills. The student explains the principles of access controls. The student is expected to:

(A) define the principle of least privilege;

(B) describe the impact of granting access and permissions;

(C) identify different access components such as passwords, tokens, key cards, and biometric verification systems;

(D) explain the value of an access log to identify suspicious activity;

(E) describe the risks of granting third parties access to personal and proprietary data on social media and systems;

(F) describe the risks involved with accepting Terms of Service (ToS) or End User License Agreements (EULA) without a basic understanding of the terms or agreements; and

(G) identify various access control methods such as mandatory access control (MAC), attribute-based access control (ABAC), role-based access control (RBAC), and discretionary access control (DAC).

(10) Incident response. The student follows a methodological approach to prepare for and respond to an incident. The student is expected to:

(A) define the components of the incident response cycle, including preparation; detection and analysis; containment, eradication, and recovery; and post-incident activity;

(B) describe incident response preparation;

(C) discuss incident response detection and analysis;

(D) discuss containment and eradication of and recovery from an incident;

(E) describe post-incident activities such as reflecting on lessons learned, using collected incident data, and retaining evidence of an incident;

(F) develop an incident response plan; and

(G) describe ways a user may compromise the validity of existing evidence.

(11) Incident response. The student objectively analyzes collected data from an incident. The student is expected to:

(A) identify the role of chain of custody in digital forensics;

(B) describe safe data handling procedures;

(C) explain the fundamental concepts of confidentiality, integrity, availability, authentication, and authorization;

(D) identify and report information conflicts or suspicious activity;

(E) identify events of interest and suspicious activity by examining network traffic; and

(F) identify events of interest and suspicious activity by examining event logs.

(12) Incident response. The student analyzes the various ways systems can be compromised. The student is expected to:

(A) analyze the different signatures of cyberattacks;

(B) identify points of weakness and attack vectors such as online spoofing, phishing, and social engineering; and

(C) differentiate between simple versus multistage attacks.

§127.678. Cybersecurity Capstone (One Credit), Adopted 2022.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Foundations of Cybersecurity. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging foundations.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services such as laboratory and testing services, and research and development services.

(3) Cybersecurity is a critical discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the expansion of a globally connected society. As computing has become more sophisticated, so too have the abilities of adversaries looking to penetrate networks and access sensitive information. Cybersecurity professionals prevent, detect, and respond to minimize disruptions to governments, organizations, and individuals.

(4) In the Cybersecurity Capstone course, students will develop the knowledge and skills needed to explore advanced concepts related to the ethics, laws, and operations of cybersecurity. Students will examine trends and operations of cyberattacks, threats, and vulnerabilities. Students will develop security policies to mitigate risks. The skills obtained in this course prepare students for additional study toward industry certification. A variety of courses are available to students interested in the cybersecurity field. Cybersecurity Capstone may serve as a culminating course in this field of study.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Employability skills. The student demonstrates necessary skills for career development and successful completion of course outcomes. The student is expected to:

(A) identify and demonstrate employable work behaviors such as regular attendance, punctuality, maintenance of a professional work environment, and effective written and verbal communication;

(B) identify and demonstrate positive personal qualities such as authenticity, resilience, initiative, and a willingness to learn new knowledge and skills;

(C) solve problems and think critically;

(D) demonstrate leadership skills and function effectively as a team member; and

(E) communicate an understanding of ethical and legal responsibilities in relation to the field of cybersecurity.

(2) Employability skills. The student identifies various employment opportunities in the cybersecurity field. The student is expected to:

(A) develop a personal career plan along with the education, job skills, and experience necessary to achieve career goals;

(B) develop a resume or a portfolio appropriate to a chosen career plan; and

(C) demonstrate interview skills for successful job placement.

(3) Ethics and laws. The student evaluates ethical and current legal standards, rights, and restrictions governing technology, technology systems, digital media and information technology, and the use of social media in the context of today's society. The student is expected to:

(A) analyze and apply to a scenario local, state, national, and international cybersecurity laws such as David's Law and Digital Millennium Copyright Act;

(B) evaluate noteworthy incidents or events regarding cybersecurity; and

(C) evaluate compliance requirements such as Section 508 of the Rehabilitation Act of 1973, Family Educational Rights and Privacy Act of 1974 (FERPA), Health Insurance Portability and Accountability Act of 1996 (HIPAA), Gramm-Leach-Bliley Act (GLBA), and Cybersecurity Maturity Model Certification (CMMC).

(4) Digital citizenship. The student understands and demonstrates the social responsibility of end users regarding significant issues relating to digital technology, safety, digital hygiene, and cyberbullying. The student is expected to:

(A) debate the relationship between privacy and security; and

(B) differentiate between ethical and unethical behavior when presented with various scenarios related to cybersecurity activities.

(5) Cybersecurity skills. The student simulates the process of penetration testing. The student is expected to:

(A) illustrate the phases of penetration testing, including plan, discover, attack, and report;

(B) design a plan to gain authorization for penetration testing;

(C) evaluate commonly used vulnerability scanning tools such as port scanning, packet sniffing, and password crackers;

(D) develop a list of exploits based on results of scanning tool reports; and

(E) prioritize a list of mitigations based on results of scanning tool reports.

(6) Cybersecurity skills. The student understands common cryptographic methods. The student is expected to:

(A) evaluate symmetric and asymmetric algorithms such as substitution cipher, Advanced Encryption Standard (AES), Diffie-Hellman, and Rivest-Shamir-Adleman (RSA);

(B) interpret the purpose of hashing algorithms, including blockchain;

(C) demonstrate password salting;

(D) explain and create a digital signature; and

(E) illustrate steganography.

(7) Cybersecurity skills. The student understands the concept of system defense. The student is expected to:

(A) explain the purpose of establishing system baselines;

(B) evaluate the role of physical security;

(C) evaluate the functions of network security devices such as firewalls, intrusion detection systems (IDS), intrusion prevention systems (IPS), intrusion detection prevention systems (IDPS), and security information and event management (SIEM) systems;

(D) analyze log files for anomalies; and

(E) develop a plan demonstrating the concept of defense in depth.

(8) Cybersecurity skills. The student demonstrates an understanding of secure network design. The student is expected to:

(A) explain the benefits of network segmentation, including sandboxes, air gaps, and virtual local area networks (VLAN);

(B) investigate and discuss the role of software-managed networks, including virtualization and cloud architecture;

(C) evaluate the role of honeypots and honeynets in networks; and

(D) create an incoming and outgoing network policy for a firewall.

(9) Cybersecurity skills. The student integrates principles of digital forensics. The student is expected to:

(A) identify cyberattacks by their signatures, indicators, or patterns;

(B) explain proper data acquisition;

(C) examine evidence from devices for suspicious activities; and

(D) critique current cybercrime cases involving digital forensics.

(10) Cybersecurity skills. The student explores expanding and emerging technology. The student is expected to:

(A) describe the concept of Security as a Service and the role of managed security service providers (MSSP);

(B) describe the integration of artificial intelligence and machine learning in cybersecurity;

(C) investigate impacts made by predictive analytics on cybersecurity; and

(D) research and investigate other emerging trends such as augmented reality and quantum computing.

(11) Cybersecurity skills. The student uses various operating system environments. The student is expected to:

(A) select and execute appropriate commands via the command line interface (CLI) such as ls, cd, pwd, cp, mv, chmod, ps, sudo, and passwd;

(B) describe the file system structure for multiple operating systems;

(C) manipulate and edit files within the CLI; and

(D) determine network status using the CLI with commands such as ping, ifconfig/ipconfig, traceroute/tracert, and netstat.

(12) Cybersecurity skills. The student clearly and effectively communicates technical information. The student is expected to:

(A) collaborate with others to create a technical report;

(B) create, review, and edit a report summarizing technical findings; and

(C) present technical information to a non-technical audience.

(13) Risk assessment. The student understands risk and how risk assessment and risk management defend against attacks. The student is expected to:

(A) differentiate types of attacks, including operating systems, software, hardware, network, physical, social engineering, and cryptographic;

(B) explain blended threats such as combinations of software, hardware, network, physical, social engineering, and cryptographic;

(C) discuss types of risk, including business, operational, security, and financial;

(D) discuss risk response techniques, including accept, transfer, avoid, and mitigate;

(E) develop a plan of preventative measures based on discovered vulnerabilities and the likelihood of a cyberattack;

(F) identify and discuss common vulnerability disclosure websites;

(G) describe common web vulnerabilities such as cross-site scripting, buffer overflow, injection, spoofing, and denial of service;

(H) describe common data destruction and media sanitation practices such as wiping, shredding, and degaussing; and

(I) develop an incident response plan for a given scenario or attack.

(14) Risk assessment. The student understands risk management processes and concepts. The student is expected to:

(A) describe Zero Trust, least privilege, and various access control methods such as mandatory access control (MAC), role-based access control (RBAC), and discretionary access control (DAC);

(B) develop and defend a plan for multi-factor access control using components such as biometric verification systems, key cards, tokens, and passwords; and

(C) review and appraise a disaster recovery plan (DRP) that includes backups, redundancies, system dependencies, and alternate sites.

(15) Risk assessment. The student investigates the role and effectiveness of environmental controls. The student is expected to:

(A) explain commonly used physical security controls, including lock types, fences, barricades, security doors, and mantraps; and

(B) describe the role of embedded systems such as fire suppression; heating, ventilation, and air conditioning (HVAC) systems; security alarms; and video monitoring.

§127.679. Computer Maintenance (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prereq-

uisite: Principles of Information Technology. Recommended corequisite: Computer Maintenance Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Computer Maintenance, students will acquire knowledge of computer maintenance and creating appropriate documentation. Students will analyze the social responsibility of business and industry regarding the significant issues relating to the environment, ethics, health, safety, and diversity in society and in the workplace as related to computer maintenance. Students will apply technical skills to address the IT industry and emerging technologies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) employ effective reading and writing skills;

(B) employ effective verbal and nonverbal communication skills;

(C) solve problems and think critically;

(D) demonstrate leadership skills and function effectively as a team member;

(E) identify and implement proper safety procedures;

(F) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(G) demonstrate planning and time-management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) identify job opportunities and accompanying job duties and tasks; and

(B) examine the role of certifications, resumes, and portfolios in the IT profession.

(3) The student applies academic skills to the requirements of computer technologies. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures such as fellow workers, management, and customers; and

(B) interpret appropriate documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins.

(4) The student acquires an understanding of computer hardware technologies. The student is expected to:

(A) explain the fundamentals of microprocessor theory;

(B) define the use of Boolean and Binary logic in computer technologies;

(C) explain the theories of magnetism, electricity, and electronics as related to computer technologies;

(D) explain proper troubleshooting techniques as related to computer hardware;

(E) differentiate among digital and analog input and output electronics theory;

(F) explain the relationships relative to data-communications theory;

(G) describe the architecture of various computer systems;

(H) describe the function of computer components such as central processing units, storage devices, and peripheral devices;

(I) explain computer system environmental requirements and related control devices; and

(J) identify new and emerging technologies that may affect the field of computer technology.

(5) The student uses hardware design, operation, and maintenance knowledge and skills to identify major computer components. The student is expected to:

(A) identify the purpose and function of computer components in the operation of the computer system such as central processing unit, mother board, sockets, chipsets, basic input and output system and their drivers, memory, hard drive technologies, video cards, input and output devices and ports, and modem and network interface cards (NIC);

(B) identify how mobile devices such as personal data assistants and cell phones operate;

(C) identify how mobile devices such as personal data assistants and cell phones connect and share data;

(D) demonstrate an understanding of the rationale behind error messages and symptoms of hardware failures;

(E) research interrupt sequences and beep codes; and

(F) identify priorities and interrupts at the system level.

(6) The student acquires knowledge of operating system design, including operation and maintenance. The student is expected to:

(A) explain the fundamentals of an operating system;

(B) compare and contrast different operating systems; and

(C) identify the operating systems of mobile devices.

(7) The student acquires knowledge of the theory behind the installation, configuration of software programs, and updates in IT systems. The student is expected to:

(A) identify the operational features and proper terminology related to computer software systems;

(B) evaluate application software packages;

(C) verify that software is properly licensed prior to installation;

(D) differentiate between types of software such as Software as a Service, single-user, per-seat, enterprise, freeware, shareware, and open-source licensing; and

(E) explain proper troubleshooting techniques related to computer software.

(8) The student acquires knowledge of the installation and configuration of network connections. The student is expected to:

(A) explain the fundamentals of network connections and interface requirements;

(B) explain the steps required to install and configure a computer on a network; and

(C) identify the steps to troubleshoot network connectivity.

§127.680. Computer Maintenance Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Information Technology. Corequisite: Computer Maintenance. This course must be taken concurrently with Computer Maintenance and may not be taken as a stand-alone course. Districts are encouraged to offer this course in a consecutive block with Computer Maintenance to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Computer Maintenance Lab, students will acquire knowledge of computer maintenance and creating appropriate documentation. Students will analyze the social responsibility of business and industry regarding the significant issues relating to the environment, ethics, health, safety, and diversity in society and in the workplace as related to computer maintenance. Students will apply technical skills to address the IT industry and emerging technologies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;

(B) demonstrate positive personal qualities such as flexibility, open mindedness, initiative, listening attentively to speakers, and willingness to learn new skills;

(C) employ effective reading and writing skills;

(D) employ effective verbal and nonverbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify and implement proper safety procedures;

(H) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(I) demonstrate planning and time-management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student applies academic skills to the requirements of computer technologies. The student is expected to:

(A) complete work orders for repair and installation;

(B) estimate supplies, materials, and labor costs for installation, maintenance, and repair work orders; and

(C) locate and interpret appropriate documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins.

(3) The student demonstrates the proper function and application of the tools, equipment, and materials used in computer technologies. The student is expected to:

(A) demonstrate safe use of equipment in computer technologies such as hand and power tools;

(B) employ available reference documentation such as tools, materials, and Internet sources to access information as needed;

(C) demonstrate proper handling and disposal of environmentally hazardous materials used in computer technologies; and

(D) research new and emerging technologies that may affect the field of computer technology.

(4) The student applies the concepts and skills of the trade in simulated work situations. The student is expected to:

(A) use electronic test equipment to measure current, voltage, power, and resistance;

(B) describe digital circuits and bus design;

(C) demonstrate the operational features and proper terminology related to computer systems;

(D) demonstrate proper usage of the various components of a computer system such as the central processor, basic input and output system, read-only memory, and random access memory; and

(E) troubleshoot computer peripheral devices.

(5) The student uses hardware design, operation, and maintenance knowledge and skills to identify major computer components. The student is expected to:

(A) assemble and install a basic computer system; and

(B) install and configure computer components such as printers and other peripherals.

(6) The student uses troubleshooting skills to solve client problems. The student is expected to:

(A) diagnose error messages and symptoms of hardware failures;

(B) research and identify interrupt sequences and beep codes;

(C) identify priorities and interrupts at the system level;

(D) test a system using diagnostic tools and software;

(E) diagnose problems in operating systems;

(F) differentiate between hardware and software failure;

(G) update Basic Input/Output System (BIOS);

(H) demonstrate hard drive maintenance procedures such as defrag scan and clear caches;

(I) gather information from the user;

(J) repair malfunctioning hardware systems;

(K) reinstall software as needed;

(L) demonstrate system backup and recovery;

(M) restore a system to various states such as safe modes and previous;

(N) demonstrate knowledge of operating system design such as operation and maintenance; and

(O) apply knowledge of operating system design to perform information support and service tasks of different operating systems.

(7) The student installs and configures software programs and updates IT systems. The student is expected to:

(A) evaluate application software packages and test the functionality of a proposed software configuration;

(B) verify software is properly licensed prior to installation;

(C) install application and systems software using available resources as needed;

(D) resolve problems with installation if any occur such as recovery from system error;

(E) perform software customization as requested;

(F) document all procedures; and

(G) install and maintain security software.

(8) The student installs, configures, and verifies active network connection. The student is expected to:

(A) demonstrate an understanding of network connection and interface requirements;

(B) install and configure a computer on a network; and

(C) verify and troubleshoot network connectivity.

(9) The student provides support to computer users to maintain service. The student is expected to:

(A) develop a written disaster recovery plan; and

(B) develop a written preventive maintenance plan.

§127.681. Networking (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Information Technology, Computer Maintenance, and Computer Maintenance Lab. Recommended corequisite: Networking Lab. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Networking, students will develop knowledge of the concepts and skills related to data networking technologies and practices in order to apply them to personal or career development. To prepare for success, students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates the professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;

(B) identify and demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;

(C) employ effective reading and writing skills;

(D) employ effective verbal and nonverbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify and implement proper safety procedures;

(H) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(I) demonstrate planning and time-management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) select and research a specific job area with its accompanying duties and tasks;

(B) formulate a personal career plan along with the education, job skills, and experience necessary to achieve career goals; and

(C) develop a resume.

(3) The student relates core academic skills to the requirements of telecommunications and data network services. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) complete work orders for repair and installation;

(C) estimate supplies, materials, and labor costs on installation, maintenance, and repair work orders; and

(D) interpret technical documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins.

(4) The student acquires an understanding of telecommunications and data network services. The student is expected to:

(A) explain digital and analog electronics theory;

(B) demonstrate knowledge of binary in relation to Internet Protocol (IP) addressing;

(C) distinguish the differences between a data packet and voice communications;

(D) define the layers and functions of the Open System Interconnection model;

(E) explain Transport Control Protocol and IP fundamentals, including subnetting;

(F) distinguish between public and private networks;

(G) describe the standards and operations of wireless technologies in telecommunications and data networks;

(H) differentiate between types of networks;

(I) identify national standards for data communication; and

(J) identify the potential benefits and problems for the future of telecommunications and data networking.

(5) The student analyzes various types of configurations and upgrading. The student is expected to:

(A) demonstrate understanding of components of telecommunications and data networks;

(B) identify major network operating systems;

(C) distinguish between different types of cables used in the telecommunications and data networking;

(D) describe telecommunications and data networking media and connectors;

(E) differentiate among computer network topologies;

(F) explain the distinction between connectionless and connection transport;

(G) explain the use of Transport Control Protocol and IP utilities;

(H) explain how to test, validate, and troubleshoot IP connectivity; and

(I) identify good practices to ensure network security.

(6) The student recognizes and recommends the various types of network components to address industry needs. The student is expected to:

(A) analyze various types and components of networks; and

(B) analyze the characteristics of networks to select the optimum configuration for an industry solution.

(7) The student develops a network design plan. The student is expected to:

(A) produce planning documentation required prior to network implementation;

(B) explain the impact of environmental factors on computer networks;

(C) identify common peripheral ports and common network components such as hubs, routers, and switches;

(D) develop an addressing scheme, including a subnetting chart;

(E) specify the tools that are commonly used to resolve network equipment problems;

(F) identify vendor testing documentation such as patches, fixes, and upgrades;

(G) demonstrate standard backup procedures and backup media storage practices; and

(H) identify the factors that might affect performance in a network environment such as logic or frequency spectrum interference.

(8) The student provides support to computer users to maintain service. The student is expected to:

(A) develop a written disaster recovery plan; and

(B) develop a written preventive maintenance plan.

§127.682. Networking Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Information Technology, Computer Mainte-

nance, and Computer Maintenance Lab. Corequisite: Networking. This course must be taken concurrently with Networking and may not be taken as a stand-alone course. Districts are encouraged to offer this course in a consecutive block with Networking to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Networking Lab, students will develop knowledge of the concepts and skills related to telecommunications and data networking technologies and practices in order to apply them to personal or career development. To prepare for success, students must have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;

(B) identify and demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;

(C) employ effective reading and writing skills;

(D) employ effective verbal and nonverbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify and implement proper safety procedures;

(H) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(I) demonstrate planning and time-management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) select and research a specific job area with its accompanying duties and tasks;

(B) formulate a personal career plan along with the education, job skills, and experience necessary to achieve career goals; and

(C) develop a resume.

(3) The student applies related core academic skills to the requirements of telecommunications and data network services. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) complete work orders for repair and installation;

(C) estimate supplies, materials, and labor costs on installation, maintenance, and repair work orders; and

(D) interpret technical documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins.

(4) The student recognizes and recommends the various types of network components to address industry needs. The student is expected to:

(A) analyze various types and components of networks;

(B) use knowledge of the characteristics of networks to select the optimum configuration for an industry solution; and

(C) recommend data network solutions based on scenario-driven problems.

(5) The student develops a network design plan. The student is expected to:

(A) produce necessary documentation required prior to network implementation such as administrative and test accounts, passwords, Internet Protocol addressing, and configurations;

(B) analyze the impact of environmental factors on computer networks;

(C) indicate common peripheral ports and common network components;

(D) develop an addressing scheme, including a subnetting chart;

(E) specify the tools that are commonly used to resolve network equipment problems;

(F) identify vendor testing documentation such as patches, fixes, and upgrades;

(G) demonstrate awareness of standard backup procedures and backup media storage practices;

(H) distinguish between common types of telecommunications and data network cabling;

(I) identify the factors that might affect performance in a network environment such as logic or frequency spectrum interference; and

(J) research new and emerging technologies that may affect the field of telecommunications and data networking services.

(6) The student implements a data network plan. The student is expected to:

(A) demonstrate awareness of compatibility and cabling issues;

(B) implement an addressing scheme, including a subnet;

(C) install various types of data connectors and cabling used in computer networking and data communications;

(D) connect various types of data connectors and cabling used in computer networking and data communications;

(E) troubleshoot physical and logical indicators of trouble;

(F) employ a systematic approach to identify a network problem, distinguish between operator or system error, and select the appropriate steps to correct the error;

(G) determine the cause of a problem and select the appropriate corrective action for the network problem; and

(H) maintain a hierarchical structure for the storing and organizing of data on networks.

(7) The student implements network security systems. The student is expected to:

(A) assess potential security threats to information systems;

(B) identify the range of security needs and the problems that can occur on a data network due to security lapses;

(C) define and identify unethical practices such as hacking, phone fraud, online piracy, and data vandalism;

(D) evaluate issues related to privacy, depersonalization, and government control of data communications;

(E) develop and implement a network security plan; and

(F) identify the role that network components such as routers, firewalls, intrusion detection systems, and virtual private networks play in security.

(8) The student knows the function and application of the tools, equipment, technologies, and materials used in telecommunications services. The student is expected to:

(A) demonstrate safe use of equipment commonly employed in telecommunications services such as hand and power tools; and

(B) demonstrate proper handling and disposal of environmentally hazardous materials used in telecommunications services.

(9) The student provides support to computer users to maintain service. The student is expected to:

(A) develop a written disaster recovery plan; and

(B) develop a written preventive maintenance plan.

§127.683. Digital Media (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Digital Media, students will analyze and assess current and emerging technologies, while designing and creating multimedia projects that address customer needs and resolve a problem. Students will implement personal and interpersonal skills to prepare for a rapidly evolving workplace environment. The knowledge and skills acquired and practiced will enable students to successfully perform and interact in a technology-driven society. Students will enhance reading, writing, computing, communication, and critical thinking and apply them to the IT environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors and qualities that enhance employability and job advancement such as regular attendance, attention to proper attire, maintenance of a clean and safe work environment, pride in work, flexibility, and initiative;

(B) employ effective verbal and nonverbal communication skills;

(C) employ effective reading and writing skills;

(D) solve problems and think critically;

(E) demonstrate leadership skills and function effectively as a team member;

(F) demonstrate an understanding of legal and ethical responsibilities in relation to the field of information technology; and

(G) demonstrate planning and time-management skills such as storyboarding and project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies employment opportunities in the IT field with a focus in the area of digital media. The student is expected to:

(A) identify job opportunities and accompanying job duties and tasks;

(B) research careers of personal interest along with the education, job skills, and experience required to achieve personal career goals;

(C) demonstrate an understanding of the functions of resumes and portfolios; and

(D) create a digital portfolio.

(3) The student uses emerging technologies to exchange and gather information and resources. The student is expected to:

(A) collaborate using various electronic technologies such as email, blogs, chat rooms, discussion threads, social media, podcasting, and wikis;

(B) demonstrate appropriate search strategies for finding resources or assets on the Internet;

(C) discuss recent digital media technologies; and

(D) evaluate and select appropriate software for the development of projects.

(4) The student complies with standard practices and behaviors that meet legal and ethical responsibilities. The student is expected to:

(A) explain and demonstrate ethical use of technology and online resources;

(B) compare and contrast fair use, open source, and creative commons;

(C) adhere to intellectual property laws and regulations;

(D) differentiate between copyright and trademarks;

(E) explain the concept of intellectual property laws, including copyright, trademarks, and patents and consequences of violating each type of law;

(F) define and identify unethical practices such as hacking, online piracy, and data vandalism;

(G) demonstrate ethical use of Internet and online resources, including citation of source; and

(H) describe the function of a non-disclosure agreement and intellectual property agreement.

(5) The student analyzes and applies design and layout principles in digital media. The student is expected to:

(A) compare and contrast printed and digital communications products that demonstrate appropriate and inappropriate use of design and layout principles;

(B) identify and apply perspective such as backgrounds, light, shades, shadows, and scale to capture a focal point and create depth;

(C) identify and apply principles of proportion, balance, variety, emphasis, harmony, symmetry, unity, and repetition in type, color, size, line thickness, shape, and space;

(D) identify and apply three-dimensional effects such as foreground, middle distance, and background images;

(E) identify and apply concepts of typography;

(F) identify and apply color theory; and

(G) create and improve digital products by applying the appropriate design and layout principles.

(6) The student designs and creates digital graphics. The student is expected to:

(A) compare and contrast the characteristics of raster-based bitmap graphics and vector-based graphics;

(B) create and modify digital graphics using appropriate vector-based and raster-based software following standard design principles;

(C) export and set graphics to be used in both print and digital formats;

(D) demonstrate knowledge of graphic resolution, file size, file formats, and file management;

(E) determine the type of data stored in a file based on its file extension and select appropriate software to modify, create, and view the file; and

(F) differentiate between the color mode selections in determining product output.

(7) The student demonstrates appropriate use of digital photography equipment and techniques. The student is expected to:

(A) demonstrate proper use of safety procedures while using digital photography equipment;

(B) capture still shot images using digital photography equipment incorporating various photo composition techniques such as lighting, perspective, candid versus posed, rule of thirds, and level of horizon;

(C) transfer still shot images from equipment to the computer; and

(D) demonstrate photographic enhancement techniques such as feathering, layering, masking, and color enhancement using appropriate photo editing software.

(8) The student demonstrates appropriate use of video equipment and techniques. The student is expected to:

(A) demonstrate proper use of safety procedures while using digital video equipment;

(B) demonstrate proper use of terminology in relation to video technology;

(C) demonstrate proper ethics in the use of digital video photography equipment to capture video images;

(D) transfer video images from equipment to the computer;

(E) apply videographic enhancement and editing techniques such as panning, transitioning, zooming, content editing, and synchronizing audio and video using appropriate digital manipulation software; and

(F) export video files in digital formats to be used in various delivery systems such as podcasts, downloadable media, social media, and streaming video.

(9) The student demonstrates appropriate use of audio equipment and techniques. The student is expected to:

(A) demonstrate proper use of safety procedures while using digital audio equipment;

(B) demonstrate proper use of terminology and concepts in relation to audio technology;

(C) demonstrate proper use of digital audio equipment to capture audio files;

(D) transfer audio files from equipment to the computer;

(E) demonstrate proper use of audio editing software such as adding effects, fading, volume control, and manipulation of waveforms using appropriate digital manipulation software; and

(F) export audio files to be used in digital formats in various delivery systems such as podcasts, downloadable files, social media, and streaming video.

(10) The student demonstrates appropriate use of animation. The student is expected to:

(A) plan and create a linear and non-linear animation using accepted standards such as design principles, frames and key frames, integration of audio into an animation, and user interactive controls;

(B) deploy animation to be used in various digital formats and on various video animation players; and

(C) create an interactive animation.

(11) The student demonstrates appropriate project management in the creation of digital media projects. The student is expected to:

(A) initiate a project, including identifying the purpose, audience, and audience needs for design plans;

(B) develop a plan for a media project such as a storyboard and stage development and identify equipment and resources;

(C) execute and monitor and control a project along its timeline and make suggested revisions until completion of the project; and

(D) close a project, including identifying lessons learned.

(12) The student deploys digital media into print, web-based, and video products. The student is expected to:

(A) incorporate video, audio, text, graphics, and animations into a web page;

(B) incorporate various digital media products into an electronic document such as a newsletter, social media outlet, poster, or report; and

(C) incorporate various digital media products into an interactive product such as an animation, computer program, simulation, interactive website, or application.

§127.684. Web Communications (One-Half Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course is a Level 1 course and is recommended for students in Grade 9.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Web Communications, students will acquire knowledge of web communications and technological operations and concepts. This is an exploratory course in web communications. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) demonstrate proficiency in the use of local and online collaboration;

(B) create websites using web editors or web authoring programs;

(C) evaluate the accessibility and usability of original websites; and

(D) conceptualize possible technologies based on current technical trends.

(2) Communication and collaboration. The student uses digital technology to work collaboratively toward his or her own learning and the learning of others. The student is expected to:

(A) analyze and implement the proper and acceptable use of digital/virtual communications technologies such as instant messaging (IM), chat, email, and social networking;

(B) define and implement the acquisition, sharing, and use of files taking into consideration primary ownership and copyright;

(C) apply decisions regarding the selection, acquisition, and sharing of uniform resource locators (URLs) used in research, taking into consideration their quality, appropriateness, and effectiveness; and

(D) solve problems using critical-thinking strategies.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) verify the accuracy, validity, and currency of acquired information;

(B) conduct effective searches using Boolean operators;

(C) acquire and use appropriate vocabulary terms;

(D) cite sources appropriately using established methods;

(E) model ethical and legal acquisition of digital information following guidelines in the student code of conduct, including plagiarism and copyright laws;

(F) identify and discuss emerging technologies and their impact;

(G) understand Internet history and structure and how they impact current use; and

(H) demonstrate appropriate use of grammar, spelling, and vocabulary when creating original work.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) demonstrate the transfer and adaptation of knowledge through the creation of original work;

(B) evaluate and implement security measures such as firewalls and Hypertext Transfer Protocol Secure (HTTPS) to protect original work;

(C) analyze and follow timelines needed to create, edit, and present original work;

(D) verify current licensing issues for software being used for the creation of original work;

(E) identify and evaluate the design and functionality of web pages using rubrics;

(F) optimize web information for fast download such as dial-up and high-speed Internet and mobile devices; and

(G) evaluate original work through self-, peer, and professional review of websites.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) engage in online activities that follow appropriate behavioral, communication, and privacy guidelines, including ethics, personal security, and verbiage determined by the intended audience;

(B) understand the negative impact of inappropriate technology use, including online bullying and harassment;

(C) implement online security guidelines, including identity protection, limited personal information sharing, and password protection of a secure website; and

(D) advocate and practice safe, legal, and responsible use of information and technology.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge of hardware such as scanners, cameras, printers, video cameras, and external hard drives;

(B) identify the parts of a computer and explain their functions;

(C) summarize the need, functionality, and use of servers;

(D) identify the advantages and disadvantages of running a personal web server versus using a web server provider;

(E) differentiate and appropriately use various input, processing, output, and primary/secondary storage devices;

(F) create and implement universally accessible documents;

(G) analyze bandwidth issues as they relate to audience, servers, connectivity, and cost;

(H) establish a folder/directory hierarchy for storage of a web page and its related or linked files;

(I) follow file and folder naming conventions, including spacing, special characters, and capitalization; and

(J) identify basic design principles when creating a website.

§127.685. Web Design (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. This course is a Level 3 course and is recommended for students in Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Web Design students will acquire knowledge of web design and technological operations and concepts that support creativity, innovation, collaboration, information fluency, critical thinking and decision making. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) demonstrate proficiency in local and online collaboration;

(B) create a website using web editors and web authoring programs;

(C) evaluate the accessibility and usability of an original website as it relates to a target audience;

(D) conceptualize new possible technologies based on current technical trends;

(E) analyze the use of virtualization such as virtual classrooms, distance learning, virtual storage, and a virtual operating system;

(F) demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components; and

(G) make decisions regarding the selection, acquisition, and use of software, taking into consideration its quality, appropriateness, effectiveness, and efficiency.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) analyze and implement the proper and acceptable use of digital/virtual communications technologies such as instant messaging (IM), chat, email, and social networking;

(B) define and implement the acquisition, sharing, and use of files, taking into consideration their primary ownership and copyright;

(C) apply decisions regarding the selection, acquisition, and sharing of uniform resource locators (URLs) used in research, taking into consideration their quality, appropriateness, and effectiveness;

(D) solve problems using critical-thinking strategies; and

(E) compare, evaluate, and implement the use of wired versus wireless access.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) verify the accuracy, validity, and currency of acquired information;

(B) conduct effective searches with Boolean operators;

(C) acquire and use appropriate vocabulary terms;

(D) cite sources appropriately using established methods;

(E) model ethical and legal acquisition of digital information following guidelines in the student code of conduct, including plagiarism and copyright laws;

(F) identify and discuss emerging technologies and their impact;

(G) understand Internet history and structure and how they impact current use;

(H) demonstrate appropriate use of grammar, spelling, and vocabulary when creating original work;

(I) acquire, evaluate, and use various web standards such as World Wide Web Consortium (W3C), Ecma International, and Internet Corporation for Assigned Names and Numbers (ICANN) to make informed decisions and implement standards in original work;

(J) understand, analyze, and use interactive websites;

(K) understand, evaluate, and determine the appropriate use of dynamic and static websites;

(L) understand, evaluate, and determine the appropriate use of open/closed source file formats and software;

(M) explain and demonstrate how search engines work such as advanced options, preferences, advertising, and search categories;

(N) evaluate, create, and apply principles of project management, including web storyboards, site maps, job duties, time constraints, group dynamics, communication interaction, and project completion, evaluation, and feedback;

(O) understand the use and application of a virtual private network (VPN);

(P) distinguish among protocols, including Hypertext Transfer Protocol (HTTP) and File Transfer Protocol (FTP);

(Q) summarize the technical needs of a World Wide Web server, including random access memory (RAM), hard disk capacity, central processing unit (CPU) speed, busses, methods of connectivity, and appropriate software;

(R) demonstrate proficiency in the use of a variety of electronic input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by incorporating such components while publishing web pages;

(S) demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranets;

(T) demonstrate proficiency in and appropriate use and navigation of local area networks (LANs), wide area networks (WANs), the Internet, and intranets for research and resource sharing;

(U) construct appropriate search strategies in the acquisition of information from the Internet, including keyword searches and searches with Boolean operators; and

(V) acquire information in electronic formats, including text, audio, video, and graphics, citing the source.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) demonstrate the transfer and adaptation of knowledge through the creation of original work;

(B) evaluate and implement security measures to protect original work such as firewalls and Hypertext Transfer Protocol Secure (HTTPS);

(C) analyze and follow timelines needed to create, edit, and present original work;

(D) verify current licensing issues for software being used for the creation of original work;

(E) identify and evaluate the design and functionality of web pages using rubrics;

(F) optimize web information for fast download such as dial-up and high-speed Internet and mobile devices;

(G) evaluate original work through self-, peer, and professional review of websites;

(H) evaluate the types, functions, and target audiences of websites;

(I) read, use, and develop technical documents;

(J) analyze, examine, assess, and decide on servers as they relate to the management of a website;

(K) analyze, examine, assess, and decide on a web host;

(L) analyze, examine, assess, and decide on domain name acquisition and retention;

(M) evaluate the functionality of a website such as color scheme, grammar, technological constraints, age appropriateness, cross-platform usability, and user relevant criteria as it relates to an intended audience;

(N) identify software file formats and their characteristics and appropriate use;

(O) identify and apply search engine optimization (SEO) to ensure optimal website visibility;

(P) investigate and choose electronic security methods for a web server to protect from unauthorized access and negative intentions; and

(Q) draw conclusions from data gathered from electronic and telecommunication resources.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) engage in online activities that follow appropriate behavioral, communication, and privacy guidelines, including ethics, personal security, verbiage determined by the intended audience, and ethical use of files and file sharing;

(B) understand the negative impact of inappropriate technology use, including online bullying and harassment;

(C) implement online security guidelines, including identity protection, limited personal information sharing, and password protection of a secure website;

(D) engage in safe, legal, and responsible use of information and technology;

(E) understand and respond to local, state, national, and global issues to ensure appropriate cross-browser and cross-platform usability;

(F) interpret, use, and develop a safe online shared computing environment;

(G) identify legal, ethical, appropriate, and safe website marketing practices;

(H) identify legal, ethical, appropriate, and safe multimedia usage, including video, audio, graphics, animation, and emerging trends;

(I) analyze the impact of the World Wide Web on society through research, interviews, and personal observation; and

(J) participate in relevant and meaningful activities in the larger community and society to create electronic projects.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge of hardware, including scanners, cameras, printers, video cameras, and external hard drives;

(B) identify the parts of a computer and explain its functions;

(C) summarize the need for and functionality and use of servers;

(D) identify the advantages and disadvantages of running a personal web server versus using a web server provider;

(E) differentiate and appropriately use various input, processing, output, and primary/secondary storage devices;

(F) create and implement universally accessible documents;

(G) analyze bandwidth issues as related to audience, server, connectivity, and cost;

(H) establish a folder/directory hierarchy for storage of a web page and its related or linked files;

(I) create file and folder naming conventions to follow established guidelines, including spacing, special characters, and capitalization;

(J) identify basic design principles when creating a website, including white space, color theory, background color, shape, line, proximity, unity, balance (ratio of text to white space), alignment, typography, font size, type, style, image file size, repetition, contrast, consistency, and aesthetics;

(K) demonstrate knowledge of the six core domains (gov, net, com, mil, org, edu) and be familiar with new domain implementation;

(L) implement escape codes, HyperText Markup Language (HTML), cascading style sheets (CSS), and JavaScript through hard coding, web editors, and web authoring programs;

(M) identify and use FTP client software;

(N) implement java applet insertion;

(O) identify and differentiate various network topologies, including physical and logical;

(P) create, evaluate, and use web-based animation;

(Q) create, evaluate, and use video, including editing, compression, exporting, appropriateness, and delivery;

(R) demonstrate the ability to conduct secure communications from a web server to a client; and

(S) use hypertext linking appropriately when creating web pages.

§127.686. Discrete Mathematics for Computer Science (One Credit), Beginning with School Year 2012-2013.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2012-2013 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra II. This course is a Level 3 course and is recommended for students in Grades 11 and 12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, in-

cluding laboratory and testing services, and research and development services.

(3) Discrete Mathematics for Computer Science provides the tools used in most areas of computer science. Exposure to the mathematical concepts and discrete structures presented in this course is essential in order to provide an adequate foundation for further study. Discrete Mathematics for Computer Science is generally listed as a core requirement for Computer Science majors. Course topics are divided into six areas: sets, functions, and relations; basic logic; proof techniques; counting basics; graphs and trees; and discrete probability. Mathematical topics are interwoven with computer science applications to enhance the students' understanding of the introduced mathematics. Students will develop the ability to see computational problems from a mathematical perspective. Introduced to a formal system (propositional and predicate logic) upon which mathematical reasoning is based, students will acquire the necessary knowledge to read and construct mathematical arguments (proofs), understand mathematical statements (theorems), and use mathematical problem-solving tools and strategies. Students will be introduced to discrete data structures such as sets, discrete functions, and relations and graphs and trees. Students will also be introduced to discrete probability and expectations. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:

(A) model algorithms and real-world situations using formal tools of symbolic logic;

(B) model computer science problems by using graphs and trees; and

(C) calculate the probabilities of events and expectations of random variables for such problems as games of chance.

(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) convert spoken language statements to appropriate statements in propositional logic;

(B) explain basic terminology of sets, functions, and relations;

(C) state the definition of the Master theorem;

(D) use the context of a particular application to interpret the meaning derived when computing the permutations and combinations of a set;

(E) interpret associated operations and terminology in context; and

(F) define and provide examples of logical equivalence, normal forms, validity, and modus ponens/modus tollens.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) construct truth tables for negation, conjunction, disjunction, implication, biconditional, and bit operators; and

(B) use truth tables to demonstrate propositional relations.

(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) analyze practical examples using appropriate models of sets, functions, and relations;

(B) compare and contrast tautology, contradiction, and contingency as related to propositional equivalences;

(C) compare and contrast examples and use of counterexamples, contrapositions, and contradictions;

(D) describe the appropriate use and limitations of predicate logic;

(E) apply formal methods of symbolic propositional and predicate logic;

(F) use formal logic proofs and logical reasoning to solve problems;

(G) outline the basic structure of proofs, including direct, indirect, contradiction, induction, existence, and constructive proofs;

(H) compare and contrast the types of problems best satisfied by direct, indirect, contradiction, induction, existence, and constructive proofs;

(I) relate mathematical induction to recursion and recursively defined structures;

(J) compare and contrast weak, strong, and structural induction, including when each is most appropriately used and examples of each;

(K) compare and contrast dependent and independent events;

(L) use recurrence equations to analyze algorithms and other practical problems;

(M) use counting techniques to analyze algorithms and other practical problems;

(N) apply probability tools to solve problems; and

(O) define, compare, and contrast simple graphs, multigraphs, and directed and undirected graphs using definitions, properties, and examples, including special cases.

(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:

(A) model ethical acquisition and use of digital information;

(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies; and

(C) investigate how the concepts of discrete mathematics are related to relevant problems and significant questions.

(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:

(A) perform operations associated with sets, functions, and relations;

(B) apply basic counting principles, including cardinality and the pigeonhole principle;

(C) apply appropriate precedence when using logical operators;

(D) use appropriate strategies, including De Morgan's Laws, to identify propositional equivalences;

(E) identify and appropriately use predicates, existential and universal quantifiers, and valid arguments;

(F) identify possible applications of proofs, including evaluating algorithmic complexity;

(G) state and appropriately use the product and sum rules;

(H) compute permutations and combinations of a set;

(I) solve a variety of basic recurrence equations;

(J) apply the binomial theorem to independent events;

(K) apply Bayes' theorem to dependent events;

(L) demonstrate transversal methods for trees and graphs; and

(M) relate graphs and trees to data structures, algorithms, and counting.

§127.687. Game Programming and Design (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is a Level 2 course and is recommended for students in Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Game Programming and Design will foster student creativity and innovation by presenting students with opportunities to design, implement, and present meaningful programs through a variety of media. Students will collaborate with one another, their instructor, and various electronic communities to solve gaming problems. Through data analysis, students will include the identification of task requirements, plan search strategies, and use programming concepts to access, analyze, and evaluate information needed to design games. By acquiring programming knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will learn digital citizenship by researching current laws and regulations and by practicing integrity and respect. Students will create a computer game that is presented to an evaluation panel. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:

(A) understand the basic game design elements, including conceptual ideas, storyline, visualization, storyboard, game effects, sound elements, game play, game controls, and player tutorial;

(B) create a design concept document;

(C) create a storyboard;

(D) demonstrate an understanding of the fundamentals of game art, including the look and feel, graphics coordinate system, basics of color, and color palettes;

(E) use bitmap graphics images, including designing, creating, reading, and manipulating images;

(F) create backgrounds, including solid, image, and tiled backgrounds;

(G) write programs creating images using geometric shapes;

(H) create games using sprites by evaluating the role of sprites, creating sprites, and managing sprites;

(I) create programs using sprite sheets;

(J) demonstrate an understanding of image rendering, including transparency, refresh rate, hardware acceleration, and animation;

(K) find, create, and edit game audio sound effects and music; and

(L) implement game sound mechanics, including playing, pausing, and looping.

(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) design and implement procedures to set timelines for, track the progress of, and evaluate a game product;

(B) seek and respond to input from peers and professionals in evaluating a game project;

(C) demonstrate knowledge and appropriate use of operating systems, program development tools, and networking resources;

(D) use network resources to acquire, organize, maintain, and evaluate information;

(E) collaborate to research the business of games, including the roles of developer, marketing, publisher, and retail sales; and

(F) demonstrate an understanding of and evaluate online technology, including online interaction and massive multiplayer games.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) play board games to research and collect game play data;

(B) evaluate, analyze, and document game styles and playability; and

(C) research the dramatic elements in games, including kinds of fun, player types, and nonlinear storytelling.

(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) demonstrate an understanding of the game design process, including generating ideas, brainstorming, and paper prototyping;

(B) write programs using variables of different data types;

(C) evaluate game rules and instructions;

(D) demonstrate an understanding of the user experience by comparing rules and game-play patterns;

(E) write game rules and instructions;

(F) develop game software;

(G) write computer game code, resolve game defects, and revise existing game code; and

(H) test a finished game product by implementing sound testing techniques.

(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:

(A) explore intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements;

(B) model ethical acquisition and use of digital information;

(C) demonstrate proper digital etiquette when using networks, responsible use of software, and knowledge of acceptable use policies;

(D) model respect of intellectual property, including manipulating graphics, morphing graphics, editing graphics, and editing sound;

(E) discuss and evaluate the social issues surrounding gaming; and

(F) evaluate the cultural aspects of game design fundamentals, including rationale for games and types of games.

(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to game programming. The student is expected to:

(A) identify basic game components, including the game engine, game play subsystems, data structures, models, and interfaces;

(B) generate random numbers in a program;

(C) create a program implementing conditional statements;

(D) develop an appropriate data model;

(E) demonstrate an understanding of and apply object-oriented game programming;

(F) demonstrate an understanding of game programming essentials, including event-driven programming, communicating with messages, and device management;

(G) demonstrate an understanding of the role of game events, the animation loop, and game timing;

(H) demonstrate an understanding of the role of game engines;

(I) demonstrate an understanding of video display flicker and double buffering;

(J) apply basic game screen design and layout, including visual controls, user interfaces, menus, and options;

(K) use game control design to understand, access, and control input devices, including keyboard, mouse, and joystick;

(L) demonstrate an understanding of and apply game animation, including the principles of animation and frame-based animation;

(M) demonstrate an understanding of decision making and types of decisions;

(N) demonstrate an understanding of game events, including listeners, triggers, and timed events;

(O) demonstrate an understanding of and implement collision detection, including bounding boxes and sprite collisions;

(P) implement a tile-based game, including loading tile maps, drawing tile maps, rendering a tile map, and layering sprites;

(Q) demonstrate an understanding of artificial intelligence and develop and implement artificial intelligence;

(R) demonstrate an understanding of game balance and tuning; and

(S) demonstrate an understanding of player progression, including leveling, linear progression, and maintaining high score data.

§127.688. Mobile Application Development (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is a Level 3 course and is recommended for students in Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

(3) Mobile Application Development will foster students' creativity and innovation by presenting opportunities to design, implement, and deliver meaningful projects using mobile computing devices. Students will collaborate with one another, their instructor, and various electronic communities to solve problems presented throughout the course. Through data analysis, students will identify task requirements, plan search strategies, and use software development concepts to access, analyze, and evaluate information needed to program mobile devices. By using software design knowledge and skills that support the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. Students will learn digital citizenship by researching current laws and regulations and by practicing integrity and respect. Students will gain an understanding of the principles of mobile application development through the study of development platforms, programming languages, and software design standards. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. The student is expected to:

(A) create effective user interfaces appropriate for a specified mobile device that is best suited for an identified purpose;

(B) create effective user interfaces for browser-based, native, and hybrid mobile applications;

(C) create mobile application components appropriate for identified needs;

(D) create browser-based applications for mobile devices;

(E) create native applications that can reside on specified mobile devices; and

(F) create mobile applications that combine native and hybrid components.

(2) Communication and collaboration. The student communicates and collaborates with peers to contribute to his or her own learning and the learning of others. The student is expected to:

(A) demonstrate an understanding of and discuss how teams function;

(B) use teamwork to solve problems;

(C) describe the development workflow of mobile applications;

(D) use time-management techniques to develop and maintain work schedules, meet deadlines, and establish mobile application project criteria;

(E) describe a problem solution; and

(F) document and share problem solutions through various media.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) analyze, identify, and describe mobile application project stakeholders and their perspectives;

(B) collect and analyze available data to identify mobile application project requirements;

(C) analyze, identify, and describe input, output, and processing requirements; and

(D) analyze, identify, and define hardware and software specifications.

(4) Critical thinking, problem solving, and decision making. The student uses appropriate strategies to analyze problems and design algorithms. The student is expected to:

(A) compare and contrast design decisions based on the hardware considerations of a mobile device;

(B) compare and contrast available mobile technologies, including platforms and their operating systems;

(C) compare and contrast available development approaches, including application to specific technologies and platforms;

(D) determine the most appropriate solution for the development of a given mobile application, including browser-based, native, and hybrid approaches;

(E) compare and contrast available programming languages and how their use might be applied to specific technologies and platforms;

(F) identify and justify the selection of an appropriate programming language, including available resources and required interfaces;

(G) select an appropriate program development environment;

(H) identify and use available libraries;

(I) evaluate and justify the selection of appropriate options and components;

(J) compare and contrast available networks and their implications for mobile application development; and

(K) compare and contrast design strategies related to mobile network and device security.

(5) Digital citizenship. The student explores and understands safety, legal, cultural, and societal issues relating to the use of technology and information. The student is expected to:

(A) discuss copyright laws and issues;

(B) model ethical acquisition and use of digital information;

(C) cite sources using established methods;

(D) demonstrate proper digital etiquette and knowledge of acceptable use policies;

(E) investigate mobile device security measures such as passwords, virus detection, and virus prevention;

(F) describe potential risks and benefits associated with the use of a mobile application;

(G) identify current and emerging technologies related to mobile applications; and

(H) evaluate technologies and assess their applicability to current mobile applications.

(6) Technology operations and concepts. The student understands technology concepts, systems, and operations as they apply to computer science. The student is expected to:

(A) demonstrate an understanding of the difference between desktop and mobile applications;

(B) demonstrate an understanding of hardware and software structures and requirements in the design of mobile applications;

(C) recognize multiple platforms and demonstrate an understanding of their associated requirements;

(D) recognize various program development environments;

(E) demonstrate an understanding of event-based programming and its appropriate use;

(F) describe how memory management affects mobile application design;

(G) demonstrate an understanding of how low bandwidth and the mobility of a device affect the design of mobile applications;

(H) identify applications that are best suited for mobile devices;

(I) demonstrate an understanding of the use of libraries when designing mobile applications;

(J) use a simulation tool to emulate a mobile device's functionality; and

(K) use actual mobile devices to test mobile applications.

§127.720. Independent Study in Technology Applications (One Credit), Beginning with School Year 2012-2013.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2012-2013 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: a minimum of one credit from the courses in the Information Technology Career Cluster. This course is a Level 4 course and may be taken at Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Independent Study in Technology Applications, through the study of technology applications foundations, including technology-related terms, concepts, and data input strategies, students will communicate information in different formats and to diverse audiences using a variety of technologies. Students will learn to make informed decisions; develop and produce original work that exemplifies the standards identified by the selected profession or discipline; and publish the product in electronic media and print. Students will practice the efficient acquisition of information by identifying task requirements, using search strategies, and using technology to access, analyze, and evaluate the acquired information. By using technology as a tool that supports the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) apply existing knowledge to promote creativity in designing new technology products or services;

(B) design and implement procedures to track trends, set timelines, and review and evaluate progress for continual improvement in process and product;

(C) produce electronic documentation to illustrate the progress of a project;

(D) seek and respond to input from peers and professionals in delineating technological tasks and problem solving;

(E) make necessary revisions and/or proceed to the next stage of study;

(F) use technology terminology appropriate to the independent study course;

(G) develop and apply advanced creativity and innovation employed in technology applications skills;

(H) identify and solve problems, individually and with input from peers and professionals, using research methods and advanced creativity and innovation skills used in a selected profession or discipline;

(I) develop products that meet standards identified by the selected profession or discipline; and

(J) produce original work to solve an identified problem and publish a product in electronic media and print.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) format developed projects according to defined output specifications, including target audience and viewing environment;

(B) present findings to a panel for comment and professional response;

(C) determine and implement the best method of presenting or publishing findings;

(D) synthesize and publish information in a variety of print or digital formats;

(E) use evolving network and Internet resources and appropriate technology skills to create, exchange, and publish information;

(F) develop cultural understanding and global awareness by interacting with learners of other cultures through evolving digital formats and communication methods;

(G) collaborate with others to identify a problem to be solved, hypotheses, and strategies to accomplish a task;

(H) participate with electronic communities as a learner, initiator, contributor, and facilitator/mentor; and

(I) participate in relevant, meaningful activities in the larger community and society to create electronic projects.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student is expected to:

(A) use evolving network and Internet resources for research and resource sharing of technology applications;

(B) apply appropriate search strategies in the acquisition of information from the Internet, including keyword and Boolean search strategies;

(C) pose hypotheses and questions related to a selected problem;

(D) acquire information using appropriate research strategies with source citations through electronic formats, including interactive components, text, audio, video, graphics, and simulations; and

(E) identify, create, and use available file formats, including text, image, video, and audio files.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) evaluate the design, functionality, and accuracy of the accessed information;

(B) conduct systematic research;

(C) demonstrate creative-thinking and problem-solving skills;

(D) integrate appropriate productivity tools, including network, mobile access, and multimedia tools, in the creation of solutions to problems;

(E) use enriched curricular content in the creation of products;

(F) synthesize and generate new information from data gathered from electronic resources;

(G) read and use technical documentation; and

(H) write simple technical documentation relative to the audience.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements;

(B) model ethical acquisition and use of digital information;

(C) model respect of intellectual property when editing graphics, video, text, and sound files;

(D) demonstrate proper etiquette, responsible use of software, and knowledge of acceptable use policies when using network resources;

(E) demonstrate best practices in understanding and applying information security;

(F) develop and maintain a technical documentation library in a variety of formats; and

(G) investigate how technology has changed and the social and ethical ramifications of computer usage.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge and appropriate use of input devices, operating systems, software applications, and communication and networking components;

(B) select, acquire, and use appropriate digital tools;

(C) delineate and make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity; and

(D) use appropriate technology terminology and naming conventions.

§127.721. Independent Study in Evolving/Emerging Technologies (One Credit).

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: a minimum of one credit from the courses in the Information Technology Career Cluster. This course is a Level 4 course and may be taken at Grades 9-12.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In the Independent Study in Evolving/Emerging Technologies course, through the study of evolving/emerging technologies, including technology-related terms, concepts, and data input strategies, students will communicate information in different formats and to diverse audiences using a variety of technologies. Students will learn to make informed decisions, develop and produce original work that exemplifies the standards identified by the selected profession or discipline, and publish the product in electronic media and print. Students will demonstrate efficient acquisition of information by identifying task requirements, using search strategies, and using technology to access, analyze, and evaluate the acquired information. By using technology as a tool that supports the work of individuals and groups in solving problems, students will select the technology appropriate for the task, synthesize knowledge, create solutions, and evaluate the results. The six strands include creativity and innovation; communication and collaboration; research and information fluency; critical thinking; problem solving, and decision making; digital citizenship; and technology operations and concepts.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) Creativity and innovation. The student demonstrates creative thinking, constructs knowledge, and develops innovative products and processes using technology. The student is expected to:

(A) apply existing knowledge to promote creativity in designing new technology products or services;

(B) design and implement procedures to track trends, set timelines, and review and evaluate progress for continual improvement in process and product;

(C) produce electronic documentation to illustrate the progress of a project;

(D) seek and respond to input from peers and professionals in delineating technological tasks and problem solving;

(E) make necessary revisions and/or proceed to the next stage of study;

(F) use technology terminology appropriate to the independent study course;

(G) develop and apply advanced creativity and innovation employed in technology applications skills;

(H) identify and solve problems, individually and with input from peers and professionals, using research methods and advanced creativity and innovation skills used in a selected profession or discipline;

(I) develop products that meet standards identified by a selected profession or discipline; and

(J) produce original work to solve an identified problem and publish a product in electronic media and print.

(2) Communication and collaboration. The student uses digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning experience of others. The student is expected to:

(A) format developed projects according to defined output specifications, including target audience and viewing environment;

(B) present findings to a panel for comment and professional response;

(C) determine and implement the best method of presenting or publishing findings;

(D) synthesize and publish information in a variety of print or digital formats;

(E) use evolving network resources and appropriate technology skills to create, exchange, and publish information;

(F) develop cultural understanding and global awareness by interacting with learners of other cultures through evolving digital formats and communication methods;

(G) collaborate with others to identify a problem to be solved, hypotheses, and strategies to accomplish a task;

(H) participate with electronic communities as a learner, initiator, contributor, and facilitator/mentor; and

(I) participate in relevant, meaningful activities in the larger community and society to create electronic projects.

(3) Research and information fluency. The student applies digital tools to gather, evaluate, and use information. The student uses a variety of strategies to acquire information from electronic resources, with appropriate supervision. The student is expected to:

(A) use evolving network and Internet resources for research and resource sharing of technology applications;

(B) apply appropriate search strategies in the acquisition of information from the Internet, including keyword and Boolean search strategies;

(C) pose hypotheses and questions related to a selected problem;

(D) acquire information using appropriate research strategies with source citations through electronic formats, including interactive components, text, audio, video, graphics, and simulations; and

(E) identify, create, and use available file formats, including text, image, video, and audio files.

(4) Critical thinking, problem solving, and decision making. The student uses critical-thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. The student is expected to:

(A) evaluate the design, functionality, and accuracy of the accessed information;

(B) conduct systematic research;

(C) demonstrate creative-thinking and problem-solving skills;

(D) integrate appropriate productivity tools, including network, mobile access, and multimedia tools, in the creation of solutions to problems;

(E) use enriched curricular content in the creation of products;

(F) synthesize and generate new information from data gathered from electronic resources;

(G) read and use technical documentation; and

(H) write simple technical documentation relative to the audience.

(5) Digital citizenship. The student understands human, cultural, and societal issues related to technology and practices legal and ethical behavior. The student is expected to:

(A) discuss intellectual property, privacy, sharing of information, copyright laws, and software licensing agreements;

(B) model ethical acquisition and use of digital information;

(C) model respect of intellectual property when editing graphics, video, text, and sound files;

(D) demonstrate proper etiquette, responsible use of software, and knowledge of acceptable use policies when using network resources;

(E) demonstrate best practices in understanding and applying information security;

(F) develop and maintain a technical documentation library in a variety of formats; and

(G) investigate how technology has changed and the social and ethical ramifications of computer usage.

(6) Technology operations and concepts. The student demonstrates a sound understanding of technology concepts, systems, and operations. The student is expected to:

(A) demonstrate knowledge and appropriate use of input devices, operating systems, software applications, and communication and networking components;

(B) select, acquire, and use appropriate digital tools;

(C) delineate and make necessary adjustments regarding compatibility issues, including digital file formats and cross-platform connectivity; and

(D) use appropriate technology terminology and naming conventions.

§127.722. Advanced Placement (AP) Computer Science A (Two Credits).

(a) General requirements. This course is a Level 3 course in a career and technical education (CTE) program of study. Students shall be awarded two credits for successful completion of this course. Recommended prerequisites: Algebra I or a student should be comfortable with functions and the concepts found in the uses of functional notation such as $f(x) = x + 2$ and $f(x) = g(h(x))$.

(b) Content requirements. Content requirements for Advanced Placement (AP) Computer Science A are prescribed in the College Board Publication Advanced Placement Course Description: Computer Science A, published by The College Board.

§127.723. Advanced Placement (AP) Computer Science Principles (One Credit).

(a) General requirements. This course is a Level 2 course in a career and technical education (CTE) program of study. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Algebra I.

(b) Content requirements. Content requirements for Advanced Placement (AP) Computer Science Principles are prescribed in the College Board Publication Advanced Placement® Curriculum Framework: AP Computer Science Principles, published by The College Board.

§127.724. International Baccalaureate (IB) Computer Science Standard Level (Two Credits).

(a) General requirements. This course is a Level 3 course in a career and technical education (CTE) program of study. Students shall be awarded two credits for successful completion of this course. Recommended prerequisites: Computer Science I, Algebra II.

(b) Content requirements. Content requirements for IB Computer Science Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§127.725. International Baccalaureate (IB) Computer Science Higher Level (Two Credits).

(a) General requirements. This course is a Level 3 course in a career and technical education (CTE) program of study. Students shall be awarded two credits for successful completion of this course. Recommended prerequisites: Computer Science I, Algebra II.

(b) Content requirements. Content requirements for IB Computer Science Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§127.726. International Baccalaureate (IB) Digital Society Standard Level (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. Recommended prerequisites: Computer Science I, Algebra II.

(b) Content requirements. Content requirements for IB Digital Society Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§127.727. International Baccalaureate (IB) Digital Society Higher Level (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. Recommended prerequisites: Computer Science I, Algebra II.

(b) Content requirements. Content requirements for IB Digital Society Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§127.735. Practicum in Information Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. Prerequisite: a minimum of two high school information technology (IT) courses. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant

technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In the Practicum in Information Technology, students will gain advanced knowledge and skills in the application, design, production, implementation, maintenance, evaluation, and assessment of products, services, and systems. Knowledge and skills in the proper use of analytical skills and application of IT concepts and standards are essential to prepare students for success in a technology-driven society. Critical thinking, IT experience, and product development may be conducted in a classroom setting with an industry mentor, as an unpaid or paid internship, as part of a capstone project, or as career preparation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;

(B) identify and demonstrate qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;

(C) employ effective reading and writing skills;

(D) employ effective verbal and nonverbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify and implement proper safety procedures;

(H) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(I) demonstrate planning and time-management skills such as storyboarding and project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) improve on a personal career plan along with education, job skills, and experience necessary to achieve career goals;

(B) develop a resume that includes letters of recommendation and a portfolio appropriate to a chosen career plan; and

(C) illustrate interview skills for successful job placement.

(3) The student applies academic knowledge and skills to research and develop projects. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques consistent with IT industry standards;

(B) demonstrate proper use of mathematics concepts in the development of products or services; and

(C) demonstrate proper use of science principles in the development of products or services.

(4) The student selects an approach for conducting research to discover a problem in the field of IT with the appropriate supervision and guidance. The student is expected to:

(A) identify a problem relating to information technology; and

(B) describe and use an approach such as top-down or bottom-up for conducting a research activity.

(5) The student creates a technological solution for a problem in the field of IT. The student is expected to:

(A) apply critical-thinking strategies to develop a solution using appropriate technologies and resources, IT concepts, and industry standards;

(B) apply decision-making techniques to the selection of technological solutions; and

(C) explain how the proposed technological solution will resolve the problem.

(6) The student designs, creates, and implements a product or service that addresses a problem in the field of IT and incorporates the solution. The student is expected to:

(A) work closely with a mentor throughout the design, creation, and implementation process;

(B) develop a product or service that meets a specified need following a problem-solving strategy;

(C) identify areas where quality, reliability, and safety can be designed into a product or service;

(D) develop and implement a security management plan to address security requirements;

(E) develop a sustainability plan for the product or service;

(F) develop an evaluation method for analyzing the effect of the product or service on client satisfaction and problem resolution;

(G) develop a project portfolio that documents the research and development process; and

(H) present the portfolio to a panel of professionals using formal presentation skills.

(7) The student creates a personal portfolio. The student is expected to:

(A) create a portfolio that documents all projects and accomplishments such as academics, volunteer experience, employment experience, awards, and certifications;

(B) organize and prioritize information within the portfolio; and

(C) use written, verbal, and visual communication techniques consistent with IT industry standards.

§127.736. Extended Practicum in Information Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Information Technology Career Cluster. Prerequisite: a minimum of two high school information technology courses. Corequisite: Practicum in Information Technology. This course must be taken concurrently with Practicum in Information Technology and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In Extended Practicum in Information Technology, students will gain advanced knowledge and skills in the application, design, production, implementation, maintenance, evaluation, and assessment of products, services, and systems. Knowledge and skills in the proper use of analytical skills and application of IT concepts and standards are essential to prepare students for success in a technology-driven society. Critical thinking, IT experience, and product development may be conducted in a classroom setting with an instructor, with an industry mentor, or both.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to IT;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, integrity, customer service, work ethic, and adaptability with increased fluency;

(D) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(E) employ planning and time-management skills and tools such as project management and storyboarding with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques consistent with IT industry standards with increased proficiency;

(B) apply active listening skills to obtain and clarify information;

(C) create and deliver formal and informal presentations in an effective manner; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) apply critical-thinking strategies with increased fluency to develop solutions using appropriate technologies and resources, IT concepts, and industry standards; and

(C) apply decision-making techniques with increased fluency to choose a technology-based solution.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow IT security rules, regulations, and procedures; and

(B) develop and implement security management plans to address security requirements.

(5) The student understands the professional, ethical, and legal responsibilities in IT. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) describe and practice ethical and legal responsibilities associated with the field of IT;

(C) show integrity by choosing the ethical course of action when making decisions; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised IT experience. The student is expected to:

(A) design, create, and implement a product or service that addresses a problem or meets a specified need in the field of IT;

(B) identify areas where quality, reliability, and safety can be designed into a product or service;

(C) develop a sustainability plan for the product or service;

(D) develop an evaluation method to analyze the effect of the product or service on client satisfaction and problem resolution; and

(E) collect representative work samples.

§127.737. Computer Technician Practicum (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Information Technology, Computer Maintenance, Computer Maintenance Lab, Networking, and Networking Lab. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In the Computer Technician Practicum, students will gain knowledge and skills in the area of computer technologies, including advanced knowledge of electrical and electronic theory, computer principles, and components related to the installation, diagnosis, service, and repair of computer-based technology systems. Students will reinforce, apply, and transfer their knowledge and skills to a variety of settings and problems. Proper use of analytical skills and application of IT concepts and standards are essential to prepare students for success in a technology-driven society. Critical thinking, IT experience, and product development may be conducted in a classroom setting with an instructor, with an industry mentor, or both.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills required by business and industry. The student is expected to:

(A) identify and demonstrate work behaviors that enhance employability and job advancement such as regular attendance, promptness, attention to proper attire, maintenance of a clean and safe work environment, appropriate voice, and pride in work;

(B) identify and demonstrate qualities such as flexibility, open-mindedness, initiative, listening attentively to speakers, and willingness to learn new knowledge and skills;

(C) employ effective reading and writing skills;

(D) employ effective verbal and nonverbal communication skills;

(E) solve problems and think critically;

(F) demonstrate leadership skills and function effectively as a team member;

(G) identify and implement proper safety procedures;

(H) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(I) demonstrate planning and time-management skills such as storyboarding and project management, including initiating, planning, executing, monitoring and controlling, and closing a project.

(2) The student identifies various employment opportunities in the IT field. The student is expected to:

(A) improve on a personal career plan along with education, job skills, and experience necessary to achieve career goals;

(B) develop a resume appropriate to a chosen career plan, including letters of recommendation; and

(C) illustrate interview skills for successful job placement.

(3) The student relates core academic skills to the requirements of computer technologies. The student is expected to:

(A) demonstrate effective verbal and written communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) complete work orders and related paperwork for repair and installation;

(C) estimate supplies, materials, and labor costs for installation, maintenance, and repair work orders; and

(D) read and interpret technical documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins.

(4) The student applies communication, mathematics, English, and science knowledge and skills to research and develop projects. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques consistent with IT industry standards;

(B) demonstrate proper use of mathematics concepts in the development of products or services; and

(C) demonstrate proper use of science principles to the development of products or services.

(5) The student knows the concepts and skills that form the basis of computer technologies. The student is expected to:

(A) explain microprocessor theory;

(B) define the use of Boolean logic in computer technologies;

(C) describe the theories of magnetism, electricity, and electronics as they apply to computer systems;

(D) identify proper troubleshooting techniques;

(E) differentiate among digital and analog input and output electronics theories;

(F) describe the architecture of various computer systems;

(G) describe the function of central processing units, storage devices, peripheral devices, and microprocessor units; and

(H) explain computer system environmental requirements and related control devices.

(6) The student knows the proper function and application of the tools, equipment, technologies, and materials used in computer technologies. The student is expected to:

(A) demonstrate safe use of equipment in computer technologies such as hand and power tools;

(B) employ available reference tools, materials, and Internet sources to access information as needed;

(C) demonstrate the proper handling and disposal of environmentally hazardous materials used in computer technologies; and

(D) identify new and emerging technologies that may affect the field of computer technology such as quantum computing, photonics, and nanotechnology.

(7) The student applies the essential knowledge and skills for computer technologies to career preparation, job shadowing, mentoring, or apprenticeship training in simulated and actual work situations. The student is expected to:

(A) identify a problem relating to information technology;

(B) develop a solution using appropriate technologies, IT concepts, and IT industry standards;

(C) explain how the proposed technological solution will resolve the problem and the methodologies involved;

(D) apply decision-making techniques to the selection of technological solutions;

(E) identify areas where quality, reliability, and safety can be designed into a product or service;

(F) apply critical-thinking strategies to analyze and evaluate the proposed technological solution;

(G) develop a sustainability plan for the product or service;

(H) select and use the appropriate technological resources to conduct, research, design, and develop activities;

(I) develop the documentation of the research and development process; and

(J) present the solution to a panel of professionals using formal presentation skills.

(8) The student employs project management knowledge to oversee IT projects. The student is expected to:

(A) implement project methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project, to manage information system projects;

(B) define the scope of work to achieve individual and group goals;

(C) develop time and activity plans to achieve objectives;

(D) implement or participate with cross-functional teams to achieve IT project goals;

(E) develop and implement quality assurance test plans; and

(F) create a contingency plan.

(9) The student recognizes and analyzes potential IT security threats to develop and maintain security requirements. The student is expected to:

(A) describe potential security threats to information systems;

(B) identify the range of security needs and the problems that can occur due to security lapses;

(C) develop and implement plans to address security threats;

(D) document security procedures; and

(E) describe the use of computer forensics in countering security threats such as IT crimes and security breaches.

(10) The student provides support to computer users to maintain service. The student is expected to:

(A) employ effective listening skills when working with clients to identify support needs;

(B) identify customer need and formulate a support plan;

(C) create queries and reports and assess critical system information;

(D) employ problem-solving skills in performing support, maintenance, and repair;

(E) use hardware and software diagnostics;

(F) report to the user the cause of and solution to the problem; and

(G) create written documentation indicating the cause of and solution to the problem.

(11) The student demonstrates and applies knowledge of security risks and safeguards. The student is expected to:

(A) install security software;

(B) update security software; and

(C) use security software to clean an infected machine.

(12) The student provides support to computer users to maintain service. The student is expected to:

(A) develop a written disaster recovery plan; and

(B) develop a written preventive maintenance plan.

(13) The student creates a personal portfolio. The student is expected to:

(A) create a portfolio that documents all projects and accomplishments such as academics, volunteer experience, employment experience, awards, and certifications;

(B) organize and prioritize information within the portfolio; and

(C) use written, verbal, and visual communication techniques consistent with IT industry standards.

§127.738. Extended Computer Technician Practicum (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Information Technology Career Cluster. Recommended prerequisites: Principles of Information Technology, Computer Maintenance, Computer Maintenance Lab, Networking, and Networking Lab. Corequisite: Computer Technician Practicum. This course must be taken concurrently with Computer Technician Practicum and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Information Technology (IT) Career Cluster focuses on building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

(3) In the Extended Computer Technician Practicum, students will gain knowledge and skills in the area of computer technologies, including advanced knowledge of electrical and electronic theory, computer principles, and components related to the installation, diagnosis, service, and repair of computer-based technology systems. Students will reinforce, apply, and transfer their knowledge and skills to a variety of settings and problems. Proper use of analytical skills and application of IT concepts and standards are essential to prepare students for success in a technology-driven society. Critical thinking, IT experience, and product development may be conducted in a classroom setting with an instructor, with an industry mentor, or both.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to IT;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, regular attendance, promptness, integrity, pride in work, and customer service with increased fluency; and

(D) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student applies professional communications strategies. The student is expected to:

(A) demonstrate proper use of written, verbal, and visual communication techniques consistent with IT industry standards with increased proficiency;

(B) analyze, interpret, and effectively communicate information;

(C) apply active listening skills to obtain and clarify information; and

(D) exhibit public relations skills to maintain internal and external customer/client satisfaction.

(3) The student implements advanced problem-solving methods. The student is expected to employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions.

(4) The student understands and applies proper safety and security techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow IT security rules, regulations, and procedures;

(B) recognize and analyze potential IT security threats and address security by installing and updating security software and using security software to clean an infected machine;

(C) identify the range of security needs and the problems that can occur due to security lapses with increased proficiency;

(D) demonstrate safe use of computer technology equipment such as hand and power tools with increased proficiency; and

(E) demonstrate the proper handling and disposal of environmentally hazardous materials used in computer technologies in a consistent manner.

(5) The student understands the professional, ethical, and legal responsibilities in IT. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) describe and practice ethical and legal responsibilities associated with the field of IT;

(C) show integrity by choosing the ethical course of action when making decisions; and

(D) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised IT experience. The student is expected to:

(A) select and use the appropriate technological resources to conduct, document, and evaluate learning activities in a supervised IT experience;

(B) read and interpret technical documentation such as schematics, drawings, charts, diagrams, technical manuals, and bulletins with increased fluency;

(C) employ available reference tools, materials, and Internet sources with increased fluency to access information as needed;

(D) develop solutions using appropriate technologies, IT concepts, and IT industry standards with increased proficiency;

(E) implement project methodologies to manage information system projects; and

(F) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER N. LAW AND PUBLIC SERVICE

19 TAC §§127.746 - 127.751, 127.758 - 127.769, 127.800 - 127.803

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.746. Principles of Law, Public Safety, Corrections, and Security (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Principles of Law, Public Safety, Corrections, and Security introduces students to professions in law enforcement, protective services, corrections, firefighting, and emergency management services. Students will examine the roles and responsibilities of police, courts, corrections, private security, and protective agencies of fire and emergency services. The course provides students with an overview of the skills necessary for careers in law enforcement, fire service, protective services, and corrections.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student achieves academic knowledge and skills required for career and postsecondary education opportunities associated with the career field. The student is expected to:

(A) apply English language arts knowledge and skills required for career and postsecondary education opportunities;

(B) apply mathematics knowledge and skills required for career and postsecondary education opportunities; and

(C) apply science knowledge and skills for career and postsecondary education associated with the career field.

(3) The student uses communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) evaluate effective use of grammar to develop verbal communication skills;

(B) differentiate among speaking strategies used to communicate specific ideas to various audiences;

(C) interpret voice quality and delivery to analyze verbal communication; and

(D) demonstrate effective interpersonal skills necessary to communicate with coworkers and the public.

(4) The student formulates ideas, proposals, and solutions to address problems related to the career field in order to ensure effective and efficient delivery of services. The student is expected to:

(A) use analytical skills to formulate ideas, proposals, and solutions to problems;

(B) formulate ideas, proposals, and solutions to ensure delivery of services; and

(C) use critical-thinking skills to solve ethical issues identified in the career field.

(5) The student implements measures to maintain safe and healthful working conditions in a law and public safety environment. The student is expected to:

(A) identify, analyze, and evaluate the dangers associated with the different career fields;

(B) create and recommend strategies for issues related to the safety and health of employees based on an assessment of a simulated workplace environment;

(C) discuss methods for safe handling of hazardous materials;

(D) discuss the importance of good health and physical fitness; and

(E) demonstrate first aid, cardiopulmonary resuscitation, and automated external defibrillator procedures.

(6) The student analyzes the legal responsibilities associated with roles and functions within law, public safety, corrections, and security organizations to demonstrate a commitment to professional and ethical behavior. The student is expected to:

(A) examine real-world situations involving ethical dilemmas and professional conduct;

(B) explain laws, regulations, and policies that govern professionals; and

(C) recommend a strategy for responding to an unethical or illegal situation.

(7) The student recognizes the importance of interagency cooperation. The student is expected to:

(A) discuss the importance of police, fire, emergency medical services, court, corrections, and security systems working together to protect the public;

(B) examine the roles and responsibilities of first responders;

(C) identify jurisdictional problems that may arise as multiple agencies work together; and

(D) differentiate the roles of private security and public law enforcement agencies.

(8) The student understands the historical and philosophical development of criminal law. The student is expected to:

(A) identify the sources and origin of law in the United States;

(B) explain the impact of the U.S. Constitution and Bill of Rights on criminal law in regard to the rights of citizens;

(C) differentiate between crimes classified as felonies or misdemeanors and the punishments for each;

(D) analyze the essential elements and classifications of a crime;

(E) identify problems commonly associated with the enforcement of criminal laws; and

(F) identify the process by which laws are enacted.

(9) The student identifies the roles of the public safety professional. The student is expected to:

(A) identify career opportunities in federal, state, county, and municipal law enforcement agencies;

(B) identify the education and training required for various levels of law enforcement;

(C) discuss the history of policing in the United States;

(D) identify the roles and responsibilities of law enforcement professionals;

(E) analyze the impact of constitutional law on police as it relates to arrest, use of force, searches, and seizure;

(F) examine the role of emergency medical services in public safety; and

(G) identify how public safety professionals manage the stress related to these jobs.

(10) The student identifies the roles and functions of court systems. The student is expected to:

(A) identify career opportunities in the court systems;

(B) identify the levels and functions of criminal courts;

(C) examine the roles of the courtroom work groups such as judges, prosecutors, defense counsel, and bailiffs;

(D) explain pretrial and courtroom procedures; and

(E) identify types of sentencing and sentencing rules.

(11) The student identifies the roles and functions of the correctional system. The student is expected to:

(A) explain career opportunities available in the correctional system, including probation and parole;

(B) explain the duties and responsibilities of correctional officers;

(C) recognize the history of prisons in the United States;

(D) explain the differences between jails and prisons;

(E) identify the levels of security in prisons and jails; and

(F) explain the constitutional rights of inmates in prisons and jails.

(12) The student identifies the roles and functions of private security systems and agencies. The student is expected to:

(A) explain the career opportunities available in private security;

(B) discuss the history and importance of private security in the United States; and

(C) examine the relationship between private security and public safety agencies.

(13) The student identifies the roles and functions of fire protection services. The student is expected to:

(A) identify the career opportunities in fire protection services;

(B) explain the duties and responsibilities of firefighters;

(C) recognize the importance of the operation of 911 and computer-aided dispatch systems; and

(D) explain the relationships among police, fire, and emergency medical services.

(14) The student identifies the roles and functions of student community organizations that support or provide additional information and guidance to those interested in law, public safety, corrections, and protective services. The student is expected to:

(A) research and participate in community organizations such as SkillsUSA, Law Enforcement Explorer Scouts, and National Technical Honor Society; and

(B) identify community outreach organizations such as Citizens on Patrol; local student police organizations; or national student police organizations.

§127.747. Correctional Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) In Correctional Services, students prepare for certification required for employment as a municipal, county, state, or federal correctional officer. Students will learn the role and responsibilities of a county or municipal correctional officer; discuss relevant rules, regulations, and laws of municipal, county, state, or federal facilities; and discuss defensive tactics, restraint techniques, and first aid procedures as used in the municipal, county, state, or federal correctional setting. Students will analyze rehabilitation and alternatives to institutionalization for inmates.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student researches the history of correctional services in the municipal, county, state, or federal setting. The student is expected to:

(A) examine the history of corrections such as municipal, county, state, and federal;

(B) examine the rules of conduct and disciplinary action guidelines for employees of municipal, county, state, or federal correctional facilities;

(C) analyze personal responsibilities, including preferences, to determine requirements for employment in municipal, county, state, or federal correctional services; and

(D) effectively search methods to locate potential employment opportunities in municipal, county, state, or federal correctional services.

(3) The student recognizes professional standards and ethical responsibilities in the municipal, county, state, or federal correctional facilities. The student is expected to:

(A) identify employer expectations such as effective verbal communication skills; professional conduct; knowledge of laws, regulations, and policies; punctuality and attendance; initiative; cooperation; time management; and sensitivity to and value for diversity;

(B) identify professional standards in municipal, county, state, or federal correctional facilities such as dress, grooming, and personal protective equipment as appropriate; and leadership and teamwork when collaborating with others to accomplish goals and objectives; and

(C) analyze the ethical responsibilities of correctional officers to ensure protections of rights.

(4) The student uses verbal communication skills necessary for municipal, county, state, or federal correctional officers. The student is expected to:

(A) define technical concepts and vocabulary associated with municipal, county, state, or federal correctional services through effective verbal communication; and

(B) contribute to group discussions and meetings by demonstrating active listening and effective speaking skills.

(5) The student performs active listening skills to obtain and clarify information. The student is expected to:

(A) apply listening skills to obtain and clarify information provided in verbal communication; and

(B) demonstrate communication skills to explain the meaning of technical vocabulary concepts related to correctional services.

(6) The student uses first aid, infection control, and cardiopulmonary resuscitation in a correctional facility. The student is expected to:

(A) demonstrate first aid procedures, cardiopulmonary resuscitation, and automated external defibrillator use in a simulated emergency situation;

(B) comply with standard precautions as they relate to infection control; and

(C) use special requirements for handling hazardous materials to maintain a safe working environment.

(7) The student recognizes constitutional laws and laws of correctional systems. The student is expected to:

(A) apply constitutional laws, including laws of arrest, to execute official correctional service duties while respecting citizen rights;

(B) explore the impact of the U.S. legal system on the correctional system;

(C) differentiate between the civil and criminal justice systems and explain how change impacts correctional services;

(D) use the appropriate techniques to manage crisis situations to protect individuals and society;

(E) execute protocols associated with arrest, search, and seizure using the statutes set forth by the Fourth Amendment;

(F) summarize the rights of an individual being interrogated under the Fifth Amendment;

(G) examine trial, jury, and due process rights; and

(H) state the conditions under which citizens and noncitizens of the United States may be interrogated in the correctional environment.

(8) The student models behaviors during interactions with prisoners that demonstrate concern for individuals with disabilities. The student is expected to:

(A) apply the appropriate procedures for use with individuals who have mental disorders, physical disabilities, communication disorders, and atypical behaviors;

(B) execute protocols to provide appropriate assistance to people with disabilities and impairments; and

(C) analyze the impact of the Americans with Disabilities Act on inmates and correctional staff.

(9) The student uses conflict resolution skills and knowledge to resolve conflicts among individuals in correctional environments. The student is expected to:

(A) examine the origins of conflict and the needs that motivate behavior;

(B) analyze different responses to conflict and the results generated;

(C) use principle-centered conflict resolution processes in order to resolve conflicts; and

(D) interpret visual and vocal cues to comprehend information received such as from body language, eye movement, voice tone, and voice inflection.

(10) The student analyzes hostile situations and executes conflict management strategies to take charge of problems that arise in correctional settings. The student is expected to:

(A) review security post procedures in a correctional facility;

(B) explain the importance of a perimeter security system;

(C) appraise situations and select the appropriate degree of force;

(D) complete steps involved in pre-event planning to respond to crisis situations; and

(E) perform appropriate crisis management to protect individual and societal rights.

(11) The student applies technical skill procedures of correctional staff to effectively manage day-to-day operations of correctional facilities. The student is expected to:

(A) demonstrate knowledge of policies and procedures for inmate supervision and discipline;

(B) demonstrate protocol designed to restrain individuals placed into custody without violating personal rights or jeopardizing personal safety;

(C) develop emergency plans and procedures for correctional facilities;

(D) describe the process for providing food services and the critical elements to ensure an effective operation;

(E) describe the steps for processing inmates such as reception, orientation, and classification;

(F) conduct a simulated parole interview;

(G) analyze prisoner re-entry programs and the effect of the programs on the community; and

(H) describe the importance of public relations as related to communities and citizens.

(12) The student identifies basic organizational models for municipal, county, state, or federal correctional facilities and the officer's role in maintaining order and safety. The student is expected to:

(A) identify three primary models of detention facilities;

(B) identify the role and core responsibilities of the officer in the detention facility; and

(C) recognize issues involving prisoners' constitutional rights.

(13) The student recognizes issues related to human behavior and relations in a detention facility. The student is expected to:

(A) identify the importance of ethical judgment and behavior in the criminal justice system;

(B) recognize issues involved with human relations between staff and prisoners;

(C) compare and contrast stress and stress-related issues for correctional personnel;

(D) evaluate the process of promoting cultural awareness at a municipal, county, state, or federal facility; and

(E) identify state and federal laws related to civil rights, sexual harassment, and liability issues for detention personnel.

(14) The student identifies methods of screening for and addressing injurious prisoner behavior. The student is expected to:

(A) identify various methods of screening for suicide risks;

(B) recognize procedures for preventing suicide among prisoners and for responding to suicide attempts; and

(C) identify various methods for determining, classifying, and dealing with intoxicated prisoners in the correctional setting.

(15) The student recognizes intake procedures for a detention facility. The student is expected to:

(A) identify general booking procedures such as basic orientation procedures, fingerprinting, report writing, and documentation of prisoner information;

(B) identify steps in the prisoner admission process; and

(C) recognize the process for releasing prisoners.

(16) The student recognizes various inmate health care issues and processes. The student is expected to:

(A) identify issues and symptoms involving persons with a variety of mental impairments at a detention facility;

(B) identify questions to ask when screening prisoners for mental illness and recognize methods for interacting and communicating with prisoners who may be mentally ill;

(C) recognize processes for maintaining inmate health records and understand health risks of communicable diseases; and

(D) recognize legal aspects of health care in a detention facility.

(17) The student identifies methods of providing various prisoner services. The student is expected to identify processes for issuing prisoner supplies and recognize issues involving prisoner food service, visitations, prisoner correspondence, and telephone usage.

(18) The student recognizes prisoner and facility security protocols. The student is expected to:

(A) identify issues involving inmate counts;

(B) demonstrate procedures for inventorying prisoner's property;

(C) identify the process of searching male and female prisoners;

(D) identify the processes and procedures for searching cells and common areas within a correctional facility; and

(E) identify issues involving facility security.

(19) The student recognizes the appropriate actions to take in emergency situations at a detention facility. The student is expected to:

(A) identify procedures for responding to a riot and disturbance in a municipal, county, state, or federal correctional facility;

(B) identify procedures for responding to events such as assaults, fires, medical emergencies, prisoner escapes, and hostage situations;

(C) recognize issues in dealing with disruptive inmates and groups; and

(D) identify procedures for escape attempts and escapes.

(20) The student identifies report-writing methods and courtroom procedures. The student is expected to:

(A) identify the process involved with writing reports;

(B) identify appropriate courtroom attire and demeanor; and

(C) recognize procedures for preparing for courtroom testimony.

(21) The student evaluates situations requiring the use of force. The student is expected to:

(A) demonstrate the use of the force continuum in simulated situations requiring varied degrees of force; and

(B) explain the guidelines and restrictions imposed by state and federal governments related to the use of deadly force.

(22) The student analyzes procedures and protocols for self-defense in homeland security and protective services. The student is expected to demonstrate self-defense and defensive tactics such as ready stance and escort positions, strikes, kicks, punches, handcuffing, and searching.

§127.748. Firefighter I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Firefighter I introduces students to firefighter safety and development. Students will analyze Texas Commission on Fire Protection rules and regulations, proper incident reporting and records, proper use of personal protective equipment, and the principles of fire safety.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student uses communication skills as related to fire management. The student is expected to:

(A) demonstrate the use of speech and written communication platforms common to fire management services;

(B) practice steps involved in using radio communication for fire management;

(C) apply the Incident Command System to manage emergencies; and

(D) apply protocols in emergency management response when working at an accident scene.

(3) The student executes safety procedures and protocols associated with fire management services. The student is expected to:

(A) apply local, state, and federal regulations pertaining to safety issues;

(B) apply protocols for handling hazardous materials at the awareness level; and

(C) practice personal safety procedures.

(4) The student comprehends the steps to develop an institutional professional growth plan to develop team building and leadership skills common for fire management systems. The student is expected to:

(A) recognize techniques for functioning within a group environment; and

(B) demonstrate model leadership within fire management.

(5) The student applies laws, ordinances, regulations, and rules as defined by the Texas Commission on Fire Protection Certification Curriculum Manual to perform duties within a set of rules or protocols. The student is expected to:

(A) identify the correct laws and rules applicable to basic firefighter certification by the Texas Commission on Fire Protection;

(B) review the Texas Commission on Fire Protection requirements for certification as a basic firefighter as stated in the Standards Manual for Fire Protection Personnel;

(C) identify the various levels of firefighter certifications by the Texas Commission on Fire Protection as stated in the Standards Manual for Fire Protection Personnel;

(D) identify the levels of instructor certification by the Texas Commission on Fire Protection as stated in the Standards Manual for Fire Protection Personnel; and

(E) describe responsibilities of a firefighter as required by the National Fire Protection Association 1500: Standard on Fire Department Occupational Safety and Health Program.

(6) The student describes the stages of a fire, the process of combustion, and the appropriate action to be taken for extinguishment. The student is expected to:

(A) describe the four products of combustion commonly found in structural fires that create a life hazard;

(B) define terms such as fire, flash point, ignition temperature, fire point, flammable (explosive) range, boiling point, oxidation, pyrolysis, reducing agent, vaporization, combustion, vapor density, and specific gravity;

(C) describe the process of thermal layering that occurs in structural fires and how to avoid disturbing the normal layering of heat;

(D) define fire triangle and fire tetrahedron;

(E) describe heat energy sources such as chemical, electrical, mechanical, and nuclear;

(F) identify the stages of fire development;

(G) explain the special conditions that occur during a fire's growth such as flameover, rollover, flashover, thermal layering, and backdraft; and

(H) identify the units of heat measurement and how to convert units.

(7) The student describes the methods of heat transfer. The student is expected to:

(A) describe methods of heat transfer such as conduction, convection, and radiation; and

(B) describe examples of heat transfer in fire emergencies such as conduction, convection, and radiation.

(8) The student analyzes the physical states of matter in which fuels are commonly found. The student is expected to:

(A) describe the physical states of matter in which fuels are commonly found such as solid, liquid, and gaseous fuels;

(B) explain terms related to the combustion process such as specific gravity, vapor density, and the theory of surface-to-mass ratio; and

(C) identify narcotic asphyxiant gases and irritants common in smoke.

(9) The student comprehends the fire extinguishment theory. The student is expected to:

(A) describe the fire extinguishment theory; and

(B) analyze methods of extinguishment such as temperature reduction, fuel removal, oxygen exclusion, and inhibiting chemical reaction.

(10) The student describes the characteristics of water as it relates to fire extinguishing potential. The student is expected to:

(A) explain the law of thermodynamics as it relates to specific heat, latent heat, and heat flow; and

(B) compare the advantages and disadvantages of water as an extinguishing agent.

(11) The student analyzes the internal systems that sustain life in the human body and identifies the physical requirements of a self-contained breathing apparatus wearer. The student is expected to:

(A) describe the internal systems that sustain life in the human body such as the respiratory and cardiovascular systems;

(B) describe the National Fire Protection Association standards applicable to the self-contained breathing apparatus;

(C) identify the firefighter's physical requirements for wearing a self-contained breathing apparatus;

(D) identify respiratory hazards during firefighting that require the use of respiratory protection;

(E) identify the different types of self-contained breathing apparatus; and

(F) describe the safety features and function of the open circuit self-contained breathing apparatus.

(12) The student demonstrates confidence in performing firefighting skills while wearing a self-contained breathing apparatus. The student is expected to:

(A) identify the safety requirements when using the self-contained breathing apparatus;

(B) describe how to calculate the air supply duration in the cylinder;

(C) describe the safety rules when wearing the self-contained breathing apparatus;

(D) describe the uses and limitations of the self-contained breathing apparatus;

(E) demonstrate the various methods of donning and doffing the self-contained breathing apparatus while wearing protective clothing;

(F) demonstrate the replacement of an expended cylinder on a self-contained breathing apparatus assembly with a full cylinder;

(G) demonstrate rescue procedures without compromising the rescuer's respiratory protection such as rescuing a firefighter with functioning respiratory protection, a firefighter without functioning respiratory protection, or a civilian without respiratory protection;

(H) perform firefighting skills while wearing the self-contained breathing apparatus with a fully charged cylinder;

(I) demonstrate the use of the self-contained breathing apparatus to manage a restricted passage in conditions of obscured visibility; and

(J) demonstrate emergency procedures to be used in the event of failure of the self-contained breathing apparatus.

(13) The student demonstrates inspection, care, and testing procedures for the self-contained breathing apparatus. The student is expected to:

(A) document routine maintenance for the self-contained breathing apparatus; and

(B) describe the use of an air supply system for recharging an air cylinder and cylinder testing maintenance of a self-contained breathing apparatus.

(14) The student identifies the types and components of fire service protective clothing and personal protective equipment. The student is expected to:

(A) identify the various types of fire service protective clothing;

(B) identify the different components of structural firefighting protective equipment and their functions;

(C) demonstrate the correct procedures for inspection and maintenance of personal protective equipment;

(D) describe the limitations of personal protective equipment in providing protection to firefighters;

(E) explain the physical limitations of a firefighter working in a personal protective ensemble; and

(F) demonstrate the donning and doffing of personal protective equipment such as helmet with eye protection, hood, boots, gloves, protective coat and trousers, self-contained breathing apparatus, and personal alert safety system device.

(15) The student demonstrates the proper testing and operation of a personal alert safety system device. The student is expected to:

(A) explain the proper operation of a personal alert safety system; and

(B) demonstrate the proper testing of a personal alert safety system.

(16) The student recognizes all aspects of the fire department organization. The student is expected to:

(A) identify aspects of the fire department organization;

(B) explain the firefighter's role as a member of the fire department;

(C) analyze the rules and regulations common to most fire departments;

(D) identify the mission of the fire service and of the local fire department according to the authority having jurisdiction;

(E) describe the function of a standard operating system and the responsibilities of a firefighter relating to compliance with the provisions of occupational safety and health programs; and

(F) explain the components of a member assistance program.

(17) The student recognizes common types of accidents and injuries and their causes. The student is expected to:

(A) describe the elements of a personnel accountability system and the application of the system at an incident;

(B) identify potential long-term firefighter health considerations of exposure to products of combustion;

(C) identify common types of accidents or injuries such as those occurring at the emergency scene, responding to and returning from calls on fire apparatus, in personal vehicles, at the fire station, at other on-duty locations, and during training; and

(D) demonstrate techniques for action when trapped or disoriented in a fire situation or in a hostile environment.

(18) The student describes the handling of different types of accidents and hazards. The student is expected to:

(A) describe the procedures for terminating utility services to a building;

(B) explain hazards that exist and describe procedures to be used in electrical emergencies;

(C) describe the safe handling and operation of hand and power tools;

(D) describe safety procedures for fire service lighting equipment such as power supply (portable or mounted), lights, cords, and connectors; and

(E) recognize the procedures for the use of safety equipment such as seat belts, ear protection, eye protection, and other safety equipment provided for protection while riding on apparatus.

(19) The student identifies safety procedures for ensuring a safe environment. The student is expected to:

(A) identify protective equipment and describe its uses;

(B) recognize traffic and scene control devices;

(C) identify structure fire and roadway emergency scene potential hazards;

(D) describe solutions to mitigate potential hazards; and

(E) describe procedures for safe operation at emergency scenes.

§127.749. Firefighter II (Three Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Firefighter I. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded three credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Firefighter II is the second course in a series for students studying firefighter safety and development. Students will understand Texas Commission on Fire Protection rules and regulations,

proper incident reporting and records, proper use of personal protective equipment, and the principles of fire safety. Students will demonstrate proper use of fire extinguishers, ground ladders, fire hoses, and water supply apparatus systems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student uses information technology applications as they pertain to fire management situations. The student is expected to:

(A) apply protocols for managing emergency situations using radio equipment, computer technology, and public address and warning systems; and

(B) demonstrate use of word-processing and spreadsheet software in fire management services.

(3) The student evaluates behaviors, strategies, and protocols that demonstrate an understanding of duties while responding to a variety of emergency incidents. The student is expected to:

(A) identify response procedures to emergency incidents; and

(B) apply response procedures to simulated emergency incidents.

(4) The student describes the characteristics and applications for the classes of extinguishers. The student is expected to:

(A) identify the classification of types of fires as they relate to the use of portable fire extinguishers and the materials involved in each class of fire;

(B) identify the appropriate fire extinguisher for each class of fire;

(C) identify and describe fire extinguisher characteristics and operations; and

(D) describe and demonstrate the operation of fire extinguishers using Pull Aim Squeeze Sweep (PASS).

(5) The student explains the purpose of the National Fire Protection Association standards applicable to fire service ground ladders. The student is expected to:

(A) identify the materials used in ladder construction and the features;

(B) describe and demonstrate inspection and maintenance procedures for different types of ground ladders and describe procedures for conducting an annual service test on ground ladders;

(C) identify the load capacities for ground ladders;

(D) identify and select a ladder for a given task;

(E) demonstrate raising and positioning ground ladders;

(F) describe and demonstrate securing a ladder;

(G) explain and demonstrate proper ladder climbing techniques while transporting tools and equipment or assisting a person with a simulated injury; and

(H) demonstrate the deployment of a roof ladder on a pitched roof.

(6) The student describes the purpose of the National Fire Protection Association standards applicable to fire service hoses and reviews the procedures for care, maintenance, and inspection of fire hoses, couplings, nozzles, and water valves. The student is expected to:

(A) identify and describe the use and construction of fire hoses and couplings;

(B) explain the application of each size and type of hose on a pumper as required to be carried by National Fire Protection Association 1901;

(C) demonstrate the methods of connecting fire hose couplings;

(D) demonstrate the one- and two-person methods of connecting, dismantling, and rolling various sizes of hose lines;

(E) demonstrate advancing dry hose lines and charged attack lines of different sizes;

(F) demonstrate methods of hose load finishes;

(G) describe and demonstrate extending a section of hose and replacing damaged sections of hose using proper safety equipment such as clothing for performing overhaul activities; and

(H) describe the methods of washing and drying a fire hose.

(7) The student explains requirements for the production of effective fire streams. The student is expected to:

(A) identify, define, and demonstrate characteristics of fire streams;

(B) identify the type, design, operation, required nozzle pressure, and flow of a given selection of nozzles and tips;

(C) demonstrate the proper use of nozzles, hose appliances, water valves, adapters, and tools;

(D) identify various types of nozzles and their components; and

(E) identify terms relating to the principles of fire service hydraulics.

(8) The student identifies water supply sources and methods to move water from the supply source to the fire. The student is expected to:

(A) describe the operation of fire hydrants such as fully opened fire hydrants and closed fire hydrants;

(B) identify the National Fire Protection Association hydrant color code;

(C) describe making a hydrant-to-pumper connection;

(D) explain the hazards involved when the hydrant-to-pumper connection is not properly sealed; and

(E) describe the apparatus, equipment, and appliances required to provide water at rural locations.

(9) The student explains the duties of a firefighter after a fire. The student is expected to:

(A) explain how debris is handled from fires, including house fires and chemical fires;

(B) describe the duties for gathering information that may lead to the determination of the fire cause;

(C) identify the proper procedure for restoration of the premises after a fire; and

(D) describe the duties for fire and security surveillance during and after the fire.

§127.750. Law Enforcement I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Law Enforcement I is an overview of the history, organization, and functions of local, state, and federal law enforcement. Students will understand the role of constitutional law at local, state, and federal levels; the U.S. legal system; criminal law; and law enforcement terminology and the classification and elements of crime.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student explores the legal authorities pertaining to law enforcement officers' use of force. The student is expected to:

(A) identify key terminology relating to the use of force and explain the legal authorities and the justification for use of force;

(B) analyze the deciding factors for use of force when effecting an arrest;

(C) analyze circumstances that are high risks for officers;

(D) analyze various force options or alternatives to increase the student's awareness of various force options or alternatives available to peace officers;

(E) discuss force options available to peace officers; and

(F) examine elements that an officer must recognize and control in every encounter.

(3) The student uses verbal and nonverbal communication skills necessary for law enforcement. The student is expected to:

(A) relate the meaning of technical concepts and vocabulary associated with law enforcement;

(B) interpret facial expressions, voice quality and delivery, gestures, and body positioning as related to nonverbal communication;

(C) interpret voice quality and delivery such as combination of pitch, tone, and wording;

(D) recognize diversity in culture;

(E) employ active listening skills; and

(F) contribute to group discussions and meetings.

(4) The student demonstrates a working knowledge of the laws, methods, and techniques relative to accident investigation:

(A) produce a crash report involving two or more vehicles in an accident;

(B) apply laws associated with accident investigation;

(C) research procedures for responding to an accident scene and how to maintain control of an accident scene; and

(D) demonstrate how to maintain traffic control at an accident scene.

(5) The student understands ethical behavior standards required for law enforcement personnel. The student is expected to:

(A) explain the role of the U.S. Constitution in relation to the development and implementation of law enforcement;

(B) evaluate individual ethical behavior standards;

(C) analyze legal and ethical behavior standards protecting citizens' constitutional rights;

(D) demonstrate strategies to enhance public trust; and

(E) explain the mission of law enforcement in protecting a democratic society.

(6) The student explores the U.S. legal system and the requirements for law enforcement. The student is expected to:

(A) explain how citizens are protected by constitutional laws of local, state, and federal courts;

(B) analyze the impact of Supreme Court decisions such as *Mapp v. Ohio*, *Terry v. Ohio*, and *Tennessee v. Garner*;

(C) analyze the similarities, differences, and interactions between local, state, and federal court systems;

(D) illustrate the progression of a case as it moves through local, state, and federal jurisdictions; and

(E) compare the characteristics of civil and criminal court systems.

(7) The student analyzes custody and interrogation as they relate to the U.S. Supreme court decision in *Miranda v. Arizona*. The student is expected to:

(A) demonstrate the application of the constitutional rights, using the Miranda warning requirements for both adult and juvenile suspects;

(B) explain the additional requirements above the Miranda warnings for juvenile suspects, offenders, and witnesses; and

(C) demonstrate a non-custodial and custodial interview and interrogation.

(8) The student analyzes procedural and substantive criminal law. The student is expected to:

(A) define crime categories and respective punishments according to the Texas Penal Code;

(B) analyze the elements of criminal acts according to Texas laws, including Alcoholic Beverage Code, Family Code, Penal Code, Health and Safety Code, and Criminal Code of Procedure;

(C) differentiate *mala prohibita* and *mala in se*; and

(D) analyze types of criminal defenses.

(9) The student analyzes law related to victims and witnesses. The student is expected to:

(A) analyze the rights of victims of crimes and witnesses to crime laws such as the Victim and Witness Protection Act of 1982, the Victims of Crime Act of 1984, the Victim's Rights and Restitution Act, the Child Victims' Bill of Rights of 1990, and the Victim Rights Clarification Act of 1997;

(B) analyze the psychological, social, and economic impact of crime on the victim such as:

(i) identifying the elements of a crisis reaction, the phases of a victim's reaction to a crime, the ripple effect of crime victimization, and crisis intervention; and

(ii) identifying and discussing the potential for secondary victimization by the criminal justice system and how to avoid it; and

(C) identify statutory responsibilities relating to victims' rights such as:

(i) identifying the legal basis of law enforcement's responsibilities to victims' rights;

(ii) summarizing legal requirement for providing victims written notice; and

(iii) explaining rights granted to victims of crime.

(10) The student executes protocols and procedures protecting the rights of juvenile offenders and victims. The student is expected to:

(A) discuss juvenile law as it relates to the steps in processing status offenses of juveniles; and

(B) demonstrate the procedure for holding conferences with juveniles and parents or guardians.

(11) The student analyzes the steps in handling family violence calls involving Temporary Ex Parte Protective Orders, Protective Orders, and Magistrate's Orders for Emergency Protection and the procedures for responding to family violence. The student is expected to:

(A) understand the dynamics and legal issues of family violence and child abuse such as:

(i) explaining common characteristics of family violence offenders and describing the cycle of abuse phases;

(ii) discussing the types of abuse often occurring in family violence incidences, explaining some barriers victims face when attempting to leave an abusive relationship; and

(iii) defining terminology associated with family violence related to Texas Family Code, Title 4, for Protective Orders and Family Violence; and

(B) evaluate the recommended steps in handling family violence calls involving Temporary Ex Parte Protective Orders, protective orders, and Magistrate's Order for Emergency Protection such as:

(i) identifying the legal requirements for investigation of domestic abuse and child abuse or neglect and medical treatment and examinations for both;

(ii) designing a plan on how to handle family violence situations and procedures for conducting preliminary investigations; and

(iii) demonstrating how to provide and explain community resources and referrals to victims of family violence.

(12) The student explains laws associated with the Texas Health and Safety Code. The student is expected to:

(A) identify current commonly abused drugs in society;

(B) research the effects of substances as it applies to the Texas Health and Safety Code; and

(C) summarize the procedures for handling drugs, dangerous drugs, and controlled substances.

(13) The student summarizes the philosophy and concepts that influence the development and implementation of a community-oriented police program. The student is expected to:

(A) define community-oriented policing; and

(B) evaluate the skills needed to be a successful community-oriented police officer.

(14) The student uses field note-taking and report-writing skills to complete a police call sheet, an incident report, and a supplemental report. The student is expected to:

(A) describe the components of a police call sheet, an incident report, and a supplemental report;

(B) explain why a police call sheet, an incident report, and a supplemental report are legal documents;

(C) demonstrate obtaining the appropriate information for a police call sheet, an incident report, and a supplemental report; and

(D) write a police call sheet, an incident report, and a supplemental report using clear, concise, and legible entries.

(15) The student analyzes reasonable suspicion and probable cause for motor vehicle traffic stops. The student is expected to:

(A) apply techniques used to assess risk in vehicle stops;

(B) understand and analyze traffic laws contained in the Texas Transportation Code and their applications;

(C) execute a simulated misdemeanor traffic stop using the seven-step violator contact method;

(D) execute a simulated felony traffic stop with one and two patrol units;

(E) identify if a traffic law has been violated according to the Texas Transportation Code regarding a driving situation; and

(F) identify the regulations relating to arrest, charging procedures, notices, and promises to appear.

(16) The student employs procedures to protect, document, and process a crime scene. The student is expected to:

(A) demonstrate how to lift and preserve developed latent prints from a simulated crime scene; and

(B) demonstrate how to photograph, sketch, search, collect, document, and protect the crime scene area for further investigation.

(17) The student demonstrates and applies a working knowledge of the detection, apprehension, and arrest of an intoxicated driver. The student is expected to:

(A) explain the laws related to driving while intoxicated and related offenses; and

(B) discuss the development of "reasonable suspicion" for the intoxicated driver stop and temporary detention.

(18) The student demonstrates a working knowledge of a tactical entry into a residence and building safely. The student is expected to:

(A) describe techniques officers can use to safely approach a residence or building;

(B) explain techniques to safely enter and search a residence or building;

(C) demonstrate the correct techniques for entering a doorway and searching a room(s); and

(D) demonstrate methods for clearing buildings or residences and techniques used when suspects are found inside a building or residence.

§127.751. Law Enforcement II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Law Enforcement I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Law Enforcement II provides the knowledge and skills necessary to prepare for a career in law enforcement. Students will understand ethical and legal responsibilities, patrol procedures, first responder roles, telecommunications, emergency equipment operations, and courtroom testimony.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student achieves the academic knowledge and skills required to prepare for postsecondary education and a career in law enforcement. The student is expected to:

(A) demonstrate the use of communication skills to evaluate body language, gestures, verbal tone, and inflection;

(B) apply interpersonal communication skills;

(C) apply writing skills to facilitate effective field note taking and report writing such as police incident reports;

(D) create various scenarios that use patrol tactics to effect an arrest; and

(E) demonstrate appropriate use of law, public safety, corrections, and security terminology.

(3) The student uses telecommunications equipment. The student is expected to:

(A) support the use of telecommunication mobile and handheld radio systems and current technology;

(B) formulate simulated radio communications using phonetic alphabet and common terminology;

(C) conduct simulated radio and data communications using mobile data computers and handheld radios;

(D) evaluate safety concerns with the use of telecommunications equipment, including when in the presence of non-first responders and while operating vehicles;

(E) explain the need of prioritizing calls for service; and

(F) identify the procedures used during emergency communications incidents such as hostage incidents and active pursuits.

(4) The student presents testimony in legal proceedings in accordance with courtroom procedures. The student is expected to:

(A) explain the roles of the courtroom work group;

(B) analyze the importance of reviewing field notes, reports, and evidence prior to pre-trial meeting;

(C) apply proper explanation for the introduction of evidence for admission into a trial;

(D) analyze effective courtroom testimony;

(E) demonstrate an understanding of the importance of professionalism in demeanor and attire as a witness; and

(F) discuss the importance of a pre-trial meeting with a prosecutor.

(5) The student recognizes the importance of using interpersonal communication techniques to resolve conflicts and reduce anger. The student is expected to:

(A) examine interpersonal communication techniques used in law enforcement;

(B) distinguish between passive, passive-aggressive, aggressive, and assertive behavior;

(C) discuss strategies for dealing with difficult people; and

(D) examine factors that contribute to a person's hostility.

(6) The student examines the techniques used to manage crisis situations and maintain public safety. The student is expected to:

(A) demonstrate crisis negotiations to promote the safety of individuals and the general public;

(B) participate in a simulated scenario as a crisis negotiation team member;

(C) demonstrate effective communication techniques in a simulated crisis negotiation;

(D) examine hostage safety considerations during a simulated crisis negotiation; and

(E) differentiate between public safety and individual rights during crisis negotiation.

(7) The student understands techniques to foster public cooperation for victims in a variety of law enforcement situations. The student is expected to:

(A) demonstrate procedures for advising crime victims' legal recourse;

(B) explain step-by-step court procedures for suspects, victims, and witnesses entering the system;

(C) explain the procedures for providing appropriate assistance to individuals with disabilities such as autism, Alzheimer's disease, hearing impairment, visual impairment, and mobility impairment;

(D) define the steps involved in conducting the preliminary investigation of specialized crimes such as hate crimes, bullying, sexual harassment, and terroristic threat;

(E) analyze the elements of conducting a death notification; and

(F) interpret legal requirements of law enforcement to victims of crime.

(8) The student analyzes procedures and protocols for domestic violence. The student is expected to:

(A) recognize techniques to enforce domestic violence laws;

(B) diffuse a simulated domestic violence incident; and

(C) apply laws in making an arrest.

(9) The student explores civil law enforcement procedures for serving writs, warrants, and summons. The student is expected to:

(A) research civil law procedures such as attachment, garnishment, claim, and delivery;

(B) identify limits on use of force and entry to private property during civil process service;

(C) differentiate among domestic violence protective orders, no-contact orders, and orders to pick up children; and

(D) identify requirements for emergency mental health evaluation.

(10) The student analyzes local and state law enforcement procedures pertaining to alcohol and beverage laws. The student is expected to:

(A) explain alcohol and beverage laws and procedures controlling illegal sales and consumption;

(B) define alcoholic beverages;

(C) differentiate between legal and illegal alcohol sales; and

(D) identify circumstances under which alcoholic beverages may be legally consumed.

(11) The student explores laws and procedures to enforce violations of driving while intoxicated and driving under the influence. The student is expected to:

(A) execute and interpret tests related to driving under the influence such as the National Traffic Highway Safety Administration Standardized Field Sobriety Test and the Horizontal Gaze Nystagmus, Walk-and-Turn, and One-Leg Stand tests;

(B) recognize and interpret indicators of impaired driving;

(C) describe methods used to detect and apprehend drivers under the influence; and

(D) prepare evidence and reports required to give court testimony related to driving under the influence.

(12) The student identifies crowd control methods. The student is expected to:

(A) explain the deployment of less-than-lethal and chemical crowd control measures;

(B) identify the need assessment of crowd management, including officer safety, surveillance, protection of life, protection of property, and requests for assistance from other officers and agencies;

(C) demonstrate establishing perimeters for crowd control; and

(D) explain the importance of identifying group leaders, followers, and victims.

(13) The student evaluates situations requiring the use of force. The student is expected to:

(A) demonstrate the use of the force continuum in simulated situations requiring varied degrees of force;

(B) explain the guidelines and restrictions imposed by state and federal governments related to the use of deadly force;

(C) identify the legal authority for the use of force;

(D) analyze and evaluate the use of less-than-lethal use of force; and

(E) analyze and evaluate the use of deadly force.

(14) The student describes procedures designed to safely transport a person in custody. The student is expected to:

(A) demonstrate a search of an individual incidental to an arrest;

(B) demonstrate the procedures for transporting a person without violating personal rights or jeopardizing personal safety;

(C) demonstrate different methods of restraining a person being transported; and

(D) discuss transporting non-custodial persons and juveniles.

(15) The student conducts interviews and interrogations of individuals ensuring protection of rights as outlined in the U.S. Constitution. The student is expected to:

(A) demonstrate interviewing and interrogation techniques; and

(B) simulate interviews of rape victims, child witnesses, and child victims.

(16) The student investigates and documents a motor vehicle accident. The student is expected to:

(A) record simulated crash scene evidence using standard report procedures;

(B) analyze simulated crash scene evidence using standard laws, regulations, and procedures;

(C) perform mathematical calculations using speed, velocity, time, and distance;

(D) draw scale diagrams of simulated collisions using templates; and

(E) interpret crash scene evidence.

(17) The student recognizes law enforcement roles in preparedness and response systems for disaster situations. The student is expected to:

(A) demonstrate knowledge of the incident command system;

(B) coordinate with response partners from all levels of government and with the private sector;

(C) evaluate incident command system applications, organizational principles and elements, positions and responsibilities, facilities and functions, and planning; and

(D) apply Federal Emergency Management Agency Incident Command Structure to a simulated scenario.

(18) The student explores procedures for handling and managing explosives and hazardous material incidents. The student is expected to:

(A) identify and classify hazardous materials;

(B) respond to a simulated situation involving explosive materials using protocols and procedures designed to maintain personal and public safety;

(C) explain procedures for responding to reports of bomb threats and suspicious objects;

(D) conduct a simulated building and property search to locate explosive devices and materials; and

(E) explain procedures for responding to hazardous material incidents.

(19) The student examines law enforcement functions regarding critical infrastructure protection from potential terrorist and natural disaster threats. The student is expected to:

(A) analyze critical infrastructure protection techniques; and

(B) develop a plan for protecting a potential target.

(20) The student explores new and emerging technologies in law enforcement. The student is expected to:

(A) research new technologies used in law enforcement such as robots to diffuse potential explosives; and

(B) explain the importance of continuing education in law enforcement.

(21) The student evaluates patrol procedures and response to calls for service encountered by first responders. The student is expected to:

(A) demonstrate the legal justification and the application of probable cause for first responders' actions during a response to a suspected offense or an actual offense;

(B) simulate conducting a misdemeanor and a high-risk traffic stop;

(C) analyze pursuit procedures such as incidents involving vehicles, motorcycles, and foot pursuits;

(D) simulate responding to a delayed crime and a crime in progress;

(E) simulate conducting a building search;

(F) simulate conducting an arrest with a warrant or a warrantless arrest;

(G) differentiate procedures when responding with one-person units, two-person units, multiple units, other agency units, and specialized units such as air, K-9, and undercover operations;

(H) compare patrol responses when responding to offenses on-view, dispatched calls, and public information requests; and

(I) demonstrate the importance of being safety conscious when in the role of being a first responder.

(22) The student evaluates the importance of first responders in developing a positive community relationship. The student is expected to:

(A) explore the development of community policing in the United States;

(B) evaluate the role of school resource officers;

(C) evaluate the role of neighborhood service officers;

(D) evaluate the role of crime prevention officers such as McGruff Safe Kids, neighborhood watch programs, store front officers, and citizens on patrol;

(E) evaluate the responsibilities of the public information officer; and

(F) conduct a crime prevention analysis.

(23) The student demonstrates procedures in investigating a crime scene. The student is expected to:

(A) identify the legal requirements for first responders to enter, remain, release, and return to a crime scene;

(B) demonstrate procedures prior to entering a crime scene and securing a crime scene;

(C) demonstrate procedures in conducting a proper search of a crime scene for evidence such as using a strip-line search, grid-quadrant search, zone-wheel search, spiral search, or base-line search;

(D) demonstrate procedures for marking and collecting evidence found in a crime scene;

(E) demonstrate procedures for measuring and sketching evidence and important landmarks in a crime scene;

(F) demonstrate procedures for photographing the crime scene and evidence during the process of investigating a crime scene, including wide angle, mid-range, spatial relationship, and close-up photographs; and

(G) demonstrate chain of custody and proper packaging of various types of evidence for transportation.

§127.758. Criminal Investigation (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Criminal Investigation is a course that introduces students to the profession of criminal investigations. Students will understand basic functions of criminal investigations and procedures and will learn how to investigate or follow up during investigations. Students will learn terminology and investigative procedures related to criminal investigation, crime scene processing, evidence collection, fingerprinting, and courtroom presentation. Through case studies and simulated crime scenes, students will collect and analyze evidence such as fingerprint analysis, bodily fluids, hairs, fibers, shoe and tire impressions, bite marks, drugs, tool marks, firearms and ammunition, blood spatter, digital evidence, and other types of evidence.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student explores criminal investigative procedures, investigations, and follow-up according to the profession and its job functions. The student is expected to:

(A) analyze the field of criminal investigations;

(B) compare and contrast the characteristics of an effective investigator;

(C) examine preliminary investigations such as initial response, point of arrival, priorities, emergency situations, and protection of the crime scene;

(D) research follow-up procedures for an investigation; and

(E) evaluate the effectiveness of interrelationships with individuals involved in investigations such as police officers, dispatchers, prosecutors, defense counsel, physicians, coroners, medical examiners and forensic crime laboratories, citizens, witnesses, victims, complainants, and media.

(3) The student uses proper equipment in documenting the crime scene during field investigations. The student is expected to:

(A) explain the use of field notes;

(B) demonstrate an understanding of when, what, where, and how to take notes;

(C) demonstrate how to effectively take notes during an investigation;

(D) distinguish between the advantages and disadvantages of photographs and video at a crime scene and an investigation;

(E) plan how to use digital investigative photography during an investigation at a crime scene;

(F) collect and organize a photographic sequence of photographs of a crime scene such as injuries, tool marks, fingerprints, tire impressions, footprints, bite marks, and other related evidence;

(G) analyze, evaluate, make inferences, and predict occurrences of events based on photographic evidence; and

(H) formulate ideas on admissibility of photographs in a court of law.

(4) The student uses critical-thinking and problem-solving skills to create sketches for indoor and outdoor crime scenes. The student is expected to:

(A) create a plan and make observations before sketching a crime scene, both as an individual and as a team;

(B) describe the elements of a crime scene sketch such as measurements, compass directions, scale of proportion, legend/key, and title;

(C) develop a crime scene sketch using coordinates or measurements from fixed points;

(D) summarize the crime scene by taking notes and recording details;

(E) analyze and evaluate to assess the crime scene sketch; and

(F) research and describe the final sketch such as finished scale drawing and computer assisted drawing.

(5) The student explores writing effective reports for criminal investigations. The student is expected to:

(A) distinguish among organizing information, structuring the narrative, and composing the content;

(B) identify the importance and uses of reports;

(C) analyze common problems with many investigative reports;

(D) research ways to record and dictate for future report writing; and

(E) demonstrate different ways to write a report such as in writing and computerized.

(6) The student recognizes legal searches and the Fourth Amendment as it applies to searches. The student is expected to:

(A) analyze the exclusionary rule, inevitable discovery exception, and good faith exception;

(B) explain when an officer needs a search warrant or consent to search during an investigation;

(C) research Terry v. Ohio and the legal ramifications it has on pat downs and frisks;

(D) evaluate a search incident to an arrest;

(E) describe searching during emergency situations and warrantless searches of vehicles; and

(F) demonstrate how to conduct an inventory of a vehicle.

(7) The student determines what search patterns should be used in exterior and interior searches of crime scenes. The student is expected to:

(A) analyze the precedents that were established by the Carrol v. United States, Chambers v. Florida, Chimel v. California, Mapp v. Ohio, Terry v. Ohio, and Weeks v. United States decisions;

(B) conduct a systematic search of a simulated crime scene for physical evidence following crime scene search patterns such as spiral, line, grid, and strip;

(C) demonstrate how to conduct building, vehicle, suspect, and dead body searches; and

(D) explain how police canines are used to conduct legal searches.

(8) The student recognizes the procedures of evidence collection while maintaining the integrity of a crime scene. The student is expected to:

(A) compare and contrast the roles of crime scene investigators, detectives, and crime scene investigators;

(B) demonstrate the ability to work as a member of a team;

(C) discover and recognize evidence at a simulated crime scene;

(D) apply knowledge of the elements of criminal law that guide search and seizure of persons, property, and evidence;

(E) outline the chain-of-custody procedure for evidence discovered in a crime scene;

(F) demonstrate proper techniques for collecting, marking, photographing, packaging, preserving, and transporting physical evidence found at a crime scene;

(G) explain and demonstrate the use of video and still photography to preserve a simulated crime scene; and

(H) analyze the use of evidence in a court of law.

(9) The student recognizes the methods to process and analyze trace evidence commonly found in a crime scene. The student is expected to:

(A) demonstrate how to process trace evidence such as glass, blood, paint, fibers, and hair collected in a simulated crime scene;

(B) identify shoe and tire impressions from sample impressions;

(C) determine the direction of a projectile by examining glass fractures;

(D) analyze bite marks from crime scenes and investigations;

(E) compare and contrast the microscopic characteristics of the human hair and animal hair; and

(F) differentiate between natural and synthetic fibers.

(10) The student analyzes collected fingerprints or impressions from a simulated crime scene. The student is expected to:

(A) compare the three major fingerprint patterns of arches, loops, and whorls and their respective subclasses;

(B) identify minutiae of fingerprints, including bifurcations, ending ridges, islands, dots, short ridges, and enclosures;

(C) distinguish among patent, plastic, and latent impressions;

(D) perform laboratory procedures for lifting latent prints on porous and nonporous objects using chemicals such as iodine, ninhydrin, silver nitrate, and cyanoacrylate resin;

(E) perform laboratory procedures for lifting latent prints on nonporous objects using fingerprint powders such as black powder and florescent powders;

(F) explain the Automated Fingerprint Identification System (AFIS) and describe the characteristics examined in AFIS; and

(G) compare impression evidence collected at a simulated crime scene with the known impression.

(11) The student analyzes blood spatter at a simulated crime scene. The student is expected to:

(A) analyze blood stain patterns based on source, direction, and angle of trajectory; and

(B) explain the method of chemically identifying and locating an invisible blood stain using reagents such as luminol.

(12) The student explores toxicology laboratory procedures in crime labs. The student is expected to:

(A) analyze the absorption, distribution, and elimination of alcohol through the human body;

(B) research the blood alcohol laboratory procedures as they relate to blood alcohol concentration;

(C) explain the levels of tolerance and impairment due to alcohol consumption; and

(D) explain the precautions necessary for proper preservation of blood samples while at a crime scene.

(13) The student explores serology laboratory procedures in criminal investigations. The student is expected to:

(A) explain crime laboratory procedures to determine if a stain detected in a crime scene is blood; and

(B) research methodologies used to collect and analyze other body fluids.

(14) The student identifies drugs found at a simulated crime scene. The student is expected to:

(A) classify controlled substances using the schedules under the Controlled Substances Act; and

(B) identify controlled substances.

(15) The student evaluates bullet and tool mark impressions in a criminal investigation. The student is expected to:

(A) explain the individual characteristics of tool marks;

(B) describe the mechanism of modern firearms;

(C) recognize characteristics of bullet and cartridge cases;

(D) describe the composition of and method of analysis for gunshot residue and primer residue; and

(E) recognize the type of information available through the National Integrated Ballistics Information Network.

(16) The student calculates the time and cause of death in relationship to decomposition of the human body. The student is expected to:

(A) explain the process and timeline of rigor mortis and its role in calculating time of death;

(B) explain post mortem lividity and its importance when processing a crime scene;

(C) determine time of death using entomology; and

(D) determine time and cause of death methodologies through case studies.

(17) The student understands how physical evidence can provide a basis for questioning people about a crime and how questioning can provide leads for finding physical evidence. The student is expected to:

(A) explain the terms victim, complainant, witness, and suspect as they apply to a criminal investigation;

(B) demonstrate interviewing and interrogating throughout an investigation;

(C) demonstrate effective questioning techniques and positive communication skills;

(D) analyze the importance of reading the Miranda Warnings during interviewing and interrogating; and

(E) describe the techniques used to interview and question children and juveniles.

(18) The student develops a suspect profile when there is not a suspect at the crime scene and a suspect is not apprehended nearby. The student is expected to:

(A) compile information provided by victims, witnesses, and other persons likely to know about the crime or the suspect;

(B) examine physical evidence left at the crime scene to determine a suspect profile;

(C) identify a suspect Modus Operandi at a crime scene;

(D) analyze computerized composite sketch applications such as Identi-Kit;

(E) describe techniques used to create photo line ups, identification, and mug shots; and

(F) research audio, video, and electronic surveillance.

§127.759. Court Systems and Practices (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Law Enforcement I or Principles of Government or Public Administration. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Court Systems and Practices is an overview of the federal and state court systems. The course identifies the roles of judicial officers and the trial processes from pretrial to sentencing and examines the types and rules of evidence. Emphasis is placed on constitutional laws for criminal procedures such as search and seizure, stop and frisk, and interrogation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student examines the structure of the legal system in the United States. The student is expected to:

(A) trace the history, structure, and function of state and federal court systems and criminal procedure;

(B) compare and contrast the state court system and the federal court system;

(C) explain and illustrate how jurisdiction impacts criminal charges and trial proceedings;

(D) explain and interpret the purposes of law regarding criminal acts and behaviors;

(E) distinguish between constitutional law, case law, statutory law, and administrative law;

(F) identify the differences in processing a misdemeanor and felony case;

(G) describe and interpret the impact of the grand jury process on court proceedings regarding criminal scenarios;

(H) examine relationship of the U.S. Constitution and the Bill of Rights upon the court system; and

(I) describe the impact of public opinion and the legislature on the U.S. court system.

(3) The student explores the roles and responsibilities of members of courtroom work groups. The student is expected to:

(A) explain the roles of professionals such as the police, prosecutor, judge, victim advocates, and criminal defense attorney in the criminal process;

(B) examine the roles and importance of members of the courtroom such as the jury, bailiff, and court reporter;

(C) analyze the impact of the victim and the defendant upon the courtroom process; and

(D) discuss the dynamics of assembly line justice and discretion found in court proceedings.

(4) The student recognizes communication skills needed for courtroom policies and procedures. The student is expected to:

(A) use communication skills to evaluate body language such as gestures, verbal tone, and inflection during testimony;

(B) demonstrate interpersonal communication skills; and

(C) apply writing skills to formulate effective field note taking and report writing.

(5) The student examines the steps by which a criminal charge is processed through pretrial, trial, adjudication, and the appellate stages. The student is expected to:

(A) examine the interaction between police and prosecutor in filing complaints and making a decision to charge such as Defenses to Prosecution and application of various definitions of intent;

(B) explain pretrial court proceedings such as rules of discovery, challenges to evidence, and the bail process;

(C) distinguish between direct and circumstantial evidence and burden of proof for federal and state courts;

(D) explore the impact of pleas and plea bargaining on the trial proceedings;

(E) identify the trial process from pretrial to sentencing;

(F) evaluate a simulated criminal case; and

(G) conduct a mock trial demonstrating understanding of the criminal trial procedure.

(6) The student explains the structure and provisions of the U.S. Constitution and the Bill of Rights and how they impact the criminal trial process. The student is expected to:

(A) apply the police responsibilities under the Fourth Amendment regarding search and seizure in a simulated arrest scenario;

(B) determine if a search initiated in a scenario is proper under the provisions of the Fourth Amendment;

(C) analyze the exclusionary rule and the fruit of the poisonous tree doctrine to determine if evidence obtained in an illegal search scenario is admissible in court;

(D) explain the impact of the Eighth, Ninth, and Tenth amendments on the criminal justice system;

(E) analyze the effect of landmark cases such as *Miranda v. Arizona*, *Weeks v. United States*, *Mapp v. Ohio*, *Douglas v. California*, and *Escobedo v. Illinois* on individuals entering the criminal justice system;

(F) describe the due process rights of a criminal suspect in the trial and sentencing process; and

(G) explain the impact of the Fifth and Sixth amendments on the criminal trial process.

§127.760. Federal Law Enforcement and Protective Services (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Federal Law Enforcement and Protective Services provides the knowledge and skills necessary to prepare for certification in security services for federal law enforcement and protective services. The course provides an overview of security elements and types of organizations with a focus on security measures used to protect lives, property, and proprietary information, to ensure computer security, to provide information assurance, and to prevent cybercrime.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills stan-

dards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student demonstrates professional standards as required by federal law enforcement and protective services. The student is expected to:

(A) demonstrate positive work behaviors and attitudes and professional standards in federal law enforcement and protective services;

(B) support and apply ethical reasoning to a variety of simulation situations in order to make ethical decisions;

(C) demonstrate teamwork skills through working cooperatively with others to achieve tasks such as team building, consensus, continuous improvement, respect of opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate sensitivity to and value for diversity and confidentiality; and

(E) demonstrate an understanding of content, technical concepts, and vocabulary when analyzing information, following directions, conveying information, and accessing information sources such as texts, Internet websites, and technical materials.

(3) The student explores the history of federal law enforcement and protective services in the United States. The student is expected to:

(A) research the development of federal law enforcement and protective services through the history of the United States; and

(B) explain the importance of the interface between federal law enforcement and protective services and other aspects of law enforcement.

(4) The student identifies health, safety, and environmental responsibilities of federal law enforcement and protective services personnel in establishing and maintaining a safe work environment. The student is expected to:

(A) identify workplace hazards to health, safety, and the environment;

(B) inspect a workplace to identify potential health, safety, and environmental problems;

(C) investigate and document findings in simulated workplace incidents and accidents; and

(D) summarize issues and problems associated with hazardous materials.

(5) The student analyzes the impact of ethical and legal responsibilities relevant to federal law enforcement and protective services. The student is expected to:

(A) differentiate between civil and criminal law;

(B) analyze the impact of legal issues relevant to federal law enforcement and protective services;

(C) describe the importance of good public relations techniques as they relate to federal law enforcement and protective services and crisis situations;

(D) analyze the connections between constitutional and federal laws, federal law enforcement, and private security operations by referencing relevant constitutional amendments;

(E) analyze specific federal, state, and local laws and regulations affecting government security operations;

(F) summarize specific juvenile laws affecting security operations;

(G) compare alternative responses in simulated security scenarios that require application of ethical and legal behavior;

(H) discuss the possible ramifications of unethical behavior on the part of security professionals;

(I) analyze the importance of the Fourth Amendment with respect to security officer powers of arrest, search, and seizure;

(J) summarize the due process rights granted to individuals by the Fifth Amendment during an interrogation;

(K) analyze the impact of the Fourteenth Amendment as it relates to due process and equal protection of the law; and

(L) analyze the importance of social media and be familiar with its effects on federal law enforcement and protective services.

(6) The student explains risk management principles as they apply to security functions for the protection of assets. The student is expected to:

(A) describe the sources of natural, intentional, and unintentional threats such as information assurance, computer security, cybercrime, human trafficking, border security, and domestic and foreign terrorism;

(B) present examples that depict potential physical, electronic, procedural, and personnel vulnerabilities;

(C) summarize the concept of risk management from a local, state, federal, and national security perspective, including the importance of knowing what to protect and the consequences of loss; and

(D) explain how security operations and the criminal justice field interface and rely upon each other.

(7) The student analyzes the role of computer forensics in security operations. The student is expected to:

(A) summarize the role of computer applications relating to forensics investigations; and

(B) investigate criminal activity in areas such as cybercrime, the Internet, and Internet trafficking.

(8) The student analyzes security systems and their role in an overall security strategy. The student is expected to:

(A) summarize the purposes, types, and applications of physical and electronic access control systems, surveillance systems, and intrusion detection systems;

(B) analyze how physical and electronic systems work together as an integrated system to support an overall protection strategy; and

(C) analyze the roles of security surveys, inspections, and exercises to test existing protection measures.

(9) The student investigates disaster response in emergency situations as it relates to the duties of a security officer for the protection of persons, property, and information. The student is expected to:

(A) summarize the characteristics of terrorism as a criminal act; and

(B) examine the elements and techniques of critical infrastructure protection to reduce the risk to key terrorist targets and the impact of natural disasters.

(10) The student recognizes the role of intelligence analysis in crime prevention and homeland security. The student is expected to:

(A) summarize the steps of the intelligence cycle such as planning, collection, collation, evaluation, analysis, dissemination, and feedback; and

(B) execute a crime pattern analysis identifying links between a given crime and a set of potentially related incidents.

(11) The student applies crime prevention concepts. The student is expected to:

(A) diagram the crime triangle of ability, opportunity, and motive;

(B) describe the concepts of deter, detect, delay, and deny; and

(C) evaluate the security of a business or residence by using crime prevention through environmental design strategies.

(12) The student evaluates situations requiring the use of force. The student is expected to:

(A) demonstrate the use of the force continuum in simulated situations requiring varied degrees of force; and

(B) explain the guidelines and restrictions imposed by state and federal governments related to the use of deadly force.

(13) The student analyzes procedures and protocols for self-defense in homeland security and protective services. The student is expected to demonstrate self-defense and defensive tactics such as ready stance, escort positions, strikes, kicks, punches, handcuffing, and searching.

(14) The student recognizes the importance of critical infrastructures and key assets. The student is expected to:

(A) discuss the importance of critical infrastructure and key assets within federal law enforcement and protective services such as water, power and energy, information, transportation, banking and finance, defense, postal and shipping, agricultural and food, public health, and emergency services; and

(B) create a plan of action for city and state for situations involving threats to critical infrastructure and key assets.

(15) The student identifies chemical and biological threat identification, protection, detection, and decontamination concepts. The student is expected to:

(A) analyze research on the cause and effects of chemical threats such as airborne pathogens and toxic, nuclear, biological, and manmade chemicals; and

(B) create research projects on the cause and effects of chemical threats such as airborne pathogens and toxic, nuclear, biological, and manmade chemicals.

(16) The student recognizes law enforcement roles in preparedness and response systems for disaster situations. The student is expected to:

(A) develop a plan of action for disaster preparedness within home, school, or community;

(B) evaluate the effectiveness of the actions in place for all natural disasters;

(C) evaluate the effectiveness of preparedness and response systems during and after a disaster;

(D) appraise a disaster situation to determine the appropriate course of action;

(E) examine and implement the Community Emergency Response Team (CERT) guidelines for home, school, or community such as fire safety, disaster medical operations, search and rescue, and terrorism; and

(F) construct a CERT disaster simulation within the school or community.

§127.761. Principles of Government and Public Administration (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-11. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Principles of Government and Public Administration introduces students to foundations of governmental functions and career opportunities within the United States and abroad. Students will examine governmental documents such as the U.S. Constitution, current U.S. Supreme Court and federal court decisions, and the Bill of Rights.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student explores major political ideas and forms of government in history. The student is expected to:

(A) explain major political ideas in history such as natural law, natural rights, divine right of kings, and social contract theory;

(B) identify the characteristics of classic forms of government such as absolute monarchy, authoritarianism, classical republic, despotism, feudalism, liberal democracy, and totalitarianism; and

(C) explore aspects of public service and related careers at international, federal, state, and local levels.

(3) The student understands how constitutional government, as developed in the United States, has been influenced by people, ideas, and historical documents. The student is expected to:

(A) analyze the principles and ideas that underlie the Declaration of Independence and the U.S. Constitution;

(B) explain the importance of a written constitution and how the federal government serves the purposes set forth in the U.S. Constitution;

(C) explore how the Federalist Papers explain the principles of the U.S. constitutional system of government;

(D) evaluate constitutional provisions for limiting the role of government such as republicanism, checks and balances, federalism, separation of powers, popular sovereignty, and individual rights;

(E) analyze the contributions of the political philosophies of the founding fathers and explain why they created a distinctly new form of federalism and adopted a federal system of government instead of a unitary system;

(F) evaluate the limits on the national and state governments in the U.S. federal system of government and how the U.S. Constitution can be amended;

(G) categorize, diagram, or create a descriptive representation of the government powers as national, state, or shared government;

(H) analyze historical conflicts over the respective roles of national and state governments in the United States; and

(I) identify significant individuals and their roles in the field of government and politics, including ambassadors, elected officials, and appointed officials.

(4) The student compares the similarities and differences that exist among the U.S. system of government and other political systems. The student is expected to:

(A) compare and contrast the U.S. system of government with other political systems; and

(B) analyze advantages and disadvantages of presidential and parliamentary systems of government.

(5) The student explores rights guaranteed by the U.S. Constitution. The student is expected to:

(A) identify the rights guaranteed by the Bill of Rights;

(B) evaluate the role of limited government and the rule of law for the protection of individual rights;

(C) identify and recognize issues addressed in critical cases that involve U.S. Supreme Court interpretations of rights guaranteed by the U.S. Constitution;

(D) define the roles of each branch of government in protecting the rights of individuals;

(E) explain the importance of due process rights to the protection of individual rights and to the limits on the powers of government; and

(F) recognize the impact of the incorporation doctrine involving due process and the Bill of Rights on individual rights, federalism, and majority rule.

(6) The student recognizes the difference between personal and civic responsibilities. The student is expected to:

(A) explain the difference between personal and civic responsibilities of citizens versus non-citizens;

(B) present how, why, and when the rights of individuals are inviolable even against claims for the public good;

(C) analyze the consequences on society of political decisions and actions; and

(D) investigate the role of municipal management in serving public and personal good.

(7) The student recognizes the importance of voluntary individual participation in the U.S. democratic society. The student is expected to:

(A) present how to measure the effectiveness of participation in the political process at local, state, and national levels;

(B) review, document, and explain how historical and contemporary examples of citizen movements were used to bring about political change or to maintain continuity;

(C) evaluate different leadership styles and their impact on participation;

(D) explain the factors that influence an individual's political attitudes and actions;

(E) compare effectiveness of leadership characteristics of state and national leaders; and

(F) explain the importance of volunteer public service in bringing about political change and maintaining continuity.

(8) The student recognizes the relationship between government policies and the culture of the United States. The student is expected to:

(A) identify a political policy or decision in the United States that was a result of changes in American culture;

(B) discuss changes in American culture brought about by government policies such as voting rights, the GI Bill, and racial integration;

(C) present an example of a government policy that has affected a particular racial, ethnic, or religious group; and

(D) explain the influence of individuals and/or groups that have affected change in society.

(9) The student identifies the influence of geography on governmental and public administrative functions. The student is expected to:

(A) draw conclusions about the political significance to the United States of the location and geographic characteristics of critical regions compared to the economic significance of the geographic characteristics of selected places such as oil fields in the Middle East using maps and Global Positioning System (GPS) locations;

(B) interpret geographical influences on requirements for international, national, state, and local governments;

(C) predict how geographical considerations impact regional change over time;

(D) interpret the importance of cultural symbols in the planning of government activities;

(E) explore how geographic information systems assist in gathering information; and

(F) connect a positive or negative effect of a government policy to the physical and human characteristics of a place or region.

(10) The student interprets and applies concepts of governance to assess functions of government and public administration in society. The student is expected to:

(A) recall historical debates and recognize the compromises necessary to reach landmark political decisions;

(B) give examples of the processes used by individuals, political parties, interest groups, or the media to affect public policy;

(C) explore the impact of political changes brought about by individuals, political parties, interest groups, or the media;

(D) recognize how the American beliefs and principles reflected in the U.S. Constitution contribute to our national identity;

(E) evaluate the alignment of institutions of government and public administration with the principles of U.S. and international law to guide policy development; and

(F) analyze how U.S. foreign policy affects other countries.

(11) The student works with different forms and methods of communication used to manage and facilitate the flow of ideas and information among government, public administration, the business community, and the general public. The student is expected to:

(A) analyze the structure and functions of the legislative branch of government such as the bicameral structure of Congress, the role of committees, and the procedure for enacting laws;

(B) analyze the structure and functions of the executive branch of government such as the constitutional powers of the president, the growth of presidential power, and the role of the cabinet and executive departments;

(C) analyze the structure and functions of the judicial branch of government, including the federal court system and types of jurisdiction;

(D) analyze the functions of selected independent executive and regulatory agencies;

(E) explain how certain provisions of the U.S. Constitution provide for checks and balances among the three branches of government;

(F) analyze selected issues raised by judicial activism and judicial restraint;

(G) compare and contrast the structures and functions of the Texas state government to the federal system;

(H) analyze the structure and functions of local government;

(I) document, report, and record information to conform to legal requirements;

(J) research safety standards and practices ensuring public safety and environmental protection;

(K) investigate how to comply with directives to ensure protection of confidential information while carrying out duties as a government or public administration employee;

(L) compare and contrast the concepts of ethical conduct to comply with all laws and regulations affecting governmental agencies; and

(M) describe the accepted principles of financial management to administer budgets, programs, and human resources.

(12) The student uses technologies to research common objectives of government and public administration. The student is expected to:

(A) access appropriate information technologies to accomplish tasks;

(B) integrate appropriate information technologies to accomplish tasks;

(C) identify examples of government-assisted research that, when shared with the private sector, has resulted in improved consumer products such as computer and communication technologies;

(D) analyze how U.S. government policies fostering competition and entrepreneurship have resulted in scientific discoveries and technological innovations;

(E) analyze the potential impact on society of recent scientific discoveries and technological innovations;

(F) analyze the reaction of government to scientific discoveries and technological innovations; and

(G) explain the concept of intellectual property.

§127.762. Political Science I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Political Science I introduces students to political theory through the study of governments; public policies; and political processes, systems, and behavior.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and,

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student compares and contrasts current, classic, or contemporary political theories. The student is expected to:

(A) discuss why theories are important to the study of political science;

(B) draw conclusions about the classic political theorists such as Plato, Aristotle, Cicero, Machiavelli, Confucius, Hobbes, Locke, Hegel, and Marx;

(C) define the characteristics of contemporary political theories such as behaviorialism, postbehavioralism, systems theory, modernization theory, structural-functionalism, developmentalism, rational-choice theory, and new institutionalism;

(D) compare and contrast the evolution of classic and contemporary theories; and

(E) make predictions and defend opinions about the future of political science theory.

(3) The student explores historical origins of government. The student is expected to:

(A) describe the features of different types of government such as democracy, theocracy, republic, monarchy, dictatorship, communism, and socialism;

(B) use a map to label where each form of government is currently practiced or has been practiced in the past;

(C) explain how each form of government arose throughout history;

(D) develop a logical argument for the origin of different types of government; and

(E) hypothesize why some forms of government became obsolete.

(4) The student analyzes belief systems that claim to improve society. The student is expected to:

(A) define political ideologies such as feminism, Marxism, Nazism, and capitalism;

(B) coordinate the four elements of perception, evaluation, prescription, and movement with political ideologies; and

(C) predict what national or global trends could stimulate the formation of a new ideology.

(5) The student applies the concepts learned in the history and ideology of political science. The student is expected to:

(A) make observations regarding the political culture of emerging nations or nations with recent current events; and

(B) research and present the political culture of a country.

(6) The student identifies the roles played by local, state, and national governments in public and private sectors of the U.S. free enterprise system. The student is expected to:

(A) recognize that government policies influence the economy at the local, state, and national levels;

(B) identify the sources of revenue of the U.S. government and analyze their impact on the U.S. economy;

(C) identify the sources of expenditures of the U.S. government and analyze their impact on the U.S. economy;

(D) compare and contrast the role of government in the U.S. free enterprise system and other economic systems; and

(E) explain the effects of international trade on U.S. economic and political policies.

(7) The student analyzes public opinion. The student is expected to:

(A) investigate sources and influences of public opinion;

(B) analyze the effect of public opinion on leadership;

(C) critique the reliability of public opinion and how it is measured; and

(D) compare and contrast the effects of expressed public opinion on poll items such as elections, elected official behavior, tax policy, services, and environmental protection.

(8) The student identifies interest groups. The student is expected to compare and contrast the positive and negative aspects of interest groups such as public interest research groups, lobbies, and political action committees.

(9) The student analyzes the election process. The student is expected to:

(A) review the process of electing public officials;

(B) recognize the influence of political parties in elections;

(C) explore the phenomenon of political image;

(D) describe the cause-and-effect relationship of communication style in a campaign; and

(E) compare and contrast the effectiveness of telephones, television, print media, focus groups, and online resources in elections.

(10) The student explores the processes for filling public offices in the U.S. system of government. The student is expected to:

(A) compare and contrast different methods of filling public offices such as elected and appointed offices at the local, state, and national levels; and

(B) analyze and evaluate the processes of electing the president of the United States.

(11) The student examines the role of political parties in the U.S. system of government. The student is expected to:

(A) discuss the functions of the two-party system;

(B) compare and contrast the role of third parties in the United States;

(C) recognize the role of political parties in the electoral process at the local, state, and national levels; and

(D) identify opportunities for citizens to participate in the electoral process at the local, state, and national levels.

(12) The student applies the concepts of statistical analysis to political science. The student is expected to:

(A) examine concepts used in research such as theories, hypotheses, independent and dependent variables, sampling, reliability, validity, and generalizability; and

(B) compare and contrast the types of statistical data such as in political science journals, public opinion polls, and surveys.

§127.763. Political Science II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration or Political Science I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Political Science II uses a variety of learning methods and approaches to examine the processes, systems, and political dynamics of the United States and other nations. The dynamic component of this course includes current U.S. and world events.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student analyzes public administration and public affairs. The student is expected to:

(A) explore the ancient history of public administration;

(B) consider whether current practices of public administration are improvements upon older practices;

(C) explain the term bureaucracy and draw conclusions as to why public perception of bureaucracy is poor;

(D) analyze the effects of poor public perception on leadership style;

(E) analyze political pluralism, displacement and concentration hypothesis, and technological complexity;

(F) recognize that public management involves evaluation of productivity, budgets, and human resources; and

(G) research, investigate, and explain specific examples of ethics issues in public administration.

(3) The student identifies the cause and effect of expression of different viewpoints in a democratic society. The student is expected to:

(A) compare different points of view of political parties and interest groups on important contemporary issues;

(B) analyze the importance of free speech and press in a democratic society; and

(C) express the student's point of view on an issue of contemporary interest in the United States.

(4) The student analyzes international relations. The student is expected to:

(A) examine the historical development of the international system;

(B) compare and contrast the classical international system, the transitional international system, the post-World War II international system, and the contemporary international system;

(C) research national actors and international interactions;

(D) examine the rational actor model;

(E) analyze what a nation-state does when faced with a problem that requires resolution;

(F) make observations about ethics in foreign policy; and

(G) draw conclusions about the role of morality in decision making such as Cold War spying and humanitarian intervention.

(5) The student explores diplomacy as the management of international relations by negotiation. The student is expected to:

(A) compare and contrast the ancient practice of sending emissaries with current embassy activities;

(B) identify embassy and ambassador roles in international relations;

(C) distinguish between types of diplomacy such as public versus secret, multilateral versus bilateral, and tacit versus formal;

(D) use concepts of bargaining and game theory to solve problems;

(E) recognize national versus state approaches to armed force when diplomacy breaks down;

(F) analyze force without war, causes of war, and the consequences of war; and

(G) analyze the role of international law in treaties, customs, immigration, and human rights.

(6) The student analyzes international governmental organizations and non-governmental organizations. The student is expected to:

(A) identify prominent international governmental organizations and non-governmental organizations;

(B) explore the methods of operation and function of international governmental organizations and non-governmental organizations in global problem solving; and

(C) propose a solution for an international relations problem such as arms control, terrorism, commerce, currency, natural resource management, food, or population control.

(7) The student analyzes the flow of ideas and information among the federal government, public administration, the business community, and the global societies. The student is expected to:

(A) examine concepts of authority, rights, and responsibilities to evaluate their impact on the governance of societies;

(B) explain the major responsibilities of the federal government for domestic and foreign policy;

(C) practice communication techniques used to stimulate the exchange of ideas and develop international, national, state, and local networks to accomplish governmental goals; and

(D) interpret the impact of international, national, state, or local politics on the goals of governmental or public administrative agencies.

§127.764. Foreign Service and Diplomacy (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration or Principles of Law, Public Safety, Corrections, and Security. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Foreign Service and Diplomacy provides the opportunity for students to investigate the knowledge and skills necessary for careers in foreign service. The course includes law, history, media communication, and international relations associated with the diplomatic environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student integrates knowledge and presentation skills related to diplomacy and representing the United States to host-country officials, media personnel, and traveling officials. The student is expected to:

(A) demonstrate the ability to provide host-country officials with information on U.S. government and culture;

(B) demonstrate an understanding of organizing exchange programs to familiarize future host-country decision makers with U.S. institutions, customs, and culture;

(C) analyze the effectiveness of foreign support programs and other efforts of U.S. economic, intelligence, and affiliate agencies;

(D) demonstrate how to address and respond to media personnel on matters of U.S. policy raised in conjunction with visits of U.S. officials; and

(E) demonstrate how to address and respond to media personnel on matters of U.S. policy in reaction to unanticipated events.

(3) The student applies knowledge of foreign history, law, geography, and natural resources to recommend new or modified foreign service efforts. The student is expected to:

(A) describe responses of host-country personnel to U.S. programs and official visits;

(B) analyze and report the impact of American travelers and popular culture on a host country; and

(C) assess the impact of host-country responses to catastrophic events.

(4) The student applies U.S. and host-country laws, regulations, policies, and procedures to administrative management. The student is expected to:

(A) apply U.S. immigration laws and regulations to determine eligibility of individuals;

(B) explain grounds for refusal of visas;

(C) research documents and databases related to U.S. and host-country laws, regulations, policies, or procedures; and

(D) apply identification and documentation procedures.

(5) The student applies knowledge of host-country laws, customs, and effective administrative practices to manage the conduct of diplomatic operations. The student is expected to:

(A) model negotiations with a host government on reciprocity issues, taxation, diplomatic status, and other matters affecting welfare, security, and status of mission; and

(B) design a program that buys and sells goods and services for diplomatic operations.

§127.765. Planning and Governance (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Planning and Governance provides the opportunity for students to formulate plans and policies to meet social, economic, and physical needs of communities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student identifies the skills necessary to manage and modify the community planning process. The student is expected to:

(A) relate physical design to functioning of environment;

(B) analyze data relative to a project on present and future needs;

(C) assess legal aspects of regulatory compliance in planning;

(D) evaluate the presentation of class activity in regard to regulations and procedures;

(E) perform mapping and graphic functions skills;

(F) predict the interaction between economy, transportation, health and human services, and land regulation and make recommendations for the future of an activity or project; and

(G) record or document observations about local, state, and federal programs in order to provide future planning recommendations.

(3) The student develops a workplace or activity-based project and plans for land use, housing, parks and recreation, transportation, economic development, and public facilities to manage change. The student is expected to:

(A) identify emerging trends and barrier issues;

(B) practice or perform problem-solving techniques to overcome barriers to plan implementation; and

(C) evaluate the style of strategies available and necessary for achieving goals.

(4) The student creates a coherent plan for project management. The student is expected to:

(A) initiate a project, including securing class or instructor approval of project scope;

(B) plan a project;

(C) execute a project, including responding to requests for information;

(D) monitor and control a project, including demonstrating effective, cogent presentation skills for public meetings and creating a format to monitor plan budgets;

(E) close a project; and

(F) maintain professionalism in challenging group and one-on-one situations.

(5) The student uses advanced research and organizational skills to influence matters of public policy. The student is expected to:

(A) extract and evaluate ideas from research library resources and online materials;

(B) organize, structure, and conduct practice interviews with students; and

(C) compile original data and reliable source information into a student-designed objective database.

(6) The student develops reasoned, persuasive arguments to support public policy options or positions. The student is expected to:

(A) analyze and implement classical and modern patterns of rhetoric;

(B) analyze differing political, social, ideological, and philosophical perspectives;

(C) critique facts and statistical claims for accuracy and relevance; and

(D) ensure materials meet ethical standards.

(7) The student develops political instincts and understanding of political processes to gain consensus. The student is expected to:

(A) compare and contrast interests of various individuals, groups, and their representatives;

(B) explore options for promoting tolerance toward individuals and groups;

(C) employ mediation techniques;

(D) suggest alternative proposals that keep discussions from collapsing; and

(E) discuss methods of openness for decision-making or problem-solving processes.

(8) The student advocates new policies or policy changes to gain support for new or revised laws, regulations, ordinances, programs, or procedures. The student is expected to:

(A) deliver compelling arguments regarding issues or proposals;

(B) create effective media presentations and projects;

(C) employ workplace skills to show the process reactions and responses and adjust appeals accordingly;

(D) evaluate and employ techniques for motivating staff; and

(E) create project steps and activities for avoiding ethical pitfalls.

§127.766. National Security (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Government and Public Administration and Public Management and Administration or Principles of Law, Public Safety, Corrections, and Security or Junior Reserve Officer Training Corps (JROTC) coursework. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) National Security introduces the students to the aspects of disaster management. The course includes engaging simulation exercises related to natural disasters, man-made disasters, and terroristic events using homeland security programs and National Incident Management System (NIMS) programs.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student explores and examines the personnel and organizational structure within a security agency. The student is expected to:

(A) explore, develop, plan, and implement goals and objectives of an organization within a project or classroom activity;

(B) create and make personnel assignments and align them with job demands within a project or classroom activity;

(C) explore the processes used to implement evaluation systems and standards of a security agency; and

(D) explore and review the usage of available counseling and training resources using online or written materials.

(3) The student analyzes the leadership skills necessary to ensure compliance with rules of engagement and other applicable ethical standards. The student is expected to:

(A) identify rules of engagement for local, state, federal, and international agencies;

(B) evaluate U.S. and international laws, treaties, and conventions applicable to military or other security agency conduct;

(C) employ and evaluate the usage of effective training materials;

(D) facilitate and participate in group discussions of ethical issues raised by current events;

(E) investigate compliance with procedures and laws such as U.S. military, international military, maritime, criminal, and civil laws;

(F) apply current rulings and regulatory laws, rules, or standards to appropriate situations; and

(G) recognize and evaluate actions in violation of laws, rules, and standards.

(4) The student analyzes intelligence information from within and outside the United States through simulated exercises. The student is expected to:

(A) explore the scope and limits of an assigned mission in a simulated exercise;

(B) evaluate physical, psychological, cultural, and military threats of a simulated exercise;

(C) define the specific goals and intentions of foreign entities relevant to a mission;

(D) analyze physical characteristics of areas that could become battlegrounds in time of war;

(E) explore and review methods used to direct ground and sea surveillance;

(F) explore and review methods used to intercept foreign military communications; and

(G) explore and review methods used to coordinate information with other national security agencies.

(5) The student practices methods that translate and analyze signals to discover elements indicative of intent, plans, and operations of potentially hostile governments, groups, or individuals. The student is expected to:

(A) organize evidence to facilitate discovery of a potentially hostile nature; and

(B) evaluate agency and national actions of a potentially hostile nature.

(6) The student prepares and coordinates strategies to defend against the effects of chemical, biological, nuclear, and cyberterrorism or natural disasters. The student is expected to:

(A) create plans for response to both hostile and unintended events;

(B) explore and evaluate what form of safety equipment and supplies are needed for protection against chemical, biological, or nuclear effects;

(C) explore and evaluate the available intelligence information for determination of response plan implementation;

(D) create a device or project for monitoring local and global intelligence such as using information about weather and geophysical events;

(E) explore and discuss what methods are needed to maintain communications with federal, state, and local agencies; and

(F) identify and review issues that exist within the security and safety of network cyber-based systems.

(7) The student develops strategies to train persons potentially performing national security tasks. The student is expected to:

(A) explore methods and materials used to analyze missions for which training is to be provided;

(B) plan and evaluate current and past training methods; and

(C) explore and review how agencies devise means of evaluating trainee progress.

§127.767. Public Management and Administration (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration or Business Management or Business Law. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Public Management and Administration reviews actions and activities that governments and nonprofit administrations commonly use and that resemble private-sector management. Students will be introduced to management tools that maximize the effectiveness of different types and styles of administrators and affect the quality of life of citizens in the community.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student analyzes management theories. The student is expected to:

(A) explore the various management theories such as Venn Diagram, Theory X, Theory Y, and Theory Z and how they are used effectively in public administration and management; and

(B) compare and contrast management of government and nonprofit agencies to management in the private sector.

(3) The student compares and contrasts department vision, goals, and mission to support those of a public agency. The student is expected to:

(A) analyze economic, political, and social trends likely to impact an agency or department;

(B) develop expansive professional networks internally and with other organizations to broaden communication;

(C) practice and participate in the process of determining how to recruit a diverse workforce in an equitable manner;

(D) apply interpersonal skills to grasp opportunities and manage conflicts in a positive and constructive manner;

(E) emphasize the need to infuse understanding of vision, missions, and goals into all departmental activities;

(F) analyze the concept of risk management; and

(G) legally publicize all meetings at which budget and allocation decisions are to be discussed.

(4) The student practices the process of facilitating the flow of ideas and information to keep the agency and its constituency informed of departmental policies and operations. The student is expected to:

(A) address reluctance of employees to share work product and intellectual property;

(B) restate complex technical information or issues in language the general public can understand;

(C) explain, justify, or discuss public issues effectively;

(D) present techniques effectively to handle difficult interviews and situations effectively; and

(E) afford the public equal opportunity of access to all open records.

(5) The student uses agency expertise used by elected officials and others to identify, implement, and achieve common goals and objectives. The student is expected to:

(A) obtain relevant data relating to public management and non-public management from reliable sources;

(B) apply pertinent research and analytical methodologies; and

(C) assess the impact of probable changes on the public.

(6) The student uses planning and fiscal services used to fund agency priorities. The student is expected to:

(A) estimate costs according to standards for government accounting;

(B) propose options over a range of cost requirements;

(C) analyze government resources to find possibilities for new or increased funding of programs; and

(D) prepare budgets.

(7) The student develops and manages plans and systems that would meet agency needs without wasting funds or engaging in unethical behavior. The student is expected to:

(A) demonstrate an understanding of how to assist departmental staff to fulfill procurement requirements;

(B) recommend process changes to improve vendor reliability and performance;

(C) determine means of public announcements to elicit vendor interest and bids from qualified sources;

(D) identify sources that match approved vendor criteria;

(E) manage an evaluation process that would ensure each bid, proposal, or offer is evaluated completely in terms of all relevant and ethical criteria; and

(F) identify ways to safeguard proprietary information of bidders and the rights of procurement and determine the need for outside consults.

(8) The student applies laws and policies to protect or disclose information as appropriate. The student is expected to:

(A) maintain thorough familiarity with public information requirements and records maintenance and retention requirements such as the Public Information Act (Texas Government Code, Chapter 552) and the records retention requirements of Texas Government Code, Chapter 441, and Texas Local Government Code, Chapters 201-205;

(B) identify how to explain policy background and rationale to persons denied access to certain public information; and

(C) compare and contrast the reliable controls to prevent unauthorized access to or release of privileged information.

§127.768. Revenue, Taxation, and Regulation (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Government and Public Administration or Accounting I and II. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Revenue, Taxation, and Regulation provides an overview of law and investigative principles and follows agency procedures to examine evidence and ensure revenue compliance. In addition, students will learn to facilitate clear and positive communication with taxpayers and become familiar with data analysis systems and revenue-related financial problems. Students will prepare projects and class activities to simulate the skills needed to enforce legal compliance and regulatory standards.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student explores the investigation and evidence collection process in mock situations similar to regulatory commissions and agents. The student is expected to:

(A) investigate potential violators by exploring leads and conducting mock client interviews;

(B) model persuasive techniques to gain cooperation such as subpoenas and other ethically and legally acceptable means;

(C) identify and differentiate between relevant and irrelevant evidence and information;

(D) examine evidence of crimes and violations while preserving and observing the rules of evidence;

(E) examine business, commercial, industrial, and agency records for accuracy and compliance;

(F) organize facts accurately, objectively, logically, and concisely;

(G) analyze matters that are prohibited or concern invasion of privacy; and

(H) simulate conducting surveillance while recording facts about observed persons, objects, and events.

(3) The student analyzes the process of agency communication with the public. The student is expected to:

(A) analyze the common accounting problem of costs deviating from standards;

(B) compare and contrast ways to coordinate work and organize information with others performing similar tasks;

(C) simulate releasing public information to minimize controversy;

(D) identify problems that arise regarding flow of information after research responsibilities are assigned and completed;

(E) create a solution to the problem of information flow and communication; and

(F) demonstrate the ability to present authoritative advice to interested parties and acquainting them with available services.

(4) The student uses critical-thinking and problem-solving skills for revenue, taxation, and regulation by analysis and interpretation of accounting data and collection activities. The student is expected to:

(A) analyze data to identify matters needing negotiations for resolution;

(B) explore and identify different noncompliant practices;

(C) recommend application of administrative and judicial remedies; and

(D) produce mock reports to provide a basis for handling similar cases or audits.

(5) The student is expected to scrutinize regulatory investigations and enforcement. The student is expected to:

(A) conduct dimensional, operational, and process inspections;

(B) measure compliance with standards, specifications, and requirements;

(C) monitor a variety of quality characteristics;

(D) research consequences of degrees of noncompliance;

(E) investigate history and circumstances of violations; and

(F) secure expertise and make referrals as needed.

§127.769. Forensic Science (One Credit), Adopted 2021.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2023-2024 school year.

(b) General requirements. The course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisites: one credit in biology, one credit in chemistry, integrated physics and chemistry, or physics. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Law and Public Service Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Forensic Science is a survey course that introduces students to the application of science to law. Students learn terminology and procedures related to the collection and examination of physical evidence using scientific processes performed in a field or laboratory setting. Students also learn the history and the legal aspects of forensic science.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to demonstrate professional standards/employability skills such as demonstrating good attendance, punctuality, and ethical conduct; meeting deadlines, and working toward personal and team goals.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools and equipment such as scientific calculators, computers, internet access, digital cameras, video recording devices, meter sticks, metric rulers, measuring tapes, digital range finders, protractors, calipers, light microscopes up to 100x magnification, hand lenses, stereoscopes, digital scales, dissection equipment, standard laboratory glassware, appropriate personal protective

equipment (PPE), an adequate supply of consumable chemicals, biological specimens, prepared evidence slides and samples, evidence packaging and tamper evident tape, evidence tents, crime scene tape, L-rulers, American Board of Forensic Odontology (ABFO) scales, alternate light sources (ALS) and ALS protective goggles, blood specimens, blood presumptive tests, glass samples of various chemical composition, human and non-human bones, fingerprint brushes and powders, lifting tapes and cards, ten-print cards and ink pads, swabs with containers, disposable gloves, and relevant and necessary kits;

(E) collect quantitative data with accuracy and precision using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using appropriate methods of communication such as reports, graphs, tables, or charts;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field.

(6) The student explores the history of forensic science. The student is expected to:

(A) analyze the historical development and current advancements of different forensic science disciplines such as forensic biology, anthropology/odontology, forensic chemistry, trace evidence, ballistics, fingerprints, digital forensics, and questioned documents; and

(B) explain significant historical and modern contributions to the development and advancement of forensic science made by contributors such as Edmond Locard, Mathieu Orfila, Francis Galton, Edwin Henry, and Alec Jeffreys.

(7) The student analyzes legal aspects within forensic science. The student is expected to:

(A) summarize the ethical standards required of a forensic science professional;

(B) identify and explain knowledge of terminology and procedures employed in the criminal justice system as they pertain to the chain of custody procedure for evidence;

(C) identify and explain knowledge of terminology and procedures employed in the criminal justice system as they pertain to expert witness testimony;

(D) research and discuss the effect of biases such as confirmation bias and framing cognitive bias on evidence collection, forensic analysis, and expert testimony; and

(E) compare the admissibility of expert witness testimony in terms of the Frye Standard and the Daubert Standard under federal rules of evidence.

(8) The student explores career options within forensic science. The student is expected to:

(A) explore and describe discipline-specific requirements for careers in forensic science, including collegiate course requirements, licensure, certifications, and physical and mental capabilities;

(B) differentiate the roles and responsibilities of professionals in the criminal justice system, including forensic scientists, crime scene investigators, criminologists, court systems personnel, and medicolegal death investigations; and

(C) differentiate the functions of various forensic science disciplines such as forensic biology, forensic chemistry, trace evidence, ballistics, fingerprints, digital forensics, and questioned documents.

(9) The student recognizes the procedures of crime scene investigation while maintaining scene integrity. The student is expected to:

(A) explain the roles and tasks needed to complete a crime scene examination, which may require collaboration with outside experts and agencies, and demonstrate the ability to work as a member of a crime scene team;

(B) develop a detailed, technical written record based on observations and activities, documenting the crime scene examination;

(C) discuss the elements of criminal law that guide search and seizure of persons, property, and evidence;

(D) conduct a primary and secondary systematic search of a simulated crime scene for physical evidence utilizing search patterns such as spiral, line, grid, and zone;

(E) document a crime scene using photographic or audiovisual equipment;

(F) generate a physical or digital crime scene sketch, including coordinates or measurements from fixed points, compass directions, scale of proportion, legend-key, heading, and title block; and

(G) demonstrate proper techniques for collecting, packaging, and preserving physical evidence found at a crime scene while maintaining documentation, including chain of custody.

(10) The student analyzes fingerprint evidence in forensic science. The student is expected to:

(A) compare the three major fingerprint patterns of arches, loops, and whorls;

(B) identify the minutiae of fingerprints, including bifurcations, ending ridges, dots, short ridges, and enclosures/islands;

(C) distinguish between patent, plastic, and latent impressions;

(D) perform procedures for developing and lifting latent prints on nonporous surfaces using cyanoacrylate and fingerprint powders;

(E) perform procedures for developing latent prints using chemical processes on porous and adhesive surfaces with chemicals such as ninhydrin and crystal violet and documenting the results via photography; and

(F) explain the Integrated Automated Fingerprint Identification System (IAFIS) and describe the implications of Next Generation Identification (NGI) systems.

(11) The student collects and analyzes impression evidence in forensic science. The student is expected to:

(A) analyze the class and individual characteristics of tool mark impressions and the recovery and documentation of surface characteristics such as wood or metal;

(B) analyze the class and individual characteristics of footwear impressions and the recovery and documentation of surface characteristics such as soil or organic plant material;

(C) analyze the class and individual characteristics of tire tread impressions and the recovery documentation of surface characteristics such as soil or organic plant material; and

(D) compare impression evidence collected at a simulated crime scene with the known impression.

(12) The student recognizes the methods to process and analyze hair and fibers found in a crime scene. The student is expected to:

(A) demonstrate how to collect hair and fiber evidence at a simulated crime scene;

(B) perform the analysis of hair and fiber evidence using forensic science methods such as microscopy and flame testing;

(C) compare the microscopic characteristics of human hair and non-human hair, including medulla, pigment distribution, and scales;

(D) describe and illustrate the different microscopic characteristics used to determine the origin of a human hair sample; and

(E) differentiate between natural and synthetic fibers.

(13) The student recognizes the methods to process and analyze glass evidence. The student is expected to:

(A) demonstrate how to collect and preserve glass evidence;

(B) compare the composition of various types of glass such as soda lime, borosilicate, leaded, and tempered;

(C) determine the direction of a projectile by examining glass fractures; and

(D) define refractive index and explain how it is used in forensic glass analysis.

(14) The student explores principles of questioned document analysis in the physical and digital form. The student is expected to:

(A) research and explain different types of examinations performed on digital and physical evidence in a forensic laboratory such as digital data recovery, counterfeiting, ink, and paper analysis;

(B) investigate and describe the security features incorporated in U.S. and foreign currency to prevent counterfeiting; and

(C) perform handwriting comparisons of an unknown sample with exemplars by analyzing characteristics such as letter, line, and formatting.

(15) The student evaluates firearms and ballistics evidence. The student is expected to:

(A) describe the mechanism of modern firearms such as long guns and handguns;

(B) identify the components and characteristics of bullet and cartridge cases;

(C) describe the composition of and method of analysis for gunshot residue and primer residue;

(D) conduct and calculate trajectory analysis of bullet strikes within a simulated crime scene; and

(E) identify and recognize the type of information available through the National Integrated Ballistics Information Network.

(16) The student identifies controlled and illicit substances. The student is expected to:

(A) differentiate between toxicological analysis and controlled substance analysis as they relate to the method of collection and impact on the body;

(B) classify controlled substances using the schedules under the Controlled Substances Act; and

(C) identify unknown substances using presumptive and confirmatory procedures such as microchemical/color indicating reagent field tests, microscopy, chromatography, and spectrophotometry.

(17) The student explores toxicology in forensic science. The student is expected to:

(A) explain the absorption, distribution, metabolization, and elimination of toxins such as alcohol, prescription drugs, controlled substances, and carbon monoxide through the human body;

(B) describe presumptive and confirmatory laboratory procedures as they relate to toxicological analysis such as head space analysis, solid-phase extractions, gas chromatography-mass spectrometry (GC/MS), color tests, and immunoassays;

(C) interpret results from presumptive and confirmatory laboratory procedures, including GC/MS and their implications; and

(D) explain the precautions necessary in the forensic laboratory for proper preservation of biological samples.

(18) The student analyzes blood spatter at a simulated crime scene. The student is expected to:

(A) analyze blood stain patterns based on surface type and appearance such as size, shape, distribution and location in order to determine the mechanism by which the patterns are created;

(B) explain the methods of chemically enhancing latent blood patterns using reagents such as Blue Star or Amido Black; and

(C) conduct and interpret blood presumptive tests for various biologicals such as phenolphthalein and tetramethylbenzidine (TMB).

(19) The student analyzes the foundations and methodologies surrounding the processing of biological evidence for the purpose of identification. The student is expected to:

(A) identify different types of biological samples and practice proper collection and preservation techniques;

(B) identify the red blood cell antigens and antibodies as they relate to human blood types;

(C) describe the structure of a deoxyribonucleic acid (DNA) molecule and its function;

(D) explain the analytical procedure for generating a DNA profile, including extraction, quantification, amplification, and capillary electrophoresis;

(E) explain the different methodologies surrounding the different types of DNA analysis such as short tandem repeats (STRs), Y-STRs, mitochondrial DNA, and single nucleotide polymorphisms (SNPs);

(F) interpret the components of an electropherogram; and

(G) explore the databasing systems associated with DNA such as Combined DNA Index System (CODIS) and ancestry-based databasing systems.

(20) The student explores the principles surrounding medicolegal death investigations. The student is expected to:

(A) explain the principles of rigor, algor, and livor mortis and how they apply to deceased persons;

(B) differentiate between the types of wound patterns such as lacerations and blunt force trauma resulting from stabbings, bludgeoning, gunshots, and strangulations;

(C) determine cause and manner of death from an autopsy report obtained through resources such as case studies, simulated autopsies, and dissections; and

(D) determine the approximate time of death using entomology.

(21) The student explores principles of anthropology and odontology relevant to forensic science. The student is expected to:

(A) identify the major bones of the human skeletal system;

(B) compare composition and structure of human and non-human bones;

(C) describe the collection and preservation methods for bone evidence;

(D) explain the characteristics of the human skeletal system indicative of specific biological sex and approximate range of age and height; and

(E) explain how human remains are identified through dental records such as dentures, x-rays, and implants.

§127.800. Practicum in Law, Public Safety, Corrections, and Security (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Law, Public Safety, Corrections, and Security Career Cluster. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) The practicum course is designed to give students supervised practical application of previously studied knowledge and skills in law, public safety, corrections, and security. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to achieve business and industry employability skills standards such as attendance, on-time arrival, meeting deadlines, working toward personal/team goals every day, and ethical use of technology.

(2) The student demonstrates professional standards as required by business and industry. The student is expected to:

(A) adhere to policies and procedures;

(B) demonstrate positive work behaviors and attitudes such as punctuality, time management, initiative, and cooperation;

(C) accept constructive criticism;

(D) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(E) complete tasks with the highest standards to ensure quality services;

(F) describe professional standards in law, public safety, corrections, and security careers such as dress, grooming, and personal protective equipment as appropriate; and

(G) comply with practicum setting safety such as rules and regulations to maintain safe and healthful working conditions and environments.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem to develop creative and innovative solutions;

(B) critically analyze information to determine its value for the problem-solving task;

(C) compare and contrast alternatives using a variety of critical-thinking skills; and

(D) conduct technical research to gather information necessary for decision making.

(4) The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:

(A) analyze leadership characteristics such as trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation;

(B) demonstrate teamwork skills through working cooperatively with others to achieve tasks;

(C) demonstrate teamwork processes that promote skills such as team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate responsibility for shared group and individual work tasks;

(E) maintain effective working relationships in order to accomplish objectives and tasks;

(F) demonstrate effective working relationships using interpersonal skills;

(G) apply positive interpersonal skills to work cooperatively with others;

(H) demonstrate respect for individuals such as those from different cultures, genders, and backgrounds; and

(I) demonstrate sensitivity to and value for diversity.

(5) The student demonstrates verbal, nonverbal, and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions;

(B) employ verbal skills when obtaining and conveying information;

(C) access information sources for occupational tasks using technical materials and informational texts such as Internet websites;

(D) evaluate the reliability of information from technical materials, resources, and informational texts such as Internet websites;

(E) interpret verbal and nonverbal behaviors to enhance communication;

(F) apply active listening skills to obtain and clarify information; and

(G) use academic skills to facilitate effective written and verbal communication such as emails, texting, and written documents.

(6) The student demonstrates technical knowledge and skills required to pursue a career in the Law, Public Safety, Corrections, and Security Career Cluster. The student is expected to:

(A) develop advanced technical knowledge and skills related to the student's occupational objective;

(B) evaluate strengths and weaknesses in technical skill proficiency; and

(C) accept critical feedback provided by the supervisor.

(7) The student documents technical knowledge and skills. The student is expected to:

(A) update a professional portfolio reflecting items such as work quality and productivity; technical skills; problem solving; creativity and innovation; communication skills; teamwork and flexibility; initiative and self-direction; accountability and integrity; attendance; licensures or certifications, including awards and scholarships, extended learning experiences, community service, and active participation in career and technical student and professional organizations; abstract of technical competencies mastered during the practicum; updated and current resume; samples of work; and evaluation from the practicum supervisor; and

(B) present the portfolio to interested stakeholders.

§127.801. Extended Practicum in Law, Public Safety, Corrections, and Security (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Law, Public Safety, Corrections, and Security Career Cluster. Corequisite: Practicum in Law, Public Safety, Corrections, and Security. This course must be taken concurrently with Practicum in Law, Public Safety, Corrections, and Security and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Law, Public Safety, Corrections, and Security Career Cluster focuses on planning, managing, and providing legal services, public safety, protective services, and homeland security, including professional and technical support services.

(3) Extended Practicum in Law, Public Safety, Corrections, and Security is designed to give students supervised practical application of previously studied knowledge and skills in law, public safety, corrections, and security. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to law, public safety, corrections, or security;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(D) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) conduct technical research to gather information necessary for decision making.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in teaching and training. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a supervised law, public safety, corrections, or security experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised law, public safety, corrections, or security experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) examine, understand, and articulate job-specific technical vocabulary;

(D) evaluate strengths and weaknesses in technical skill proficiency; and

(E) collect representative work samples.

§127.802. Practicum in Local, State, and Federal Government (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of courses in the Government and Public Administration Career Cluster. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Students in the Practicum in Local, State, and Federal Government will concurrently learn advanced concepts of political science and government workings in the classroom setting and in the workplace. In addition, students will apply technical skills pertaining to government and public administration in a direct mentorship by individuals in professional settings such as government, public management and administration, national security, municipal planning, foreign service, revenue, taxation, and regulation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) communicate effectively with others using oral and written skills;

(B) demonstrate collaboration skills through teamwork;

(C) demonstrate professionalism by conducting oneself in a manner appropriate for the profession and workplace;

(D) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(E) show integrity by choosing the ethical course of action and complying with all applicable rules, laws, and regulations; and

(F) demonstrate time-management skills by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student analyzes classical and modern political theories. The student is expected to:

(A) review the works of theorists such as Plato, Aristotle, Cicero, Machiavelli, Confucius, Hobbes, Locke, Hegel, and Marx; and

(B) analyze contributions to modern political science from classical theorists such as Polybius, St. Thomas Aquinas, Dante, Bodin, Montesquieu, Kautilya, Ibn Khaldun, Hume, Rousseau, Kant, Smith, Nietzsche, Gandhi, and Keynes.

(3) The student analyzes the U.S. Constitution and constitutional law. The student is expected to:

(A) review basic information related to the U.S. Constitution such as the Articles of Confederation, framers of the Constitution, constitutional conventions, separation of powers, checks and balances, ratification, and the amendment process; and

(B) create a classroom Constitution and Bill of Rights simulating the U.S. Constitution.

(4) The student explores government ethics. The student is expected to formulate a plan for avoiding ethical problems in the future.

(5) The student conducts a project using analytical problem-solving techniques. The student is expected to:

(A) research a problem such as a government and public administration issue, a feasibility study, or a product evaluation;

(B) investigate the issues associated with the problem;

(C) collect primary data such as interviews, surveys, and observations;

(D) express thoughts logically and sequentially in preparing a formal report;

(E) interpret and present quantitative data in graph format within the report;

(F) prepare visuals and handouts to support the presentation; and

(G) make a final presentation of the study to the appropriate stakeholders.

(6) The student documents knowledge and skills attained in the practicum. The student is expected to:

(A) update a professional portfolio to include recognitions, awards, scholarships, a resume, a sample of work, and an evaluation from the practicum supervisor; and

(B) present the portfolio to interested stakeholders.

§127.803. Extended Practicum in Local, State, and Federal Government (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Government and Public Administration Career Cluster. Corequisite: Practicum in Local, State, and Federal Government. This course must be taken concurrently with Practicum in Local, State, and Federal Government and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Government and Public Administration Career Cluster focuses on planning and performing governmental functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

(3) Students in the Extended Practicum in Local, State, and Federal Government will concurrently learn advanced concepts of political science and government workings in the classroom setting and in the workplace. In addition, students will apply technical skills pertaining to government and public administration in a direct mentorship by individuals in professional settings such as government, public management and administration, national security, municipal planning, foreign service, revenue, taxation, and regulation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to government or public administration;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as leadership, teamwork, appreciation for diversity, conflict management, work ethic, and adaptability with increased fluency;

(D) demonstrate technology applications skills such as effective use of social media, email, Internet, publishing tools, presentation tools, spreadsheets, or databases to enhance work products with increased fluency; and

(E) employ effective planning and time-management skills with increased fluency by prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that uses time wisely and optimizes efficiency and results.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) create and deliver formal and informal presentations in an effective manner; and

(D) observe and interpret verbal and nonverbal cues and behaviors to enhance communication.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions; and

(B) analyze elements of a problem to develop creative and innovative solutions.

(4) The student understands the professional, ethical, and legal responsibilities in government and public administration. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) show integrity by choosing the ethical course of action when making decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(5) The student conducts a project using analytical problem-solving techniques. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised government or public administration experience;

(B) research a problem, complete a feasibility study, or complete a product evaluation related to a government and public administration issue;

(C) collect primary data such as interviews, surveys, and observations;

(D) interpret and present quantitative data;

(E) evaluate strengths and weaknesses in technical skill proficiency; and

(F) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER O. MANUFACTURING

19 TAC §§127.810 - 127.823, 127.865, 127.866

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.810. Principles of Manufacturing (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended prerequisite: Algebra I or Geometry. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into interme-

diate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Principles of Manufacturing, students are introduced to knowledge and skills used in the proper application of principles of manufacturing. The study of manufacturing technology allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities. Students will gain an understanding of what employers require to gain and maintain employment in manufacturing careers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and comply with appropriate dress for manufacturing activities;

(B) demonstrate positive work behaviors and personal qualities such as punctuality;

(C) demonstrate the ability to work in teams such as developing work schedules and measuring team performance;

(D) demonstrate an understanding of employers' application and interview processes; and

(E) identify federal laws and rules applicable to the workplace and enforcement agencies such as the Equal Employment Opportunity Commission and the Occupational Safety and Health Administration (OSHA).

(2) The student applies manufacturing concepts to specific problems. The student is expected to:

(A) distinguish between disciplines such as engineering, science, manufacturing, and technology;

(B) use tools such as calculators and computers to solve problems; and

(C) use a variety of measuring instruments.

(3) The student applies communication, mathematics, and science knowledge and skills to manufacturing activities. The student is expected to:

(A) demonstrate communication techniques consistent with industry standards;

(B) locate relevant information needed to solve problems;

(C) apply mathematics concepts to solve manufacturing problems;

(D) analyze science principles used to solve problems; and

(E) use the appropriate units of measure.

(4) The student manufactures products using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) analyze the processes needed to complete a project such as initiate, plan, execute, monitor and control, and close; and

(B) use a variety of tools and equipment to produce an item.

(5) The student practices safe work habits. The student is expected to:

(A) master relevant safety tests based on OSHA guidelines and principles; and

(B) use Material Safety Data Sheets (MSDS) to analyze, store, and safely dispose of hazardous materials.

(6) The student describes the importance of maintenance. The student is expected to:

(A) perform maintenance on selected equipment; and

(B) analyze the results of improper maintenance.

(7) The student describes the factors that affect the evolution of technology. The student is expected to:

(A) analyze how changes in technology affect manufacturing practices;

(B) evaluate how the development of technology in manufacturing is influenced by past events;

(C) analyze the international effects of technology;

(D) demonstrate how advancements in technology have affected the field of engineering; and

(E) evaluate the factors that affect the implementation of new ideas.

(8) The student selects and reports on career opportunities, requirements, and expectations in manufacturing and technology. The student is expected to:

(A) investigate an area of interest in manufacturing;

(B) analyze the various specializations in manufacturing; and

(C) describe the functions of engineers, technologists, and technicians.

§127.811. Diversified Manufacturing I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Algebra I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support

activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Diversified Manufacturing I, students gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of manufacturing systems allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting. Diversified Manufacturing I allows students the opportunity to understand the process of mass production by using a wide variety of materials and manufacturing techniques. Knowledge about career opportunities, requirements, and expectations and the development of skills prepare students for workplace success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations;

(B) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(C) use teamwork to solve problems;

(D) identify employers' work expectations; and

(E) use time-management techniques to develop work schedules.

(2) The student applies academic skills to the requirements of manufacturing. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers;

(B) interpret engineering drawings, charts, diagrams, and welding symbols; and

(C) select algebraic and geometric principles and formulas required for precision measuring operations.

(3) The student differentiates between the technical concepts that form the knowledge and skills of manufacturing. The student is expected to:

(A) use tools and equipment commonly employed in manufacturing in a safe manner;

(B) demonstrate an understanding of the safety regulations for the different types of manufacturing equipment such as cutting, abrasive, boring, turning, shaping, and forming tools;

(C) execute procedures using the different types of manufacturing equipment such as cutting, abrasive, boring, turning, shaping, and forming tools;

(D) research the modern materials used in manufacturing; and

(E) perform varied measurements, including precision measurements.

(4) The student investigates emerging and innovative applications of technology in engineering. The student is expected to:

(A) report on innovative applications of technology in engineering;

(B) experiment with new technologies; and

(C) experiment with different manufacturing materials such as plastic, composites, fiberglass, stone, and wood.

(5) The student manufactures products or systems using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) analyze the processes needed to complete a project such as initiate, plan, execute, monitor and control, and close; and

(B) use a variety of equipment and machines to produce an item to specification.

(6) The student practices safe work habits. The student is expected to:

(A) master safety tests developed from Occupational Safety and Health Administration regulations;

(B) analyze hazardous materials;

(C) dispose of hazardous materials safely; and

(D) store all materials correctly.

(7) The student participates in a mass manufacturing project. The student is expected to:

(A) participate in the manufacturing of a mass produced project; and

(B) develop a method to check and maintain quality control throughout the manufacturing process.

(8) The student identifies the factors that influence the cost of an item or service. The student is expected to:

(A) develop a budget for a project; and

(B) determine the most effective strategies to minimize costs.

(9) The student describes the relationship between manufacturing and marketing. The student is expected to:

(A) prepare a marketing plan for a product;

(B) analyze the effect of customer satisfaction on the image of a product; and

(C) analyze how customer demands influence the design of an object.

(10) The student applies communication, mathematics, and science knowledge and skills to manufacturing activities. The student is expected to:

(A) demonstrate communication techniques consistent with industry standards;

(B) locate relevant information needed to solve problems;

(C) apply mathematics concepts to solve manufacturing problems;

(D) analyze science principles used to solve problems; and

(E) use appropriate units of measure.

§127.812. Diversified Manufacturing II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Diversified Manufacturing I. Recommended prerequisite: Algebra I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Diversified Manufacturing II, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of manufacturing systems allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting. Diversified Manufacturing II allows students the opportunity to understand the process of mass production by using a wide variety of materials and manufacturing techniques. Knowledge about career opportunities, requirements, and expectations and the development of skills prepare students for workplace success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations;

(B) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(C) use teamwork to solve problems;

(D) identify employers' work expectations;

(E) use time-management techniques to develop work schedules;

(F) explore advanced knowledge and skills required for postsecondary education; and

(G) identify employers' expectations to foster positive customer satisfaction.

(2) The student applies academic skills to the requirements of manufacturing. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers;

(B) interpret engineering drawings, charts, diagrams, and welding symbols;

(C) select algebraic and geometric principles and formulas required for precision measuring operations;

(D) develop the information needed to mass produce a simple project such as flow charts, schedules, equipment lists, and material lists; and

(E) explore the use of jigs and fixtures in mass production.

(3) The student differentiates among the technical concepts that form the knowledge and skills of manufacturing. The student is expected to:

(A) use tools and equipment commonly employed in manufacturing in a safe manner;

(B) adhere to safety regulations for the different types of manufacturing equipment such as cutting, abrasive, boring, turning, shaping, and forming tools;

(C) execute procedures using the different types of manufacturing equipment such as cutting, abrasive, boring, turning, shaping, and forming tools;

(D) perform varied measurements, including precision measurements;

(E) design and develop the jigs and fixtures for a simple four (or fewer) part product; and

(F) participate in the production run off of the product.

(4) The student learns skills in production and programming of computer numerical control (CNC) operations. The student is expected to:

(A) develop a CNC program using a computer-aided manufacturing (CAM) program; and

(B) execute the CNC program to machine a product or run a simulation of the program.

(5) The student investigates emerging and innovative applications of technology in manufacturing. The student is expected to:

(A) research innovative technologies in manufacturing; and

(B) experiment with different manufacturing materials such as plastic, composites, fiberglass, stone, and wood.

(6) The student manufactures products or systems using the appropriate tools, equipment, machines, materials, and technical processes. The student is expected to:

(A) analyze engineering properties such as the processes needed to complete a project;

(B) analyze the processes needed to complete a project such as initiate, plan, execute, monitor and control, and close; and

(C) use a variety of tools and equipment to produce a product to specification.

(7) The student practices safe work habits. The student is expected to:

(A) master safety tests based on Occupational Safety and Health Administration regulations;

(B) analyze hazardous materials;

(C) dispose of hazardous materials; and

(D) store all materials safely.

(8) The student participates in the manufacturing of a mass-produced product. The student is expected to:

(A) participate in the manufacturing of products; and

(B) develop a method to check and maintain quality control throughout the manufacturing process.

(9) The student identifies the factors that influence the cost of an item. The student is expected to:

(A) calculate costs associated with production of a mass-produced product; and

(B) re-examine the manufacturing process to maximize efficiency and minimize costs without compromising the integrity and marketability of the product.

(10) The student describes the relationship between manufacturing and marketing. The student is expected to:

(A) prepare a marketing plan for a product;

(B) analyze the effect of customer satisfaction on the image of a product; and

(C) analyze how customer demands influence the design of an object.

(11) The student applies communication, mathematics, and science knowledge and skills to manufacturing activities. The student is expected to:

(A) demonstrate communication techniques consistent with industry standards;

(B) locate relevant information needed to solve problems;

(C) apply mathematics concepts to solve manufacturing problems;

(D) analyze science principles used to solve problems; and

(E) use appropriate units of measure.

§127.813. Manufacturing Engineering Technology I (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Algebra I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Manufacturing Engineering Technology I, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. Students will prepare for success in the global economy. The study of manufacturing engineering will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings in a manufacturing setting.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe how teams function;

(B) explain employers' work expectations; and

(C) demonstrate knowledge of the concepts and skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(2) The student applies software skills to manufacturing. The student is expected to:

(A) use computer-aided design (CAD) software to complete a design;

(B) analyze the results of product testing in a simulated modeling environment; and

(C) fabricate a prototype design of a mechanical part.

(3) The student gains skills in writing programmable logic controls so that a robot can work in coordination with a machine. The student is expected to:

(A) use computer-integrated manufacturing techniques to simulate a manufacturing process; and

(B) troubleshoot programmable logic circuit devices.

(4) The student performs functions and solves problems in the electricity and electronics field. The student is expected to:

(A) research the use of control devices; and

(B) demonstrate the use of control devices.

(5) The student learns skills in production and programming of computer numerical control (CNC) operations. The student is expected to:

(A) design a product using computer-aided manufacturing (CAM) software for production on a CNC lathe;

(B) produce a product on the CNC lathe or a simulation;

(C) design a product using CAM software for production on a CNC mill;

(D) produce a product on the CNC mill or a simulation; and

(E) complete data sheets for plan, do, check, and act forms and projects.

(6) The student knows mechanical and fluid systems. The student is expected to:

(A) identify, describe, and demonstrate the use of mechanical devices; and

(B) identify, describe, and demonstrate the use of fluid devices.

(7) The student knows electrical and thermal systems. The student is expected to:

(A) identify and describe electrical devices;

(B) demonstrate the use of electrical devices; and

(C) research the effects of heat energy and temperature on products.

(8) The student understands quality-control systems. The student is expected to:

(A) research and recognize industrial standards such as International Standards Organization and Military Specifications;

(B) explain attribute and Pareto charts; and

(C) apply statistical process control.

§127.814. Manufacturing Engineering Technology II (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Manufacturing Engineering Technology I. Recommended prerequisite: Algebra II, Computer Science I, or Physics. This course satisfies a high school mathematics graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) In Manufacturing Engineering Technology II, students will gain knowledge and skills in the application, design, production, and assessment of products, services, and systems and how those knowledge and skills are applied to manufacturing. The study of Manufacturing Engineering Technology II will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings.

(4) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(6) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) use teamwork to solve problems;

(B) demonstrate a work ethic that meets common employers' expectations;

(C) use time-management techniques to develop work schedules;

(D) describe how teams measure results;

(E) demonstrate the skills required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(F) communicate effectively with others in the workplace to clarify objectives; and

(G) apply skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(2) The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) The student applies design skills to manufacturing. The student is expected to:

(A) use computer-aided design (CAD) software to complete a design;

(B) analyze the results of product testing in a simulated modeling environment;

(C) fabricate a prototype design of a mechanical part; and

(D) use computer-integrated manufacturing techniques to simulate a manufacturing process.

(4) The student performs functions and solves problems in the electricity and electronics field. The student is expected to:

(A) develop solutions to use control devices; and

(B) troubleshoot control devices such as programmable logic circuit devices.

(5) The student learns skills in production and programming of computer numerical control (CNC) operations. The student is expected to:

(A) design a project using computer-aided manufacturing (CAM) software for a CNC lathe;

(B) produce a product on a CNC lathe or simulator;

(C) design a project using CAM software for a CNC mill;

(D) produce a product on a CNC mill or simulator; and

(E) complete data sheets for plan, do, check, and act forms and projects.

(6) The student demonstrates an understanding of mechanical and fluid systems. The student is expected to:

(A) use mechanical devices;

(B) use pneumatics devices; and

(C) use hydraulics devices.

(7) The student demonstrates an understanding of electrical and thermal systems. The student is expected to:

(A) use electrical controls;

(B) analyze the effects of heat energy and temperature on products; and

(C) develop an understanding of ventilation such as heating, air conditioning, and refrigeration.

(8) The student analyzes quality-control systems. The student is expected to:

(A) apply statistical process control;

(B) determine hardness values of different materials; and

(C) analyze attribute and Pareto charts.

(9) The student develops a system using electrical controls and pneumatics or hydraulics devices. The student is expected to:

(A) design a system that incorporates electrical controls and either a pneumatic or hydraulic device;

(B) build a system that incorporates electrical controls and either a pneumatic or hydraulic device; and

(C) test and troubleshoot the system that incorporates electrical controls and either a pneumatic or hydraulic device.

§127.815. Metal Fabrication and Machining I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Algebra I or Geometry. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Metal Fabrication and Machining I provides the knowledge, skills, and certifications required for equal employment opportunities in the metal production industry. Students must have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations;

(B) use teamwork to solve problems; and

(C) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, positive attitude, and integrity in a work situation.

(2) The student applies academic skills to the requirements of metal manufacturing. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers;

(B) interpret engineering drawings, charts, diagrams, and welding symbols; and

(C) select algebraic and geometric principles and formulas required for precision measuring operations.

(3) The student differentiates the technical concepts that form the knowledge and skills of metal manufacturing. The student is expected to:

(A) analyze the resources found in *The Machinery's Handbook* as well as the specifications and codes written by the American Welding Society (AWS), Canadian Welding Bureau (CWB), American National Standards Institute (ANSI), and American Petroleum Institute (API);

(B) examine the theory of shielded metal arc welding and gas metal arc welding;

(C) examine the sheet metal industry; and

(D) examine the nomenclature of abrasive wheels.

(4) The student differentiates the function and application of the tools, equipment, technologies, and materials used in metal manufacturing. The student is expected to:

(A) use hand and power tools and equipment commonly employed in metal manufacturing; and

(B) dispose of environmentally hazardous materials used in metal manufacturing.

(5) The student applies the technical concepts and skills of the machining industry to simulated and actual work situations. The student is expected to:

(A) use various work mounting procedures on all appropriate machines;

(B) operate machine tools such as drill press, lathe, saw, grinders, and milling machines;

(C) execute lathe procedures such as cutting threads, turning tapers, drilling, reaming, polishing, knurling, and boring; and

(D) execute milling procedures such as milling flat surfaces, bevels, chamfers, grooves, and key-way seats needed to machine precision pieces.

(6) The student applies the technical concepts and skills of the welding industry to simulated and actual work situations. The student is expected to:

(A) perform cutting processes such as straight cuts, bevel cuts, and hole piercing with oxy-fuel and plasma;

(B) use the common types of electrodes with the shield metal arc welding process;

(C) practice using gas metal arc welding to weld in multiple positions to produce groove and fillet welds; and

(D) inspect groove and fillet welds to AWS, CWB, ANSI, and API codes.

(7) The student applies the technical concepts and skills of the sheet metal industry to simulate actual work situations. The student is expected to:

(A) use mathematics in precision measuring operations; and

(B) interpret, engineering drawings, charts, and diagrams as related to the sheet metal industry.

(8) The student differentiates the concepts that form the technical knowledge and skills of sheet metal manufacturing. The student is expected to:

(A) analyze the types, sizes, and properties of sheet metal materials;

(B) analyze the fundamentals of oxy-fuel processes as related to sheet metal; and

(C) analyze the fundamentals of shielded metal arc welding and gas metal arc welding as related to sheet metal under various AWS codes.

(9) The student understands the function and application of the tools, equipment, technologies, and materials used in sheet metal manufacturing. The student is expected to:

(A) practice safe use of equipment; and

(B) dispose of hazardous materials used in sheet metal manufacturing.

(10) The student applies the knowledge and skills of sheet metal manufacturing in simulated and actual work situations. The student is expected to:

(A) draw simple metal layouts; and

(B) construct common sheet metal seams.

§127.816. Metal Fabrication and Machining II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Metal Fabrication and Machining I. Recommended prerequisites: Geometry and Algebra II. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support

activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Metal Fabrication and Machining II builds on the knowledge, skills, and certifications students acquire in Metal Fabrication and Machining I. Students will develop advanced concepts and skills as related to personal and career development. This course integrates academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) determine advanced knowledge and skills required to gain industry-recognized certifications;

(B) identify employers' work expectations;

(C) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, positive attitude, promptness, attendance, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace as specified by the Occupational Safety and Health Administration and other appropriate agencies.

(2) The student describes the importance of teamwork, leadership, integrity, honesty, work habits, and organizational skills. The student is expected to:

(A) use teamwork to solve problems;

(B) distinguish among team roles such as team leaders and team members;

(C) discuss Equal Employment Opportunity law in the workplace; and

(D) use time-management techniques to develop work schedules.

(3) The student applies advanced academic skills to the requirements of metal fabrication and machining. The student is expected to:

(A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) successfully complete work orders;

(C) estimate labor costs using various algebraic formulas;

(D) interpret advanced engineering drawings, charts, diagrams, and welding symbols; and

(E) demonstrate calculation of precision measuring operations using algebra, geometry, and trigonometry.

(4) The student knows the advanced concepts that form the technical knowledge and skills of metal fabrication and machining. The student is expected to:

(A) analyze the resources found in various manufacturing reference materials;

(B) demonstrate knowledge of the various welding processes;

(C) examine the sheet metal industry; and

(D) examine the advanced use of abrasives.

(5) The student knows the function and application of the tools, equipment, technologies, and materials used in metal fabrication and machining. The student is expected to:

(A) operate various welding machines, cutting equipment, and grinding equipment commonly employed in metal fabrication;

(B) demonstrate knowledge of computer numerical control (CNC) machines;

(C) demonstrate knowledge of the concepts of automated welding machines;

(D) demonstrate knowledge of emerging technologies that may affect metal manufacturing; and

(E) dispose of environmentally hazardous materials associated with and used in metal fabrication manufacturing.

(6) The student applies the advanced concepts and technical knowledge and skills of the machining industry to simulated and actual work situations. The student is expected to:

(A) use various work mounting procedures on appropriate machines;

(B) examine the cutting operations such as drill press, lathe, saw, grinders, and milling machines;

(C) execute lathe procedures such as cut threads, turn tapers, drills, reams, polishes, knurls, and bores;

(D) mill flat surfaces, bevels, chamfers, grooves, and key-seats; and

(E) machine precision pieces.

(7) The student applies the advanced concepts and technical knowledge and skills of the welding industry to simulated and actual work situations. The student is expected to:

(A) demonstrate cutting processes such as oxy-fuel and plasma;

(B) demonstrate the use of the common types of electrodes using the shielded metal arc welding process;

(C) use shielded metal arc welding, gas metal arc welding, and gas tungsten arc welding to weld fillet and groove welds using various positions; and

(D) inspect welds to the American Welding Society (AWS), Canadian Welding Bureau (CWB), American National Standards Institute (ANSI), and American Petroleum Institute (API) codes.

(8) The student applies the advanced concepts and technical knowledge and skills of the sheet metal industry to simulated and actual work situations. The student is expected to:

(A) estimate labor costs;

(B) use advanced mathematics in precision measuring operations; and

(C) interpret industrial standard blueprints, drawings, charts, and diagrams.

(9) The student knows the advanced concepts and technical knowledge and skills of sheet metal manufacturing. The student is expected to:

(A) analyze properties of sheet metal materials and fasteners;

(B) analyze oxy-fuel processes as related to sheet metal; and

(C) demonstrate knowledge of shielded metal arc welding, gas metal arc welding, and gas tungsten arc welding as related to sheet metal under AWS code.

(10) The student knows the function and application of the tools, equipment, technologies, and materials used in sheet metal. The student is expected to:

(A) use equipment commonly employed in sheet metal safely;

(B) dispose of environmentally hazardous materials used in sheet metal manufacturing properly; and

(C) demonstrate knowledge of emerging technologies that may affect sheet metal.

(11) The student applies the advanced concepts and technical skills in simulated and actual work situations. The student is expected to:

(A) draw advanced sheet metal layouts;

(B) construct sheet metal seams;

(C) construct transitions and offsets;

(D) use the gas tungsten arc welding process in sheet metal construction;

(E) apply the principles of sheet metal construction to the fabrication of various sheet metal products; and

(F) apply skills in sheet metal to career preparation learning experiences.

§127.817. Precision Metal Manufacturing I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Manufacturing and completion of or concurrent enrollment in Algebra I or Geometry. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Precision Metal Manufacturing I will provide the knowledge, skills, and technologies required for employment in precision machining. While the course is designed to provide necessary skills in machining, it also provides a real-world foundation for any engineering discipline. This course may address a variety of materials such as plastics, ceramics, and wood in addition to metal. Students will develop knowledge of the concepts and skills related to precision metal manufacturing to apply them to personal and career development. This course supports integration of academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for success. This course is designed to provide entry-level employment for the student or articulated credit integration into a community college and dual credit with a community college with completion of the advanced course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(F) review the fine, detailed aspects of both quantitative and qualitative work processes and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and

(I) prioritize tasks, follow schedules, and work toward goal-relevant activities in an effective, efficient manner.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) determine academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the professional standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(3) The student applies advanced academic skills to the requirements of precision metal manufacturing. The student is expected to:

(A) demonstrate technical writing skills related to writing requirements found in manufacturing;

(B) demonstrate mathematical skills such as algebra, geometry, trigonometry, statics, and conversion as applied to machining;

(C) interpret engineering drawings, including drawings using geometric dimensioning and tolerancing;

(D) describe orthographic and isometric views of three-dimensional figures;

(E) evaluate mathematics as it applies to precision machining operations; and

(F) discuss basic concepts of physics as applied to machining.

(4) The student recognizes the concepts and skills that form the technical knowledge required in precision machining. The student is expected to:

(A) examine the resources found in recognized manufacturing reference materials such as *The Machinery's Handbook*; and

(B) demonstrate knowledge of the uses of reference charts such as tap drill charts, drill size charts, and feed-speed charts.

(5) The student evaluates the function and application of the tools, equipment, technologies, and materials used in precision machining. The student is expected to:

(A) practice safety while running equipment commonly employed in machine shops;

(B) identify and properly dispose of environmentally hazardous materials used in machine shops;

(C) demonstrate knowledge of computer numerical control (CNC) operations;

(D) demonstrate knowledge of emerging technologies that may affect the machine shop;

(E) demonstrate knowledge of heating metals such as hardening, tempering, annealing, normalizing, and case hardening steel;

(F) apply technical knowledge and skills in a machine shop to career preparation experiences;

(G) identify basic metallic and non-metallic materials; and

(H) compare various abrasives for type, structure, bond, and use.

(6) The student employs skills necessary to perform bench work and layout. The student is expected to:

(A) use equipment commonly employed in bench work and layout in a safe manner;

(B) develop the ability to use a file to cut flats, angles, and radiuses;

(C) employ standard layout tools to transfer a part design to the actual part;

(D) perform center punching and hand drilling of holes using an electric or air hand drill;

(E) perform hand tapping of holes;

(F) perform hand reaming of holes using an electric or air hand drill;

(G) develop a detailed layout part such as the National Institute for Metalworking Skills (NIMS) Level 1 layout part;

(H) develop a detailed bench work part such as the NIMS Level 1 bench work part; and

(I) employ basic housekeeping skills as applied to a machine shop.

(7) The student employs skills necessary to perform precision measurement. The student is expected to:

(A) use equipment commonly used during precision measurement in a safe manner;

(B) write an inspection plan;

(C) identify and select the required measuring instrument(s) to conduct the required inspection procedure(s); and

(D) describe statistical process control.

(8) The student employs skills necessary to perform manual lathe work. The student is expected to:

(A) use equipment such as accessories commonly implemented on and around a lathe in a safe manner;

(B) analyze the advantages and disadvantages between a four-jaw independent chuck, a three-jaw universal chuck, and a collet workholding system;

(C) indicate a part in a four-jaw independent chuck within.003" total indicated runout (TIR) using a standard indicator;

(D) identify and describe the function of the components of a lathe;

(E) identify and use most accessories and tooling for turning operations;

(F) demonstrate the standard turning operations of boring, chamfering, cutting tapers, drilling, facing, grooving, knurling, polishing, threading, and turning on a manual lathe;

(G) write a detailed process plan for turning, including appropriate processes such as feeds, speeds, tool selection, and sequencing;

(H) develop a detailed turning part such as the NIMS Level 1 turning, chucking or turning between centers part; and

(I) employ basic preventative maintenance on the lathe.

(9) The student employs skills necessary to perform manual milling work. The student is expected to:

(A) use equipment commonly used with a milling machine in a safe manner;

(B) analyze the advantages and disadvantages of various work holding methods such as using a vise, clamping to a table, and clamping to an angle plate;

(C) contrast the various ancillary tools used on milling machines such as a rotary table, indexing head, and super spacer;

(D) identify or describe the function of the components of a milling machine;

(E) tram in the head of a vertical milling machine;

(F) locate and set a work piece in a milling vise employing a dial indicator;

(G) develop a square block in the milling machine to close tolerances;

(H) demonstrate various hole-making activities such as spot drilling, drilling, reaming, tapping, countersinking, and boring on the milling machine;

(I) demonstrate various milling activities such as climb milling, conventional milling, slotting, grooving, cutting angles, and chamfering;

(J) write a detailed process plan, including appropriate feeds, speeds, tool selection, work holding methods, and sequencing for milling;

(K) develop a detailed milling part such as the NIMS Level 1 milling part; and

(L) employ basic preventative maintenance on the milling machine.

(10) The student employs skills necessary to perform work on various support equipment commonly found in a machine shop. The student is expected to:

(A) use various support equipment commonly found in a machine shop in a safe manner;

(B) understand basic pedestal grinder functions such as wheel selection criteria and requirements;

(C) understand basic sawing functions such as band type, speed, and feeds for various types of material;

(D) understand basic drill press operations, including work holding, appropriate speeds, and feeds; and

(E) use proper safety procedures for surface grinding operations.

§127.818. Precision Metal Manufacturing II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Precision Metal Manufacturing I. Recommended corequisite: Precision Metal Manufacturing II Lab. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Precision Metal Manufacturing II will provide students the knowledge, skills, and technologies required for employment in precision machining. While this course is designed to provide necessary skills in machining, it also provides a real-world foundation for any engineering discipline. This course addresses a variety of materials such as plastics, ceramics, and wood in addition to metal. Students will develop knowledge of the concepts and skills related to these systems to apply them to personal and career development. This course supports integration of academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for success. This course is designed to provide entry-level employment for the student or articulated credit integration into a community college and dual credit with a community college with completion of the advanced course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) comply with all applicable rules, laws, and regulations;

(F) review with a critical eye the fine, detailed aspects of both quantitative and qualitative work processes and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and

(I) prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that uses time in an effective, efficient manner.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) determine academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate progress toward personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(3) The student applies the technical knowledge and skills of advanced precision metal manufacturing. The student is expected to:

(A) apply the technical aspects found in *The Machinery's Handbook* resource; and

(B) select appropriate resources from the Internet as applied to manufacturing.

(4) The student builds on the manual machining skills gained in Precision Metal Manufacturing I. The student is expected to:

(A) develop a detailed turning part such as the National Institute for Metalworking Skills (NIMS) Level 1 turning, chucking, or turning between centers part with zero defects (100% to the print) in a safe manner; and

(B) develop a detailed milling part such as the NIMS Level 1 milling part with zero defects (100% to the print) in a safe manner.

(5) The student learns about standard computer numerical control (CNC) machinery. The student is expected to:

(A) research the history of numerical control machines;

(B) distinguish among different types of CNC machines used in the industry;

(C) demonstrate safety rules for CNC operation;

(D) demonstrate the methods by which programs can be entered into a controller; and

(E) use appropriate machining terminology to enhance CNC vocabulary.

(6) The student appraises various CNC systems to differentiate the development and implementation of those systems. The student is expected to:

(A) examine the types of drive motors used on CNC machinery;

(B) explain the Cartesian coordinate system;

(C) differentiate between absolute and incremental positioning; and

(D) illustrate the difference between datum and delta dimensioning.

(7) The student learns the process planning and tool selection within a CNC lab environment. The student is expected to:

(A) develop a detailed process plan, including proper tool selection, feeds, and speeds, for the material being cut and finish specifications on the engineering drawing, logical sequence of operations, and appropriate inspection points;

(B) develop a logical sequence of operations and appropriate inspection points;

(C) demonstrate use of carbide inserts; and

(D) apply various carbide inserts by determining the correct type, grade, style, feed, and speed for the most common materials machined in a basic machine shop.

(8) The student evaluates tool changing and tool offset registers in the CNC lab environment. The student is expected to:

(A) perform various types of tool changes;

(B) demonstrate quick change tooling used on CNC milling machines;

(C) demonstrate appropriate tool storage;

(D) demonstrate the proper use of tool offset registers;

(E) determine tool offset length; and

(F) incorporate tool offsets for a set up.

(9) The student operates a CNC lathe. The student is expected to:

(A) use equipment commonly associated with a CNC lathe in a safe manner;

(B) recognize, name, and describe the function of the primary components of a CNC lathe;

(C) perform preventative maintenance checks on a CNC lathe such as checking all fluid levels, system pressure, tooling wear, and component lubrication and cleaning;

(D) test the coolant for proper density and adjust accordingly in order to reach the correct mixture;

(E) perform a power up on a standard CNC lathe;

(F) demonstrate the use of the jog controls on the operator panel to jog the lathe's axes;

(G) demonstrate the ability to locate, assemble, and measure tooling according to work instructions and job documentation;

(H) install tools and tool holders in the automatic tool changer locations according to work instructions and job documentation;

(I) locate and set workpiece to zero on a CNC lathe;

(J) set any required work offsets for the part to be machined after a basic tool setting process has been completed;

(K) set the proper geometry/tool offsets for each tool in a standard tool setting process;

(L) operate a CNC lathe in automatic mode; and

(M) illustrate the proper power down process on a CNC lathe.

(10) The student operates a CNC mill. The student is expected to:

(A) use equipment commonly found on and around a CNC mill in a safe manner;

(B) recognize, name, and describe the function of the primary components of a CNC mill;

(C) perform preventative maintenance checks on a CNC mill such as checking all fluid levels, system pressure, tooling wear, and component lubrication and cleaning;

(D) test the coolant for proper density and adjust accordingly in order to reach the correct mixture;

(E) perform a power up on a standard CNC mill;

(F) demonstrate the use of the jog controls on the operator panel to jog the mill's axes;

(G) demonstrate the ability to locate, assemble, and measure tooling using a presetter or other means according to work instructions and job documentation;

(H) install tools and tool holders in the automatic tool changer locations according to work instructions and job documentation;

(I) locate and set workpiece to zero on a CNC mill;

(J) set any required work offsets for the part to be machined after a basic tool setting process has been completed;

(K) set the proper geometry/tool offsets for each tool in a standard tool-setting process;

(L) operate a CNC mill in automatic mode; and

(M) illustrate the proper power down process on a CNC mill.

(11) The student learns to manually program a CNC lathe without the help of computer-aided design or manufacturing (CAD/CAM) software. The student is expected to:

(A) calculate trigonometry to determine coordinates from technical drawings to cut arcs and angles;

(B) use trigonometry for determining cutter offsets;

(C) use appropriate mathematical skills to solve problems while programming a CNC lathe;

(D) write a simple program to face and turn;

(E) write a simple program to cut radiuses, angles, grooves, and threads;

(F) write a program using cutter radius compensation;

(G) write a program using canned cycles such as G71; and

(H) write a program and produce a complex part such as a NIMS Level 1 CNC lathe part with zero defects.

(12) The student learns to manually program a CNC mill (without the help of CAD/CAM software). The student is expected to:

(A) use trigonometry to determine coordinates from technical drawings to cut arcs and angles;

(B) use trigonometry for determining cutter offsets;

(C) use appropriate mathematical skills to solve problems while programming a CNC lathe;

(D) write a simple program to perform hole operations;

(E) write a simple program to cut radiuses and angles;

(F) write a program using cutter radius compensation and ramping; and

(G) write a program and produce a complex part such as a NIMS Level 1 CNC milling part with zero defects.

(13) The student develops a deeper understanding of quality control. The student is expected to:

(A) evaluate engineering drawings using geometric dimensioning and tolerancing;

(B) discuss the American Society of Mechanical Engineers (ASME) Y14.5M standard that defines geometric dimensioning and tolerancing; and

(C) appraise various quality control/management programs.

§127.819. Precision Metal Manufacturing II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This lab course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Precision Metal Manufacturing I. Corequisite: Precision Metal Manufacturing II. This course must be taken concurrently with Precision Metal Manufacturing II and may not be taken as a stand-alone course. Districts are encouraged to offer this lab in a consecutive block with Precision Metal Manufacturing II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Precision Metal Manufacturing II Lab provides the knowledge, skills, and technologies required for employment in precision machining. While Precision Metal Manufacturing II Lab is designed to provide necessary skills in machining, it also provides a real-world foundation for any engineering discipline. This course may address a variety of materials such as plastics, ceramics, and wood in addition to metal. Students will develop knowledge of the concepts and skills related to these systems to apply them to personal and career development. This course supports integration of academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for success. This course is designed to provide entry-level employment for the student or articulated credit integration

into a community college and dual credit with a community college with completion of the advanced course.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(F) review with a critical eye the fine, detailed aspects of both quantitative and qualitative work processes and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and

(I) prioritize tasks, follow schedules, and work on goal-relevant activities in a way that uses time wisely in an effective, efficient manner.

(2) The student builds on the manual machining skills gained in Precision Metal Manufacturing I. The student is expected to:

(A) develop a detailed turning part such as the National Institute for Metalworking Skills (NIMS) Level 1 turning, chucking, or turning between centers part with zero defects (100% to the print) in a safe manner; and

(B) develop a detailed milling part such as the NIMS Level 1 milling part with zero defects (100% to the print) in a safe manner.

(3) The student evaluates tool changing and tool offset registers in a computer numerical control (CNC) lab environment. The student is expected to:

(A) perform various types of tool changes;

(B) demonstrate quick change tooling used on CNC milling machines;

(C) demonstrate appropriate tool storage;

(D) demonstrate the proper use of tool offset registers;

(E) determine tool offset length; and

(F) enter tool offsets for a set up.

(4) The student operates a CNC lathe. The student is expected to:

(A) use equipment commonly found on and around a CNC lathe in a safe manner;

(B) recognize, name, and describe the function of the primary components of a CNC lathe;

(C) perform preventative maintenance checks on a CNC lathe such as checking all fluid levels, system pressure, tooling wear, and component lubrication and cleaning;

(D) test the coolant for proper density and adjust accordingly in order to reach the correct mixture;

(E) perform a power up on a standard CNC lathe;

(F) demonstrate the use of the jog controls on the operator panel to jog the lathe's axes;

(G) demonstrate the ability to locate, assemble, and measure tooling according to work instructions and job documentation;

(H) install tools and tool holders in the automatic tool changer locations according to work instructions and job documentation;

(I) locate and set workpiece to zero on a CNC lathe;

(J) set any required work offsets for the part to be machined after a basic tool setting process has been completed;

(K) set the proper geometry/tool offsets for each tool in a standard tool setting process;

(L) operate a CNC lathe in automatic mode; and

(M) illustrate the proper power down process on a CNC lathe.

(5) The student operates a CNC mill. The student is expected to:

(A) use equipment commonly found on and around a CNC mill in a safe manner;

(B) recognize, name, and describe the function of the primary components of a CNC mill;

(C) perform preventative maintenance checks on a CNC mill such as checking all fluid levels, system pressure, tooling wear, and component lubrication and cleaning;

(D) test the coolant for proper density and adjust accordingly in order to reach the correct mixture;

(E) perform a power up on a standard CNC mill;

(F) demonstrate the use of the jog controls on the operator panel to jog the mill's axes;

(G) demonstrate the ability to locate, assemble, and measure tooling using a presetter or other means according to work instructions and job documentation;

(H) install tools and tool holders in the automatic tool changer locations according to work instructions and job documentation;

(I) locate and set workpiece to zero on a CNC mill;

(J) set any required work offsets for the part to be machined after a basic tool setting process has been completed;

(K) set the proper geometry/tool offsets for each tool in a standard tool setting process;

(L) operate a CNC mill in automatic mode; and

(M) illustrate the proper power down process on a CNC mill.

(6) The student learns to manually program a CNC lathe without the help of computer-aided design or manufacturing (CAD/CAM) software. The student is expected to:

(A) use trigonometry to determine coordinates from technical drawings to cut arcs and angles;

(B) use trigonometry for determining cutter offsets;

(C) use appropriate mathematical skills to solve problems while programming a CNC lathe;

(D) write a simple program to face and turn;

(E) write a simple program to cut radiuses, angles, grooves, and threads;

(F) write a program using cutter radius compensation;

(G) write a program using canned cycles such as G71; and

(H) write a program and produce a complex part such as a NIMS Level 1 CNC lathe part with zero defects.

(7) The student learns to manually program a CNC mill (without the help of CAD/CAM software). The student is expected to:

(A) use trigonometry to determine coordinates from technical drawings to cut arcs and angles;

(B) use trigonometry to determine cutter offsets;

(C) use appropriate mathematical skills to solve problems while programming a CNC lathe;

(D) write a simple program to perform hole operations;

(E) write a simple program to cut radiuses and angles;

(F) write a program using cutter radius compensation and ramping; and

(G) write a program and produce a complex part such as a NIMS Level 1 CNC milling part with zero defects.

§127.820. Introduction to Welding (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Recommended prerequisite or corequisite: Algebra I. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Introduction to Welding will provide an introduction to welding technology with an emphasis on basic welding laboratory principles and operating procedures. Students will be introduced to the three basic welding processes. Topics include: industrial safety and health practices, hand tool and power machine use, measurement, laboratory operating procedures, welding power sources, welding career potentials, and introduction to welding codes and standards. Introduction to Welding will provide students with the knowledge, skills, and technologies required for employment in welding industries. Students will develop knowledge and skills related to welding and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills will prepare students for future success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(C) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(D) choose ethical courses of action such as following applicable rules, laws, and regulations;

(E) review detailed aspects of both quantitative and qualitative work processes and end products;

(F) evaluate systems relative to causes, problems, and patterns to improve operational situations;

(G) adhere to business practices such as policies, procedures, and health and safety rules; and

(H) use time wisely by prioritizing tasks and following schedules in an efficient manner.

(2) The student explores the characteristics of a successful worker in the global economy. The student is expected to:

(A) determine academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the professional standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate progress toward personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) apply knowledge and skills to health and safety in the workplace as specified by appropriate governmental regulations.

(3) The student evaluates the function and application of the tools, equipment, technologies, and materials used in welding. The student is expected to:

(A) employ welding equipment according to safety standards;

(B) identify and properly dispose of environmentally hazardous materials used in welding;

(C) explain the importance of recycling materials used in welding;

(D) choose appropriate personal protective equipment; and

(E) evaluate skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(4) The student compares and contrasts welding joint design, material symbols, and welds. The student is expected to:

(A) demonstrate knowledge of welding sketches; and

(B) identify types of welds such as fillet, groove, spot, plug, and flanged.

(5) The student applies academic skills in relationship to welding. The student is expected to:

(A) demonstrate mathematical skills related to welding;

(B) demonstrate technical writing skills related to welding;

(C) apply accurate readings of measuring devices;

(D) accurately use appropriate tools to make measurements;

(E) solve problems using whole numbers, fractions, mixed numbers, and decimals;

(F) perform conversions between fractions and decimals; and

(G) perform conversions between standard units and metric units.

(6) The student applies the concepts and skills of welding projects. The student is expected to:

(A) explore careers in welding;

(B) understand welding codes such as American Petroleum Institute (API) 1104 and American Welding Society (AWS) D1.1;

(C) work independently to fabricate a variety of welded projects with minimal assistance; and

(D) work collaboratively with other students.

(7) The student performs oxy-fuel cutting processes on carbon steels. The student is expected to:

(A) use safe operating practices;

(B) perform safe handling of compressed gases;

(C) identify components of oxy-fuel gas cutting;

(D) demonstrate proper set-up procedures for the oxy-fuel process;

(E) identify the factors affecting the oxy-fuel cutting of base metals; and

(F) demonstrate proper cutting techniques such as piercing, straight line, and bevel;

(8) The student performs shielded metal arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of welding currents;

(C) apply shielded metal arc welding principles;

(D) demonstrate proper set-up procedure for shielded metal arc welding;

(E) determine appropriate electrodes for base metal in shielded metal arc welding;

(F) perform fillet and groove welds in all positions; and

(G) prepare joints for welding.

(9) The student performs gas metal arc welding principles and practices. The student is expected to:

(A) use safe operating practices;

(B) apply gas metal arc welding principles;

(C) demonstrate proper set-up procedure for gas metal arc welding;

(D) use appropriate equipment setup for base metal in gas metal arc welding; and

(E) perform fillet and groove welds using gas metal arc welding with various metal transfer processes.

§127.821. Welding I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisites: Algebra I, Principles of Manufacturing, Introduction to Precision Metal Manufacturing, or Introduction to Welding. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Welding I provides the knowledge, skills, and technologies required for employment in metal technology systems. Students will develop knowledge and skills related to this system and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and

expectations and the development of workplace skills prepare students for future success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(F) review the fine, detailed aspects of both quantitative and qualitative work process and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and

(I) prioritize tasks, follow schedules, and work on goal-relevant activities in a way that uses time wisely in an effective, efficient manner.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) explore academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the professional standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) demonstrate skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(3) The student applies academic skills to the requirements of welding. The student is expected to:

(A) demonstrate effective communication skills with individuals from varied cultures such as fellow workers, management, and customers;

(B) demonstrate mathematical skills to estimate costs;

(C) demonstrate technical writing skills related to work orders;

(D) apply accurate readings of measuring devices;

(E) use appropriate tools to make accurate measurements;

(F) compute measurements such as area, surface area, volume, and perimeter;

(G) solve problems using whole numbers, fractions, mixed numbers, and decimals;

(H) use various methods, including a calculator, to perform computations;

(I) perform conversions between fractions and decimals;

(J) perform conversions between standards units and metric units;

(K) calculate and apply the functions of angles such as using the Pythagorean Theorem; and

(L) diagram the parts of a circle.

(4) The student evaluates the function and application of the tools, equipment, technologies, and materials used in welding. The student is expected to:

(A) operate welding equipment according to safety standards;

(B) identify and properly dispose of environmentally hazardous materials used in welding;

(C) explain the importance of recycling materials used in welding;

(D) choose appropriate personal protective equipment; and

(E) evaluate skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(5) The student understands welding joint design, symbols, and welds. The student is expected to:

(A) demonstrate knowledge of engineering drawings, charts, and diagrams;

(B) interpret orthographic and isometric views of three-dimensional figures;

(C) interpret engineering, drawings, charts, and diagrams;

(D) analyze components of the welding symbol;

(E) identify types of welding joints;

(F) identify positions of welding; and

(G) identify types of welds such as fillet, groove, spot, plug, and flanged.

(6) The student analyzes the concepts and intricacies of inspections and related codes. The student is expected to:

(A) explain weld inspection processes; and

(B) interpret welding codes.

(7) The student analyzes oxy-fuel cutting processes on carbon steels. The student is expected to:

(A) practice safe operating practices;

(B) perform safe handling of compressed gases;

(C) identify components of oxy-fuel gas cutting system;

(D) demonstrate proper set-up procedures for oxy-fuel cutting process;

(E) identify factors affecting oxy-fuel cutting of base metals;

(F) demonstrate proper cutting techniques such as piercing, straight line, and bevel;

(G) identify acceptable cuts; and

(H) evaluate alternative fuel gasses such as propane, propylene, and Chemtane 2®.

(8) The student analyzes plasma arc cutting on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate knowledge of the theories of plasma arc cutting;

(C) apply safe handling of compressed air supply;

(D) identify components of plasma arc cutting;

(E) demonstrate correct set-up procedure for plasma arc cutting;

(F) define cutting terms; and

(G) perform straight line, piercing, bevels, and shape cuts.

(9) The student analyzes shielded metal arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) analyze welding current relationships such as alternating current and direct current, heat transfer, and polarity;

(C) apply shielded metal arc welding principles;

(D) demonstrate proper set-up procedure for shielded metal arc welding;

(E) explain the American Welding Society (AWS) identification system for shielded metal arc welding electrodes;

(F) determine appropriate electrodes for base metal in shielded metal arc welding; and

(G) perform multi-pass groove welds in all positions according to industry-accepted welding standards.

(10) The student analyzes gas metal arc welding principles and practices. The student is expected to:

(A) use safe operating practices;

(B) explain the effects that weld angle, work angle, and electrode extension have on welds;

(C) apply gas metal arc welding principles;

(D) demonstrate proper set-up procedure for gas metal arc welding;

(E) explain the AWS identification system for gas metal arc welding filler metal;

(F) determine appropriate filler metal for base metal in gas metal arc welding; and

(G) perform fillet and groove welds in all positions.

(11) The student analyzes flux cored arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) explain the effects that weld angle, work angle, and electrode extension have on welds;

(C) apply flux cored arc welding principles;

(D) demonstrate proper set-up procedure for flux cored arc welding;

(E) explain the AWS identification system for flux cored arc welding electrodes;

(F) determine appropriate filler metal for base metal in flux cored arc welding; and

(G) perform fillet and groove welds in all positions.

(12) The student analyzes gas tungsten arc welding on metals. The student is expected to:

(A) use safe operating practices;

(B) analyze electrical welding current relationships such as alternating current and direct current, heat transfer, and polarity;

(C) identify the common types of tungsten and filler metals according to the AWS identification system;

(D) demonstrate proper set-up procedure for gas tungsten arc welding;

(E) perform fillet and groove welds in all positions; and

(F) perform welds on metals such as carbon steel, stainless steel, and aluminum.

§127.822. Welding II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Welding I. Recommended prerequisites: Algebra I or Geometry. Recommended corequisite: Welding II Lab. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Welding II builds on the knowledge and skills developed in Welding I. Students will develop advanced welding concepts and skills as related to personal and career development. Students

will integrate academic and technical knowledge and skills. Students will have opportunities to reinforce, apply, and transfer knowledge and skills to a variety of settings and problems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(F) review the fine, detailed aspects of both quantitative and qualitative work process and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules;

(I) prioritize tasks, follow schedules, and work toward goal-relevant activities in an effective, efficient manner;

(J) analyze how teams function; and

(K) evaluate employers' work expectations to measure project success.

(2) The student explores the employability characteristics of a successful worker in the global economy. The student is expected to:

(A) determine academic knowledge and skills required for postsecondary education;

(B) identify employers' expectations to foster positive customer satisfaction;

(C) demonstrate the professional standards required in the workplace such as interviewing skills, flexibility, willingness to learn new skills and acquire knowledge, self-discipline, self-worth, positive attitude, and integrity in a work situation;

(D) evaluate progress toward personal career goals;

(E) communicate effectively with others in the workplace to clarify objectives; and

(F) apply knowledge and skills related to health and safety in the workplace as specified by appropriate governmental regulations.

(3) The student applies academic skills to the requirements of welding. The student is expected to:

(A) demonstrate mathematical skills to estimate costs;

(B) explain the impact of accurate readings of measuring devices on cost estimates;

(C) justify the selection of a tool to make accurate measurements;

(D) compute measurements such as area, surface area, volume, and perimeter;

(E) solve problems using whole numbers, fractions, mixed numbers, and decimals;

(F) apply right triangle relationships using the Pythagorean Theorem; and

(G) select a mathematical formula for estimation.

(4) The student knows the functions and applications of the tools, equipment, technologies, and materials used in welding. The student is expected to:

(A) use welding equipment according to safety standards;

(B) dispose of environmentally hazardous materials used in welding;

(C) explain the importance of recycling materials used in welding;

(D) evaluate the performance impact of emerging technologies in welding;

(E) use appropriate personal protective equipment to follow safety measures; and

(F) investigate the use of automated welding machines such as numerical control, computer numerical control, and robotics-controlled welding machines.

(5) The student illustrates welding joint design, symbols, and welds. The student is expected to:

(A) use knowledge of engineering drawings to complete an advanced project; and

(B) evaluate projects using engineering drawing specifications.

(6) The student applies the concepts and skills of welding to perform tasks. The student is expected to:

(A) work independently in fabricating welded projects;

(B) work collaboratively with other students to complete a real-world application item; and

(C) troubleshoot equipment.

(7) The student analyzes the concepts and intricacies of inspections related to welding codes. The student is expected to:

(A) inspect the welding projects of team members;

(B) select codes for weld inspections; and

(C) critique and evaluate the weldments of team members.

(8) The student performs advanced cutting processes on carbon steels. The student is expected to:

(A) observe safe operating practices;

(B) apply safe handling of compressed gases; and

(C) perform cutting processes according to accepted welding standards.

(9) The student performs shielded metal arc welding on metals. The student is expected to:

(A) employ safe operating practices; and

(B) demonstrate skills required to make welds in all positions according to industry-accepted welding standards.

(10) The student performs flux cored metal arc welding. The student is expected to:

(A) use safe operating practices;

(B) perform fillet and groove welds; and

(C) perform welds in all appropriate positions according to industry-accepted welding standards.

(11) The student performs gas tungsten arc welding on metals. The student is expected to:

(A) employ safe operating practices;

(B) perform fillet and groove welds in all positions; and

(C) perform welds on metals such as carbon steel, stainless steel, pipe, and aluminum according to industry-accepted welding standards.

§127.823. Welding II Lab (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This lab course is a Level 3 course and is recommended for students in Grades 11 and 12. Prerequisite: Welding I. Corequisite: Welding II. This course must be taken concurrently with Welding II and may not be taken as a stand-alone course. Districts are encouraged to offer this course in a consecutive block with Welding II to allow students sufficient time to master the content of both courses. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) Welding II Lab provides an introduction to welding technology with an emphasis on basic welding laboratory principles and operating procedures. Topics include: industrial safety and health practices, hand tool and power machine use, measurement, laboratory operating procedures, welding power sources, welding career potentials, and introduction to welding codes and standards. This course provides knowledge, skills, and technologies required for employment in welding industries. Students will develop knowledge and skills related to this system and apply them to personal career development. This course supports integration of academic and technical knowledge and skills. Students will reinforce, apply, and transfer knowledge and skills to a variety of settings and problems. Knowledge about career opportunities, requirements, and expectations and the development of workplace skills prepare students for future success.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) express ideas to others in a clear, concise, and effective manner through written and verbal communication;

(B) convey written information that is easily understandable to others;

(C) demonstrate acceptable work ethics in reporting for duty and performing assigned tasks as directed;

(D) conduct oneself in a manner acceptable for the profession and work site such as suitable dress and polite speech;

(E) choose the ethical course of action and comply with all applicable rules, laws, and regulations;

(F) review the fine, detailed aspects of both quantitative and qualitative work process and end products;

(G) evaluate systems and operations; identify causes, problems, patterns, or issues; and explore workable solutions or remedies to improve situations;

(H) follow written and oral instructions and adhere to established business practices, policies, and procedures, including health and safety rules; and

(I) prioritize tasks, follow schedules, and work toward goal-relevant activities in an effective, efficient manner.

(2) The student demonstrates the functions and applications of the tools, equipment, technologies, and metals used in code welding. The student is expected to:

(A) use welding equipment according to safety standards;

(B) identify and properly dispose of environmentally hazardous materials used in welding;

(C) explain the importance of recycling materials used in welding; and

(D) use appropriate personal protective equipment.

(3) The student applies the concepts and skills of welding of actual work situations. The student is expected to:

(A) work independently to fabricate welded projects with minimal assistance;

(B) work collaboratively with other students to complete relevant projects; and

(C) troubleshoot equipment.

(4) The student analyzes the concepts and intricacies of inspections and related codes. The student is expected to:

(A) explain weld inspection processes; and

(B) produce acceptable weldments to standards related to industry codes such as the American Welding Society (AWS), American National Standards Institute, and Canadian Welding Bureau.

(5) The student performs oxy-fuel cutting processes. The student is expected to:

(A) use safe operating practices;

(B) perform safe handling of compressed gases;

(C) assemble components involved in setting up for oxy-fuel gas cutting processes;

(D) demonstrate proper set-up for cutting techniques such as piercing, straight line, and bevel; and

(E) evaluate acceptable and unacceptable cuts.

(6) The student performs plasma arc cutting on metals. The student is expected to:

(A) use safe operating practices;

(B) explain the difference between safe and unsafe storage and handling of compressed gas supply;

(C) employ proper set-up procedures for plasma arc cutting; and

(D) demonstrate proper cutting techniques, including straight line, piercing, and bevels.

(7) The student performs shielded metal arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate shielded metal arc welding principles;

(C) demonstrate proper set-up procedures for shielded metal arc welding;

(D) select appropriate electrodes for base metal in shielded metal arc welding;

(E) perform welds such as fillet and groove according to industry-accepted welding standards;

(F) perform multiple pass welds;

(G) prepare joints for welding; and

(H) explain heating processes such as pre-heating and post-heating.

(8) The student demonstrates proper set-up procedure for gas metal arc welding. The student is expected to:

(A) use safe operating practices;

(B) demonstrate gas metal arc welding principles;

(C) demonstrate proper set-up for gas metal arc welding;

(D) select appropriate filler metals for base metal in gas metal arc welding; and

(E) perform fillet and groove welds in all positions according to industry-accepted welding standards.

(9) The student performs flux cored arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) employ and appraise flux cored arc welding principles;

(C) demonstrate proper set-up procedures for flux cored arc welding;

(D) appraise appropriate filler metal for base metal in flux cored arc welding;

(E) perform fillet and groove welds; and

(F) perform welds in all appropriate positions according to industry-accepted welding standards.

(10) The student performs gas tungsten arc welding principles and practices on metals. The student is expected to:

(A) use safe operating practices;

(B) demonstrate gas tungsten arc welding principles;

(C) demonstrate proper set-up for gas tungsten arc welding;

(D) select appropriate use of filler metals for base metal in gas tungsten arc welding; and

(E) perform welds in all appropriate positions according to industry-accepted welding standards.

(11) The student performs weldment fabrications. The student is expected to:

(A) identify layout tools;

(B) perform a part layout on plate according to a blueprint;

(C) perform a layout of a pipe fitting according to a blueprint; and

(D) perform an assembly according to a blueprint.

§127.865. Practicum in Manufacturing (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Manufacturing Career Cluster. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) The Practicum in Manufacturing course is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify and apply the employer's standard operating procedures;

(B) demonstrate positive work behaviors such as attitudes, punctuality, time management, initiative, and cooperation;

(C) communicate appropriately and accept constructive criticism;

(D) research and discuss business ethics;

(E) complete tasks such as quality products and services with the highest standards;

(F) model professional appearance such as dress, grooming, and personal protective equipment as appropriate; and

(G) comply with safety rules such as regulations to maintain safe working conditions and environments appropriate to the work setting.

(2) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem;

(B) analyze information critically to determine its value; and

(C) conduct technical research to gather information for decision making.

(3) The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:

(A) analyze leadership characteristics such as trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation;

(B) demonstrate teamwork skills through working cooperatively with others to achieve tasks;

(C) demonstrate teamwork processes such as promoting team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate responsibility for organization tasks such as shared group and individual work tasks; and

(E) establish and maintain effective working relationships.

(4) The student demonstrates oral and written communication skills. The student is expected to:

(A) demonstrate the use of content such as technical concepts and vocabulary;

(B) employ verbal skills when obtaining and conveying information;

(C) use informational texts such as Internet websites and technical materials for occupational tasks;

(D) evaluate the reliability of information such as Internet websites, technical materials, and resources;

(E) interpret verbal and nonverbal cues and behaviors to enhance communication;

(F) apply active listening skills such as obtaining and clarifying the information; and

(G) use academic skills such as effective written and oral communication.

(5) The student demonstrates technical knowledge and skills required to pursue a career in the manufacturing cluster. The student is expected to:

(A) use information literacy skills such as accessing, evaluating, and disseminating information;

(B) describe information management;

(C) maintain records to facilitate ongoing business operations;

(D) develop goals;

(E) prioritize tasks;

(F) develop timelines using time-management skills;

(G) use project-management skills such as initiate, plan, execute, monitor and control, and close to improve workflow;

(H) evaluate proficiencies in technical skills; and

(I) accept critical feedback provided by the supervisor.

(6) The student documents technical knowledge and skills using a professional portfolio. The student is expected to:

(A) demonstrate growth of technical skill competencies;

(B) demonstrate technical knowledge and skills by completing activities such as earning licensures or certifications;

(C) develop an abstract of key points of the practicum;

(D) create a job-skills resume;

(E) collect representative work samples;

(F) maintain copies of evaluations from the practicum supervisor and/or industrial representative; and

(G) present the portfolio to interested stakeholders.

§127.866. Extended Practicum in Manufacturing (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a co-

herent sequence of career and technical education courses in the Manufacturing Career Cluster. Corequisite: Practicum in Manufacturing. This course must be taken concurrently with Practicum in Manufacturing and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

(3) The Extended Practicum in Manufacturing course is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to manufacturing;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(D) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) conduct technical research to gather information necessary for decision making.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) demonstrate an understanding of and consistently follow workplace safety rules and regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in teaching and training. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a manufacturing experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised manufacturing experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate growth of technical skill competencies;

(D) evaluate strengths and weaknesses in technical skill proficiency; and

(E) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
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For further information, please call: (512) 475-1497

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SUBCHAPTER P. TRANSPORTATION, DISTRIBUTION, AND LOGISTICS

19 TAC §§127.871 - 127.886, 127.921 - 127.924

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§127.871. Principles of Transportation Systems (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) In Principles of Transportation Systems, students will gain knowledge and skills in the safe application, design, production, and assessment of products, services, and systems. This knowledge includes the history, laws and regulations, and common practices used in the transportation industry. Students should apply knowledge and skills in the application, design, and production of technology as it relates to the transportation industries. This course allows students to reinforce, apply, and transfer their academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities related to transportation systems;

(B) identify careers in transportation systems;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation within transportation;

(D) discuss certification opportunities;

(E) demonstrate knowledge of personal and occupational health and safety;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) explore career goals, objectives, and strategies as part of a plan for future career opportunities.

(2) The student develops leadership experience as it relates to transportation systems. The student is expected to:

(A) plan, propose, conduct, and evaluate industry-based occupational experiences;

(B) apply proper record-keeping skills as they relate to industry-based occupational experiences;

(C) use a customized record-keeping system for the individual industry-based occupational experiences;

(D) discuss youth leadership opportunities to create a well-rounded industry-based occupational experience; and

(E) develop a work plan and budget.

(3) The student explores concepts related to cultural diversity. The student is expected to:

(A) identify significant similarities and differences in international culture;

(B) explain the variety of world markets; and

(C) describe marketing factors and practices that impact other cultures.

(4) The student understands the historical, current, and future significance of the transportation industries. The student is expected to:

(A) define terms associated with the transportation industries;

(B) identify the scope and effect on society of the transportation industries;

(C) identify significant historical and current developments in the transportation industries;

(D) identify potential future development for transportation industry systems;

(E) describe how emerging technologies and globalization impact the transportation industries; and

(F) compare and contrast issues affecting the transportation industries such as international trade, employment, safety, and environmental issues.

(5) The student analyzes the structure of transportation organizations. The student is expected to:

(A) describe common business management principles;

(B) identify opportunities for leadership development and personal growth;

(C) demonstrate democratic principles in conducting effective meetings;

(D) describe team dynamics; and

(E) describe the development of organizational vision, mission, and goals through the strategic planning process.

(6) The student explains the transportation industries at the local, state, national, and international levels. The student is expected to:

(A) identify reasons for world trade and globalization;

(B) identify the political impact of transportation;

(C) review regulations and major laws and evaluate their impact on transportation;

(D) read appropriate written material to stay abreast of current issues impacting transportation;

(E) collect public opinion and data in order to make informed decisions;

(F) use critical-thinking skills to identify and organize alternatives and evaluate public policy issues related to transportation; and

(G) evaluate performance and contract compliance of contractors and service providers.

(7) The student demonstrates appropriate interpersonal and communication skills. The student is expected to:

(A) examine workplace ethical and legal responsibilities;

(B) define the uses of proper etiquette;

(C) identify appropriate personal appearance and health habits;

(D) practice written and oral communication skills in formal and informal situations;

(E) practice effective listening skills in formal and informal situations;

(F) read and comprehend materials common to the transportation industry;

(G) employ writing and preparation skills using technical information; and

(H) demonstrate speaking skills.

(8) The student applies appropriate research methods for transportation systems. The student is expected to:

(A) define major fields of research and development;

(B) identify and apply scientific methods of research in transportation industries;

(C) use a variety of resources for research and development; and

(D) describe the scientific methods of research.

(9) The student applies problem-solving, mathematical, and organizational skills in order to maintain financial and logistical records related to transportation. The student is expected to:

(A) discuss project proposals;

(B) maintain records appropriate to transportation system industries;

(C) collect and organize data in graphs, tables, charts, and plots; and

(D) analyze and interpret data from graphs, tables, charts, and plots.

(10) The student uses information technology tools specific to transportation industries to access, manage, integrate, and create information. The student is expected to:

(A) use management software, email applications, and Internet applications;

(B) use word-processing, database, spreadsheet, and presentation software;

(C) examine collaborative, groupware, and virtual meeting software; and

(D) discuss Geographic Information Systems, Global Positioning Systems, and other computer-based equipment in transportation systems.

(11) The student discusses methods to reduce workplace hazards in order to promote a safe working environment. The student is expected to:

(A) discuss safe work practices and emergency procedures;

(B) identify rules and laws designed to promote safety and health in transportation environments;

(C) demonstrate first aid and cardiopulmonary resuscitation procedures;

(D) demonstrate proper use of safety equipment; and

(E) evaluate worksite safety areas and/or plans.

(12) The student examines Texas Department of Public Safety regulations as related to the transportation industry. The student is expected to:

(A) discuss rules pertaining to obtaining a commercial driver license (CDL);

(B) explain the different types of CDLs;

(C) discuss the various endorsements available for a CDL;

(D) discuss the requirements for each endorsement;

(E) identify material handling and storage equipment and forklifts, including electric- and fuel-powered forklifts; and

(F) identify types of transportation that supply warehouses and distribution centers.

§127.872. Principles of Distribution and Logistics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) In Principles of Distribution and Logistics, students will gain knowledge and skills in the safe application, design, production, and assessment of products, services, and systems. This knowledge includes the history, laws and regulations, and common practices used in the logistics of warehousing and transportation systems. Students should apply knowledge and skills in the application, design, and production of technology as it relates to distribution and logistics industries. This course allows students to reinforce, apply, and transfer their academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in distribution and logistics;

(B) identify careers in distribution and logistics systems;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in distribution and logistics;

(D) discuss certification opportunities;

(E) demonstrate knowledge of personal and occupational health and safety;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) explore career goals, objectives, and strategies as part of a plan for future career opportunities.

(2) The student develops leadership experience as it relates to distribution and logistics systems. The student is expected to:

(A) plan, propose, conduct, and evaluate industry-based occupational experiences;

(B) apply proper record-keeping skills as they relate to industry-based occupational experiences;

(C) use a customized record-keeping system for the individual industry-based occupational experiences;

(D) discuss youth leadership opportunities to create a well-rounded industry-based occupational experience; and

(E) develop a work plan and budget.

(3) The student explores concepts related to cultural diversity. The student is expected to:

(A) identify significant similarities and differences in international culture;

(B) explain the variety of world markets; and

(C) describe marketing factors and practices that impact other cultures.

(4) The student understands the historical, current, and future significance of the distribution and logistics industries. The student is expected to:

(A) define terms associated with the distribution and logistics industries;

(B) identify the scope and effect upon society of the distribution and logistics industries;

(C) identify significant historical and current developments in the distribution and logistics industries;

(D) identify potential future scenarios for the distribution and logistics industry systems;

(E) describe how emerging technologies and globalization impact the distribution and logistics industries; and

(F) compare and contrast issues affecting the distribution and logistics industries such as international trade, employment, safety, and environmental issues.

(5) The student analyzes the structure of distribution and logistics organizations. The student is expected to:

(A) describe common business management principles;

(B) identify opportunities for leadership development and personal growth;

(C) demonstrate democratic principles in conducting effective meetings;

(D) describe team dynamics; and

(E) describe the development of organizational vision, mission, and goals through the strategic planning process.

(6) The student explains the distribution and logistics industries at the local, state, national, and international levels. The student is expected to:

(A) identify reasons for world trade and globalization;

(B) identify the political impact of distribution and logistics;

(C) review regulations and major laws to evaluate their impact on distribution and logistics;

(D) read appropriate written material to stay abreast of current issues impacting distribution and logistics;

(E) collect public opinion and data in order to make informed decisions;

(F) use critical-thinking skills to identify and organize alternatives and evaluate public policy issues related to distribution and logistics; and

(G) evaluate performance and contract compliance of contractors and service providers.

(7) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) examine workplace ethical and legal responsibilities;

(B) define the uses of proper etiquette;

(C) identify appropriate personal appearance and health habits;

(D) practice written and oral communication skills in formal and informal situations;

(E) practice effective listening skills in formal and informal situations;

(F) employ writing and preparation skills using technical information; and

(G) demonstrate speaking skills.

(8) The student applies appropriate research methods for distribution and logistics systems. The student is expected to:

(A) define major fields of research and development;

(B) identify and apply scientific methods of research in distribution and logistics industries;

(C) use a variety of resources for research and development; and

(D) describe the scientific methods of research.

(9) The student applies problem-solving, mathematical, and organizational skills in order to maintain financial and logistical records. The student is expected to:

(A) discuss project proposals;

(B) maintain records appropriate to distribution and logistics system industries;

(C) collect and organize data in graphs, tables, charts, and plots; and

(D) analyze and interpret data from graphs, tables, charts, and plots.

(10) The student uses information technology tools specific to distribution and logistics industries to access, manage, integrate, and create information. The student is expected to:

(A) use management software, email applications, and Internet applications;

(B) use word-processing, database, spreadsheet, and presentation software;

(C) examine collaborative, groupware, and virtual meeting software;

(D) discuss Geographic Information Systems and Global Positioning Systems; and

(E) discuss other computer-based equipment in distribution and logistics systems.

(11) The student discusses methods to reduce sources of workplace hazards in order to promote a safe working environment. The student is expected to:

(A) discuss safe work practices and emergency procedures;

(B) identify rules and laws designed to promote safety and health in the distribution and logistics environments;

(C) demonstrate first aid and cardiopulmonary resuscitation procedures; and

(D) demonstrate proper use of safety equipment.

(12) The student examines material handling in warehouses and distribution centers. The student is expected to:

(A) discuss handling practices for goods and materials;

(B) explain size, weight, and shape requirements for packaging;

(C) discuss material handling, storage, and shipping methods;

(D) analyze visual design and appearance requirements for packages;

(E) discuss layout plans for processing packages;

(F) identify material handling and storage equipment; and

(G) identify types of warehouses and distribution centers.

§127.873. Introduction to Transportation Technology (One-Half Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9 and 10. Students shall be awarded one-half credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation, infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Introduction to Transportation Technology includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. Transportation Technology includes applicable safety and environmental rules and regulations. In Transportation Technology, students will gain knowledge and skills in the repair, maintenance, and diagnosis of transportation systems. This study will allow students to reinforce, apply, and transfer academic

knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate the importance of workplace safety and environmental responsibilities and the use of personal protective equipment in transportation services;

(B) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of transportation technology;

(C) demonstrate the principles of group participation and leadership related to citizenship and career preparation;

(D) identify employers' expectations and appropriate work habits; and

(E) discuss workplace ethics in a variety of scenarios.

(2) The student demonstrates academic skills related to the requirements of transportation technology. The student is expected to:

(A) demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;

(B) demonstrate effective written communication skills with individuals from various cultures such as fellow students, coworkers, and customers; and

(C) demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using the metric and U.S. customary systems.

(3) The student understands the technical knowledge and skills of basic transportation systems. The student is expected to:

(A) locate, read, and interpret transportation repair and service information; and

(B) describe the basic and emerging transportation technologies.

(4) The student knows the functions and applications of the tools, equipment, technologies, and materials used in transportation technology. The student is expected to:

(A) demonstrate awareness of the proper way to safely use hand and power tools and equipment commonly employed in the industry;

(B) identify diagnostic tools and equipment; and

(C) identify hand and shop tools and describe their proper usage.

§127.874. Introduction to Small Engine Technology (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Introduction to Small Engine Technology includes knowledge of the function and maintenance of the systems and components of all types of small engines such as outdoor power equipment, motorcycles, generators, and irrigation engines. This course is designed to provide training for employment in the small engine technology industry. Instruction includes the repair and service of cooling, air, fuel, lubricating, electrical, ignition, and mechanical systems. In addition, the student will receive instruction in safety, academic, and leadership skills as well as career opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the small engine technology industry;

(B) identify careers in the small engine technology industry;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the small engine technology industry;

(D) discuss certification opportunities;

(E) demonstrate skills and knowledge related to personal and occupational health and safety in the workplace;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) describe and demonstrate ethical and legal responsibilities for appropriate workplace conduct;

(B) demonstrate proper etiquette and behavior;

(C) demonstrate appropriate personal appearance and hygiene;

(D) practice written and oral communication skills and employ effective listening skills;

(E) employ technical writing and preparation skills; and

(F) demonstrate effective speaking skills through prepared and extemporaneous oral presentations.

(3) The student describes the historical, current, and future significance of the small engine technology industry. The student is expected to:

(A) describe emerging technologies and their impact on the small engine technology industry;

(B) identify issues affecting the small engine technology industry related to employment, safety, and environmental issues;

(C) discuss regulations and laws and their impact on the small engine technology industry; and

(D) read appropriate written material to stay abreast of current issues impacting the small engine technology industry.

(4) The student participates in opportunities for leadership development and personal growth. The student is expected to:

(A) participate in the planning and development of leadership and skill development activities such as conducting effective meetings, team building activities, and strategic planning; and

(B) use resources available through an organization such as a career and technical student organization to develop employability skills.

(5) The student identifies the skills used to maintain and operate a small engine maintenance facility. The student is expected to:

(A) perform preventative maintenance schedule plans and systems to keep facility, tools, and equipment operating safely and properly;

(B) use the preventative maintenance schedule of the facility, tools, and equipment to determine repair or replacement needs;

(C) complete repair orders and paperwork related to the small engine technology industry to properly document work needed or completed;

(D) estimate parts and labor costs on repair orders for small engine repair; and

(E) locate, read, and interpret service repair information such as small engine schematics, charts, and service-repair manuals and bulletins.

(6) The student applies problem-solving, mathematical, and organizational skills to maintain financial and logistical records. The student is expected to:

(A) develop project proposals;

(B) develop and maintain records appropriate to the small engine technology industry;

(C) describe mathematical formulas used to perform engine calculations such as calculating cylinder volume, engine displacement, combustion chamber volume, compressed head gasket volume, piston and deck height, piston dish volume, dome volume, cylinder volume, compression ratio, and horsepower;

(D) describe mathematical formulas used to perform electrical calculations such as calculating electrical resistance, current, and voltage in engines; and

(E) apply Ohm's law to small engine electrical circuits using a digital multimeter.

(7) The student uses information technology resources specific to the small engine technology industry to access, manage, integrate, and create information. The student is expected to:

(A) use personal management software such as email and Internet applications and word-processing, database, spreadsheet, presentation, collaborative, groupware, and virtual meeting software;

(B) discuss Geographic Information Systems and Global Positioning Systems applications; and

(C) use computer-based equipment.

(8) The student demonstrates an understanding of technical knowledge and skills of small engine technology. The student is expected to:

(A) identify the use and application of small engines and their components;

(B) identify the components of electrical-electronic systems;

(C) demonstrate awareness of engine designs, components, and applications;

(D) identify and use engine measuring tools and test equipment;

(E) use tools used in the operation, maintenance, and repair of small engines;

(F) compare and contrast the characteristics of two- and four-cycle engines; and

(G) identify and discuss the functions of the major small engine components.

(9) The student applies technical knowledge and skills in simulated or actual work situations. The student is expected to:

(A) troubleshoot and repair small engines;

(B) assess the proper fuel mixtures and analyze the efficiency of various fuels used in small engines;

(C) distinguish between valve arrangement positions and analyze valve timing with respect to crankshaft rotation;

(D) perform preventative maintenance and service engine lubrication, cooling, starting, fuel, and ignition systems and associated fluids and filters;

(E) perform routine installations, inspections, adjustments, and maintenance on small engines using testing tools and equipment;

(F) demonstrate knowledge of electrical testing tools and equipment commonly used in small engine maintenance;

(G) perform measurements using precision instruments;

(H) inspect and measure small engine parts for wear tolerances;

(I) explain the relationship between an electric current and magnetic fields in ignition, charging, and starting systems; and

(J) analyze the effects of heating and cooling on small engines.

§127.875. Small Engine Technology (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Prerequisite: Introduction to Small Engine Technology. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Small Engine Technology includes advanced knowledge of the function, diagnosis, and service of the systems and components of all types of small engines such as outdoor power equipment, motorcycles, generators, and irrigation engines. This course is designed to provide hands-on and practical application for employment in the small engine technology industry. Instruction includes the repair and service of cooling, air, fuel, lubricating, electrical, ignition, and mechanical systems and small engine overhauls. In addition, students will receive instruction in safety, academic, and leadership skills as well as career opportunities.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in the small engine technology industry;

(B) identify careers in the small engine technology industry;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the small engine technology industry;

(D) discuss certification opportunities;

(E) demonstrate skills and knowledge of personal and occupational health and safety in the workplace;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills;

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities;

(I) prepare a resume; and

(J) demonstrate job interview skills.

(2) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) describe, demonstrate, and apply ethical and legal responsibilities for appropriate workplace conduct;

(B) demonstrate proper etiquette and behavior;

(C) demonstrate appropriate personal appearance and hygiene;

(D) demonstrate effective written and oral communication skills and employ effective listening skills;

(E) demonstrate advanced technical writing and preparation skills; and

(F) demonstrate effective speaking skills through prepared and extemporaneous oral presentations.

(3) The student participates in opportunities for leadership development and personal growth. The student is expected to:

(A) participate in the planning and development of leadership and skill development activities such as conducting effective meetings, team building activities, and strategic planning;

(B) use resources available through an organizations such as a career and technical student organizations to develop employability skills; and

(C) record individual progress to document achievements.

(4) The student describes the historical, current, and future significance of the small engine technology industry. The student is expected to:

(A) describe emerging technologies and their impact on the small engine technology industry;

(B) compare and contrast issues affecting the small engine technology industry related to employment, safety, environmental, and regulatory issues; and

(C) describe local and global market conditions and practices that impact the application and need of the small engine technology industry.

(5) The student identifies the skills used to maintain and operate a small engine maintenance facility. The student is expected to:

(A) develop, evaluate, and perform preventative maintenance plans and systems to keep facility, tools, and equipment operating safely and properly;

(B) complete repair orders and paperwork related to the small engine technology industry to properly document work needed

or completed such as ensuring proper customer communication and authorization;

(C) estimate parts and labor costs on repair orders for small engine repair;

(D) describe common business management principles such as technician productivity, shop efficiency, and profit margins; and

(E) locate, read, and interpret service repair information such as small engine schematics, charts, and technical bulletins.

(6) The student applies appropriate research methods to small engine technology topics. The student is expected to:

(A) use a variety of resources to research, trouble shoot, and diagnose concerns and failures; and

(B) describe the application of the scientific method of research to small engine technology such as identifying a problem, establishing a procedure, performing direct and indirect observation, collecting and interpreting data, and drawing conclusions by verifying the complaint, determining the related symptoms, analyzing the symptoms, isolating the trouble, correcting the trouble, and checking for proper operation.

(7) The student applies problem-solving, mathematical, and organizational skills to maintain financial and logistical records. The student is expected to:

(A) develop project proposals;

(B) develop and maintain records appropriate to the small engine technology industry;

(C) collect and organize data in graphs, tables, and charts;

(D) analyze and interpret data from graphs, tables, and charts;

(E) use mathematical formulas to perform engine calculations such as calculating cylinder volume, engine performance and enhancement, engine displacement, combustion chamber volume, compressed head gasket volume, piston and deck height, piston dish volume, dome volume, cylinder volume, compression ratio, and horsepower;

(F) use mathematical formulas to perform electrical calculations such as calculating and measuring electrical resistance, current, and voltage in engines;

(G) apply Ohm's law to small engine electrical circuits using a digital multimeter; and

(H) apply electrical principles to diagnose and repair small engine components such as generators, electric motors, power supplies, electronic amplifiers, relays, and circuits.

(8) The student uses information technology tools specific to the small engine technology industry to access, manage, integrate, and create information. The student is expected to:

(A) use personal management software such as email and Internet applications and word-processing, database, spreadsheet, presentation, collaborative, groupware, and virtual meeting software;

(B) discuss Geographic Information Systems and Global Positioning Systems applications; and

(C) use other computer-based equipment.

(9) The student demonstrates advanced technical knowledge and skills of small engine technology. The student is expected to:

(A) demonstrate the use and application of small engines and components;

(B) demonstrate the components of electrical-electronic systems;

(C) demonstrate knowledge of engine designs, components, and applications; and

(D) demonstrate the correct use of engine measuring tools and test equipment.

(10) The student demonstrates advanced technical knowledge and skills in simulated or actual work situations. The student is expected to:

(A) troubleshoot and repair small engines;

(B) perform preventative maintenance on small engines;

(C) assess the proper fuel mixtures and analyze the efficiency of various fuels used in small engines;

(D) distinguish between valve arrangement positions and analyze valve timing with respect to crankshaft rotation;

(E) perform preventative maintenance and service engine lubrication, cooling, starting, fuel, and ignition systems and associated fluids and filters;

(F) perform routine installations, inspections, adjustments, and maintenance on small engine testing tools and equipment;

(G) demonstrate knowledge of electrical testing tools and equipment commonly used in small engine maintenance such as digital multimeters;

(H) perform measurements using precision instruments such as micrometers, dial indicators, and Vernier calipers;

(I) inspect and measure small engine parts for wear tolerances and compare to specifications;

(J) demonstrate the relationship between an electric current and magnetic fields in ignition, starting, and charging systems with the use of test equipment;

(K) analyze the effects of heating and cooling on small engines;

(L) explain the thermophysical properties of fluids commonly used in small engine systems;

(M) explain the laws of thermodynamics;

(N) explain torque, horsepower, and heat energy transfer in small engines;

(O) calculate speed and acceleration in small engines; and

(P) compare and contrast efficiency of various engine sizes and types.

§127.876. Automotive Basics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Automotive Basics includes knowledge of the basic automotive systems and the theory and principles of the components that make up each system and how to service these systems. Automotive Basics includes applicable safety and environmental rules and regulations. In Automotive Basics, students will gain knowledge and skills in the repair, maintenance, and servicing of vehicle systems. This study allows students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);

(B) identify career and employment opportunities, including entrepreneurship opportunities, internships, and industry-recognized certification requirements for the field of automotive technology;

(C) demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;

(E) discuss certification opportunities;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) describe, demonstrate, and apply ethical and legal responsibilities for appropriate workplace conduct;

(B) demonstrate proper etiquette and behavior;

(C) demonstrate appropriate personal appearance and hygiene;

(D) demonstrate effective written and oral communication skills and employ effective listening skills;

(E) demonstrate advanced technical writing and preparation skills; and

(F) demonstrate effective speaking skills through prepared and extemporaneous oral presentations.

(3) The student demonstrates academic skills related to the requirements of automotive technology. The student is expected to:

(A) demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;

(B) demonstrate effective written communication skills, including documenting on a repair order the customer concern/complaint, root cause of the failure, and corrective action to complete the repair; and

(C) demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate.

(4) The student understands the technical knowledge and skills of basic automotive systems. The student is expected to:

(A) describe the eight major vehicle systems;

(B) locate, read, and interpret vehicle maintenance and service information; and

(C) describe the basic and emerging vehicle power systems.

(5) The student knows the functions and applications of the tools, equipment, technologies, and materials used in automotive services. The student is expected to:

(A) demonstrate the proper way to safely use hand and power tools and equipment commonly employed in the maintenance and repair of vehicles;

(B) discuss the proper handling and disposal of environmentally hazardous materials used in servicing vehicles;

(C) identify diagnostic tools and equipment; and

(D) identify hand and shop tools and describe their proper usage.

(6) The student applies technical knowledge and skills in simulated or actual work situations. The student is expected to:

(A) demonstrate the procedures for ordering and locating parts;

(B) demonstrate an understanding of the operation theory of internal combustion engines;

(C) identify brake system components, including drum, disc, power assist, and anti-lock braking system (ABS);

(D) demonstrate an understanding of basic concepts related to hydraulic brakes systems, including Pascal's Theory of Hydraulics;

(E) demonstrate an understanding of basic concepts related to electrical and electronic systems such as Ohm's law, voltage drop, resistance, amperage, voltage, and wiring diagram symbols;

(F) identify air-conditioning, heating, and accessory system components;

(G) inspect and identify chassis and power train components and systems;

(H) identify cooling and lubrication system components;

(I) identify steering and suspension components, including power steering;

(J) identify and interpret tire sidewall data information such as Department of Transportation (DOT) production date information, tire load capacity, inflation pressures, sizing description, and speed rating;

(K) compare the preventative maintenance schedules for a variety of vehicles based on their use;

(L) perform a preventative maintenance inspection;

(M) explain and perform a "jump-start" of a vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer recommended procedures; and

(N) perform regular audits and inspections to maintain compliance with safety, health, and environmental regulations.

§127.877. Automotive Technology I: Maintenance and Light Repair (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 9-12. Recommended prerequisite: Automotive Basics. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Automotive Technology I: Maintenance and Light Repair includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. This course includes applicable safety and environmental rules and regulations. In Automotive Technology I: Maintenance and Light Repair, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);

(B) identify career and employment opportunities, including entrepreneurship opportunities, and internships and industry-recognized certification requirements for the field of automotive technology;

(C) demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;

(E) discuss certification opportunities;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student demonstrates academic skills related to the requirements of automotive technology. The student is expected to:

(A) demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;

(B) demonstrate effective written communication skills, including documenting on a repair order the customer concern/complaint, root cause of the failure, and corrective action to complete the repair; and

(C) demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate.

(3) The student demonstrates technical knowledge and skills related to the manufacturer preventative maintenance schedule. The student is expected to:

(A) locate the manufacturer recommended preventative maintenance schedule;

(B) perform a preventative maintenance inspection of vehicle systems, including engine, fuel, lubrication, cooling, electrical, suspension, drive train, and air-conditioning systems;

(C) describe the function of the automotive chassis components, including braking, steering, transmission, drive train, and suspension systems;

(D) locate, read, and interpret service repair information such as schematics, charts, diagrams, graphs, parts catalogs, and technical bulletins;

(E) use published specifications to diagnose component wear and determine necessary repairs;

(F) identify the appropriate oil viscosity and capacity;

(G) verify operation of the instrument panel engine warning indicators;

(H) inspect engine assembly and document findings of fuel, oil, coolant, and other leaks;

(I) perform common fastener and thread repair, including removing broken bolt, restoring internal and external threads, and repairing internal threads with thread insert;

(J) inspect, replace, and adjust drive belts, tensioners, and pulleys;

(K) perform engine oil and filter change; and

(L) explain and perform a "jump-start" of a vehicle using jumper cables and a booster battery or an auxiliary power supply according to manufacturer recommended procedures.

(4) The student demonstrates the functions and applications of the tools, equipment, technologies, and materials used in automotive technology. The student is expected to:

(A) demonstrate the proper use of hand and power tools and equipment commonly employed in the maintenance and repair of vehicles; and

(B) discuss the proper handling and disposal of environmentally hazardous materials used in servicing vehicles.

(5) The student applies the technical knowledge and skills related to brakes in simulated or actual work situations. The student is expected to:

(A) explains Pascal's Theory of Hydraulics as it relates to the brake system;

(B) inspect brake system components, including master cylinder, brake lines, wheel cylinders, calipers, and flexible hoses and fittings, for external leaks and proper operation;

(C) inspect, measure, and refinish brake drum diameter to manufacturer specifications;

(D) remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates;

(E) lubricate, reassemble, and pre-adjust brake shoes and parking brake;

(F) remove, inspect for damage or wear, clean, lubricate, and reassemble pads and retaining hardware, caliper assembly, and mounting components such as slides and pins for proper operation;

(G) refinish a rotor on and off a vehicle and measure final rotor thickness with manufacturer specifications;

(H) retract and re-adjust caliper piston on an integral parking brake system;

(I) check brake pedal travel with, and without, engine running to verify proper power booster operation;

(J) check brake pedal travel with, and without, engine running to verify proper power booster operation;

(K) check vacuum supply from a manifold or auxiliary pump to vacuum-type brake power booster; and

(L) describe the operation of a regenerative braking system.

(6) The student applies the technical knowledge and skills related to electrical systems in simulated or actual work situations. The student is expected to:

(A) demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity as defined by Ohm's Law;

(B) demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop, current flow, resistance, and ground circuits;

(C) use wiring diagrams to trace electrical/electronic circuits;

(D) demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits;

(E) confirm proper battery capacity for vehicle application and perform battery capacity test;

(F) perform battery state-of-charge test;

(G) inspect and clean the battery, fill battery cells, and check battery cables, connectors, clamps, and hold-downs;

(H) perform starter current draw test;

(I) inspect and test fusible links, circuit breakers, fuses, and relays;

(J) perform charging system output test;

(K) inspect, adjust, or replace generator/alternator drive belts and check pulleys and tensioners for wear and belt alignment;

(L) verify operation of instrument panel gauges and warning/indicator lights, and reset maintenance indicators;

(M) inspect interior and exterior lamps and sockets, including headlights and auxiliary light such as fog and driving lights and replace as needed; and

(N) verify windshield wiper and washer operation and replace wiper blades as needed.

(7) The student applies the technical knowledge and skills related to heating and air conditioning (A/C) in simulated or actual work situations. The student is expected to:

(A) identify refrigerant type and the safety and environmental concerns related to handling and storage;

(B) inspect engine cooling and heater systems hoses;

(C) inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets;

(D) inspect A/C condenser for airflow restrictions; and

(E) identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.

(8) The student applies the technical knowledge and skills related to manual and automatic drive train and axles in simulated or actual work situations. The student is expected to:

(A) identify the different fluid types used in both an automatic and manual transmission/transaxle;

(B) identify the fluid types and capacity required by application using service information;

(C) check fluid level in a transmission or a transaxle equipped with a dip-stick;

(D) check fluid level in a transmission or a transaxle not equipped with a dip-stick;

(E) check fluid condition and inspect for leaks;

(F) drain and replace fluid and filter or filters in an automatic transmission/transaxle;

(G) drain and replace fluid in an manual transmission/transaxle; and

(H) inspect power train mounts.

(9) The student applies the technical knowledge and skills related to engine performance in simulated or actual work situations. The student is expected to:

(A) inspect and explain the electrical/electronic components, sensors and circuits on an on board diagnostics (OBD) controlled engine;

(B) perform engine absolute manifold pressure tests such as vacuum or boost;

(C) verify engine operating temperature;

(D) remove and replace spark plugs and inspect secondary ignition components for wear and damage;

(E) describe the importance of operating all OBD II monitors for repair verification;

(F) retrieve and record diagnostic trouble codes, OBD II monitor status, and freeze frame data and clear codes when applicable;

(G) inspect, service, or replace air filters, filter housings, and intake duct work;

(H) replace fuel filter or filters;

(I) inspect integrity of the exhaust manifolds, exhaust pipes, mufflers, catalytic converters, resonators, tail pipes, and heat shields; and

(J) inspect, test, and service positive crankcase ventilation (PCV) system and its components such as the filter/breather cap, valve, tubes, orifices, and hoses.

(10) The student applies the technical knowledge and skills related to suspension systems and simulated or actual work situations. The student is expected to:

(A) identify and interpret tire sidewall data information such as Department of Transportation (DOT) production date information, tire load capacity, inflation pressures, sizing description, and speed rating;

(B) demonstrate tire tread depth measuring procedures using industry standards such as common tread depth gauges;

(C) demonstrate tire and wheel balance such as static and dynamic balance, and proper wheel weight selection;

(D) demonstrate tire and wheel measurements such as radial and lateral run-out in tire and wheel assembly;

(E) inspect steering linkage components and mounts such as inner and outer tie-rod ends, pitman arm, idler arm, inner rack and pinion ends, rack and pinion mounts, upper and lower ball joints, power steering pump, and hoses for leaks;

(F) remove, clean, inspect, and repack wheel bearings, properly install wheel seals, and adjust wheel bearing pre-load;

(G) inspect shock absorbers and McPherson struts for leakage and performance using jounce and rebound tests;

(H) demonstrate wheel stud replacement and installation of wheel and tire assembly with proper torqueing procedure;

(I) identify and test the Tire Pressure Monitoring Systems (TPMS), both the direct and indirect, for proper operation;

(J) dismount and mount a tire on a wheel and reinstall the assembly, including torqueing the lug nuts; and

(K) rotate tires according to manufacturer recommendations.

§127.878. Automotive Technology II: Automotive Service (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. Prerequisite: Automotive Technology I: Maintenance and Light Repair. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Automotive Technology II: Automotive Service includes knowledge of the major automotive systems and the principles of diagnosing and servicing these systems. Automotive Technology II: Automotive Service includes applicable safety and environmental rules and regulations. In this course, students will gain knowledge and skills in the repair, maintenance, and diagnosis of vehicle systems. This study will allow students to reinforce, apply, and transfer academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. The focus of this course is to teach safety, tool identification, proper tool use, and employability.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate knowledge of the technical knowledge and skills related to health and safety in the workplace such as wearing safety glasses and other personal protective equipment (PPE) and maintaining safety data sheets (SDS);

(B) identify employment opportunities, including entrepreneurship opportunities and internships, and industry-recognized certification requirements for the field of automotive technology;

(C) demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;

(D) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;

(E) discuss certification opportunities;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student relates core academic skills to the requirements of automotive technology. The student is expected to:

(A) demonstrate effective written communication skills throughout the course, including documenting on a repair order customer concern/compliant, root cause of the failure, and corrective action to complete the repair;

(B) estimate the cost of parts and labor operations on repair orders throughout the course, including the flat rate system;

(C) demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate; and

(D) research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.

(3) The student demonstrates the technical knowledge and skills that form the core of knowledge of automotive service. The student is expected to:

(A) diagnose the major components of powered vehicles;

(B) diagnose automotive chassis and driveline components;

(C) locate, read, and interpret documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair information and technical bulletins;

(D) locate the manufacturer recommended preventative maintenance schedule;

(E) perform a preventative maintenance inspection;

(F) perform common fastener and thread repair, including removing broken bolt, restoring internal and external threads, and repairing internal threads with thread insert;

(G) perform precision measurements and use published specifications to diagnose component wear and determine necessary repairs; and

(H) employ critical-thinking skills and structured problem-solving skills to diagnose vehicle malfunctions, solve problems, and make decisions.

(4) The student knows the functions and applications of the tools, equipment, technologies, and materials used in automotive technology. The student is expected to:

(A) demonstrate the proper and safe use of hand and power tools and equipment commonly employed in the maintenance and repair of vehicles;

(B) discuss and demonstrate the proper handling and disposal of environmentally hazardous materials used in servicing vehicles;

(C) demonstrate proper use of diagnostic tools and equipment; and

(D) locate, read, and interpret service repair information such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair bulletins.

(5) The student applies the technical knowledge and skills related to suspension in simulated or actual work situations. The student is expected to:

(A) inspect and replace power steering hoses and fittings;

(B) remove, clean, inspect, repack, and install wheel bearings; replace seals; install hubs; and adjust bearings;

(C) replace wheel bearing and race;

(D) disable and enable supplemental restraint system (SRS);

(E) inspect, remove, and replace shock absorbers and struts and inspect mounts and bushings;

(F) dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system (TPMS);

(G) inspect rear suspension system lateral links/arms, trailing arms, leaf springs, spring insulators, shackles, brackets, center pins, and mounting bolts;

(H) inspect tire condition and wear patterns, check for correct size and application based on load and speed rating, and adjust air pressure;

(I) perform pre-alignment inspection and measure vehicle ride height;

(J) inspect tire and wheel assembly for air loss;

(K) identify and test indirect and direct TPMSs and operation of the instrument panel lamps;

(L) demonstrate knowledge of steps required to remove and replace sensors in a TPMS; and

(M) inspect, remove, and replace front wheel drive (FWD) bearings, hubs, seals, shafts, boots, and universal/constant velocity (CV) joints.

(6) The student applies the technical knowledge and skills related to electrical systems in simulated or actual work situations. The student is expected to:

(A) demonstrate knowledge of the causes and effects from shorts, opens, and resistance in electrical/electronic circuits;

(B) measure key-off battery drain/parasitic draw;

(C) perform solder repair of electrical wiring;

(D) replace electrical connectors and terminal ends;

(E) demonstrate the ability to maintain or restore electronic memory functions;

(F) perform slow and fast battery charges according to manufacturer recommendations;

(G) identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting a vehicle battery;

(H) perform starter current draw test and starter circuit voltage drop tests and inspect and test starter relays and solenoids;

(I) remove and install a starter in a vehicle;

(J) inspect and test switches, connectors, and wires of starter control circuits;

(K) perform charging system output test;

(L) remove, inspect, and re-install alternator;

(M) identify system voltage and safety precautions associated with high-intensity discharge headlights;

(N) disable and enable airbag system for vehicle service and verify indicator lamp operation;

(O) remove and reinstall a door panel; and

(P) describe the operation of keyless entry and remote-start systems.

(7) The student applies the technical knowledge and skills related to brakes in simulated or actual work situations. The student is expected to:

(A) describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS);

(B) measure brake pedal height, reserve distance, travel, and free play;

(C) identify components of brake warning light system;

(D) bleed and flush brake system;

(E) identify and check the operation of brake stop light system; and

(F) identify traction control and vehicle stability control system components.

(8) The student applies the technical knowledge and skills related to engine performance in simulated or actual work situations. The student is expected to:

(A) describe the importance of operating all on board diagnostics II (OBDII) monitors for repair verification;

(B) perform cylinder power balance test;

(C) perform cylinder cranking and running compression tests;

(D) perform cylinder leakage test;

(E) verify engine operating temperature;

(F) remove and replace spark plugs and inspect secondary ignition components for wear and damage; and

(G) retrieve and record diagnostic trouble codes and OBD II monitor status, freeze frame data, and clear trouble codes when applicable.

(9) The student applies the technical knowledge and skills related to engines in simulated or actual work situations. The student is expected to:

(A) install engine covers using gaskets, seals, and sealers as required;

(B) remove and replace timing belt and verify correct camshaft timing;

(C) perform cooling system pressure and dye tests to identify leaks, check coolant condition and level, and inspect and test radiator, pressure cap, coolant recovery tank, and heater core; and

(D) remove, inspect, and replace thermostat and gasket or seal.

(10) The student applies the technical knowledge and skills related to heating ventilation and air conditioning (HVAC) in simulated or actual work situations. The student is expected to:

(A) identify, locate, and replace cabin air filters;

(B) inspect air conditioning (A/C) condenser for airflow restrictions;

(C) identify the source of A/C system odors; and

(D) identify hybrid vehicle A/C system electrical circuits and safety precautions.

§127.879. Basic Collision Repair and Refinishing (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 1 course and is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Basic Collision Repair and Refinishing includes knowledge of the processes, technologies, and materials used in the reconstruction of vehicles. This course is designed to teach the concepts and theory of systems related to automotive collision repair and refinishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate awareness of workplace safety and environmental responsibilities in automotive collision repair and refinishing and understand the use of personal protective equipment;

(B) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the fields of collision repair and refinishing;

(C) review the principles of group participation and leadership related to citizenship and career preparation;

(D) identify employers' expectations and appropriate work habits;

(E) review the competencies related to resources, information systems, and technology; and

(F) apply reasoning skills to a variety of workplace situations in order to make ethical decisions.

(2) The student relates core academic skills to the requirements of collision repair and refinishing technology. The student is expected to:

(A) apply effective oral and written communication skills with individuals from various cultures such as fellow workers, management, and customers;

(B) use technical writing skills to complete collision repair and refinishing orders and related paperwork; and

(C) locate and read documents such as service and repair information, technical bulletins, specifications, schematics, and parts catalogs.

(3) The student understands the technical knowledge and skills of basic collision repair and refinishing systems. The student is expected to:

(A) demonstrate an understanding of basic types of repair procedures used in the auto collision industry;

(B) demonstrate an understanding of basic preparation, application, and refinishing with various paint products; and

(C) estimate parts and labor costs on collision repair and refinishing orders.

(4) The student knows the basic function and application of tools, equipment, technologies, and materials used in collision repair and refinishing services. The student is expected to:

(A) identify hand and power tools and equipment commonly used in collision repair and refinishing;

(B) identify proper welding and cutting techniques and processes used in collision repair;

(C) identify environmentally hazardous materials and appropriate handling methods used in collision repair and refinishing technologies; and

(D) demonstrate awareness of new and emerging collision repair and refinishing technologies.

(5) The student reviews the technical knowledge and skills of collision repair and refinishing. The student is expected to:

(A) demonstrate the safe use of various hand and power tools and equipment commonly used in collision repair and refinishing;

(B) identify types of vehicle construction materials and associated repair methods;

(C) remove paint from the damaged area of a body panel;

(D) identify and repair surface irregularities on a damaged body panel;

(E) demonstrate hammer and dolly techniques for dent repair;

(F) prepare damaged area using water-based and solvent-based cleaners;

(G) identify, prepare, and apply body filler;

(H) rough sand body filler to contour panel and finish sand for the application of primer;

(I) demonstrate the proper preparation, application, and refinishing of various paint products;

(J) apply finish using appropriate spray techniques such as gun arc, angle, distance, travel speed, and spray pattern overlap for the finish being applied;

(K) apply basecoat and clear coat for overall refinishing; and

(L) sand, buff, and polish fresh or existing finish to remove defects as required.

§127.880. Collision Repair (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prerequisite: Basic Collision Repair and Refinishing. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Collision Repair includes knowledge of the processes, technologies, and materials used in the reconstruction of vehicles. This course is designed to teach the concepts and theory of systems related to automotive collision repair and refinishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate an understanding of workplace safety and environmental responsibilities regarding automotive collision repair and understand the use of personal protective equipment;

(B) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the fields of collision repair;

(C) demonstrate the principles of group participation and leadership related to citizenship and career preparation;

(D) identify employers' expectations and appropriate work habits;

(E) review the competencies related to resources, information systems, and technology; and

(F) apply reasoning skills to a variety of workplace situations in order to make ethical decisions.

(2) The student relates core academic skills to the requirements of collision repair. The student is expected to:

(A) apply effective oral and written communication skills with individuals from various cultures such as fellow workers, management, and customers;

(B) use technical writing skills to complete collision repair orders and related paperwork;

(C) locate, read, and interpret documents such as service and repair information, technical bulletins, specifications, schematics, and parts catalogs; and

(D) apply mathematical skills to the estimating process such as establishing charges and totals, profit margins, technician productivity, and shop efficiency.

(3) The student understands the technical knowledge and skills of collision repair. The student is expected to:

(A) demonstrate an understanding of basic types of repair procedures for the different types of vehicle body construction used in the auto collision industry;

(B) demonstrate an understanding of pre-repair and repair inspection of non-damaged components;

(C) demonstrate the proper preparation, application, and refinishing of various paint products;

(D) estimate parts and labor costs of collision repair; and

(E) perform precision measurements to diagnose vehicle body shape and frame alignment angles.

(4) The student knows the function and application of tools, equipment, technologies, and materials used in collision repair. The student is expected to:

(A) use hand and power tools and equipment commonly employed in collision repair, according to industry safety standards;

(B) identify proper welding and cutting techniques and processes in collision repair;

(C) properly handle and dispose of environmentally hazardous materials used in collision repair and refinishing technologies; and

(D) demonstrate knowledge of new and emerging collision repair technologies.

(5) The student applies the technical knowledge and skills of collision repair and refinishing to simulated or actual work situations. The student is expected to:

(A) perform regular audits and inspections to maintain compliance with safety, health, and environmental regulations;

(B) identify types of vehicle construction materials and associated repair methods;

(C) identify methods of collision energy management and types of damage;

(D) determine vehicle damage and prepare an estimate of the repair costs;

(E) determine body panel damage and identify the associated repair methods, including inspection, disassembly, and repair or replacement of components;

(F) inspect, remove, replace, and align various body components such as hoods, hinges, latches, and bumper covers;

(G) identify types of vehicle finishes and associated refinish techniques;

(H) inspect, remove, and replace bolted, bonded, and welded panels or panel assemblies;

(I) identify vehicle occupant restraint systems and associated repair methods;

(J) identify vehicle body components and assess for repair or replacement;

(K) demonstrate the welding and cutting processes used in vehicle collision repair;

(L) remove, install, and adjust vehicle mechanical systems and electrical components;

(M) identify and determine the cause of paint and refinishing defects;

(N) discuss interior and exterior trim repair;

(O) discuss corrosion protection, including sealers, adhesives, and under-coatings;

(P) prepare damaged area using water-based and solvent-based cleaners;

(Q) demonstrate vehicle detailing;

(R) restore sound deadeners and foam materials; and

(S) diagnose and repair water leaks, dust leaks, and wind noise.

(6) The student applies the technical knowledge and skills of metal finishing and body filling to simulated or actual work situations. The student is expected to:

(A) remove paint from damaged area of a body panel;

(B) identify and repair surface irregularities on a damaged body panel;

(C) demonstrate hammer and dolly techniques for dent repair;

(D) heat shrink stretched panel areas to proper contour;

(E) cold shrink stretched panel areas to proper contour;

(F) identify, prepare, and apply body filler;

(G) rough sand body filler to contour panel and finish sand for the application of primer;

(H) determine the proper metal finishing techniques for aluminum; and

(I) determine the proper application of body filler to aluminum.

(7) The student applies the technical knowledge and skills of moveable glass and hardware to simulated or actual work situations. The student is expected to:

(A) inspect, adjust, repair, or replace window systems such as regulators, run channels, glass, power mechanisms, and related controls;

(B) inspect, adjust, remove, repair, or reinstall body sealing systems such as weather stripping;

(C) inspect, adjust, repair, or replace regulators, run channels, glass, power mechanisms, and related controls for roof panel options such as sun roofs and convertible tops; and

(D) inspect, remove, reinstall, and align convertible tops and related mechanisms.

(8) The student applies the technical knowledge and skills of plastics and adhesives to simulated or actual work situations. The student is expected to:

(A) identify the types of plastics used in automotive applications;

(B) clean and prepare the surface of plastic parts;

(C) repair rigid, semi-rigid, or flexible plastic panels;

(D) remove or repair damaged areas from rigid exterior composite panels; and

(E) replace bonded rigid exterior composite body panels, including straightening or aligning panel supports.

(9) The student applies the technical knowledge and skills of damage analysis to simulated or actual work situations. The student is expected to:

(A) prepare vehicle for inspection by providing access to damaged areas;

(B) analyze damage to determine appropriate methods for overall repairs;

(C) perform visual inspection of structural components and members;

(D) identify structural damage using measuring tools and equipment;

(E) perform visual inspection of non-structural components and members;

(F) determine parts, components, material type(s), and procedures necessary for a proper repair;

(G) identify type and condition of finish and determine if refinishing is required;

(H) identify suspension, electrical, and mechanical component physical damage;

(I) identify safety systems physical damage;

(J) identify interior component damage;

(K) identify damage to add-on accessories and modifications; and

(L) identify single/one-time use components.

(10) The student applies the technical knowledge and skills of estimating in simulated or actual work situations. The student is expected to:

(A) locate and record customer/vehicle owner information;

(B) locate and record vehicle identification number (VIN) information, including nation of origin, make, model, restraint system, body type, production date, engine type, and assembly plant;

(C) identify and record vehicle options, including trim level, paint code, accessories, and modifications;

(D) identify the safety systems;

(E) apply appropriate estimating and parts terminology;

(F) determine and apply appropriate estimating sequence;

(G) utilize estimating guide procedure pages;

(H) estimate labor time for operations;

(I) select appropriate labor rates for each operation such as structural, non-structural, mechanical, and refinish;

(J) select and price replacement parts such as original equipment manufacturer (OEM), alternative/optional OEM, aftermarket, recycled/used, remanufactured, rebuilt, and reconditioned parts;

(K) determine labor time, prices, charges, allowances, or fees for non-included operations and miscellaneous items;

(L) determine additional material and charges such as environmental, administrative, shop, and disposal fees;

(M) determine refinishing material and charges;

(N) review computer-assisted and manually written estimates and verify that the information is correct;

(O) identify labor time and material charges for restoring corrosion protection; and

(P) determine the approximate vehicle retail value compared to the repair cost.

§127.881. Paint and Refinishing (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Basic Collision Repair and Refinishing or Collision Repair. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Paint and Refinishing includes knowledge of the processes, technologies, and materials used in the reconstruction of vehicles. This course is designed to teach the concepts and theory of systems related to automotive paint and refinishing.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate awareness of workplace safety and environmental responsibilities in automotive paint and refinishing and understand the use of personal protective equipment;

(B) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of automotive paint and refinishing;

(C) demonstrate the principles of group participation and leadership related to citizenship and career preparation;

(D) identify employers' expectations and appropriate work habits;

(E) review the competencies related to resources, information systems, and technology; and

(F) apply reasoning skills to a variety of workplace situations in order to make ethical decisions.

(2) The student relates core academic skills to the requirements of paint and refinishing. The student is expected to:

(A) demonstrate effective oral and written communication skills with individuals from various cultures such as fellow workers, management, and customers;

(B) use technical writing skills to complete paint and refinishing orders and related paperwork;

(C) locate, read, and interpret documents such as service and repair information, technical bulletins, specifications, schematics, and parts catalogs; and

(D) demonstrate competencies required to use and interpret service repair bulletins.

(3) The student understands the technical knowledge and skills of paint and refinishing systems. The student is expected to:

(A) demonstrate the basic types of refinishing procedures for the different types of vehicle body construction used in the auto refinishing industry;

(B) demonstrate the proper preparation, application, and refinishing with various paint products, decals, and adhesives;

(C) estimate parts and labor costs on paint and refinishing orders; and

(D) perform precision measurements of paint and materials.

(4) The student knows the function and application of tools, equipment, technologies, and materials used in paint and refinishing services. The student is expected to:

(A) identify safety and personal health hazards according to Occupational Safety and Health Association (OSHA) guidelines and the "Right to Know Law";

(B) inspect spray environment and equipment to ensure compliance with federal, state, and local regulations and for safety and cleanliness hazards;

(C) select, use, inspect, ensure fit and operation, and perform maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation of a National Institute of Occupational of Safety and Health (NIOSH) approved air purifying respirator;

(D) select, use, and perform maintenance in accordance with OSHA Regulation 1910.134 and applicable state and local regulation for a NIOSH approved fresh air make-up respirator system;

(E) select and use the proper personal safety equipment such as gloves, suits, hoods, and eye and ear protection;

(F) use hand and power tools and equipment commonly employed in paint and refinishing technologies, according to industry safety standards;

(G) properly handle and dispose of environmentally hazardous materials used in paint and refinishing technologies; and

(H) demonstrate knowledge of new and emerging paint and refinishing technologies.

(5) The student applies the technical knowledge and skills of paint and refinishing to simulated or actual work situations. The student is expected to:

(A) perform regular audits and inspections to maintain compliance with safety, health, and environmental regulations;

(B) inspect types of vehicle construction materials and associated refinishing methods;

(C) identify different types of vehicle finishes and associated refinish techniques;

(D) inspect, identify, and determine the cause of paint and refinishing defects;

(E) discuss corrosion protection; and

(F) demonstrate vehicle detailing.

(6) The student applies the technical knowledge and skills of surface preparation to simulated or actual work situations. The student is expected to:

(A) inspect and identify type of finish, surface condition, and film thickness and develop and document a plan for refinishing;

(B) featheredge areas to be refinished;

(C) apply suitable metal treatment or primer;

(D) mask and protect other areas that will not be refinished;

(E) mix primer, primer-surfacer, or primer-sealer;

(F) identify a complimentary color or shade of undercoat to improve coverage;

(G) apply primer onto surface of repaired area;

(H) remove dust from area to be refinished, including cracks or moldings of adjacent areas;

(I) clean area to be refinished using a final cleaning solution;

(J) remove, with a tack rag, any dust or lint particles from the area to be refinished;

(K) apply suitable sealer to the area being refinished;

(L) apply stone chip resistant coating;

(M) identify the types of rigid, semi-rigid, or flexible plastic parts to be refinished and determine the materials needed and preparation and refinishing procedures; and

(N) identify metal parts to be refinished and determine the materials needed and preparation and refinishing procedures.

(7) The student applies the technical knowledge and skills of spray gun and related components to simulated or actual work situations. The student is expected to:

(A) inspect, clean, and determine condition of spray guns, spray environment, and related equipment such as air hoses, regulators, air lines, and air source;

(B) select spray gun setup, including fluid needle, nozzle, and cap, for product being applied;

(C) test and adjust spray gun using fluid, air, and pattern control valves; and

(D) demonstrate an understanding of the operation of pressure spray equipment.

(8) The student applies the technical knowledge and skills of paint mixing, matching, and applying techniques to simulated or actual work situations. The student is expected to:

(A) identify color code by manufacturer vehicle information label;

(B) measure, shake, stir, reduce, catalyze/activate, and strain refinish materials;

(C) apply finish using appropriate spray techniques, including gun arc, angle, distance, travel speed, and spray pattern overlap, for the finish being applied;

(D) apply selected product on test or let-down panel and check for color match;

(E) apply single stage topcoat;

(F) apply basecoat and clearcoat for panel blending and panel refinishing;

(G) apply basecoat and clearcoat for overall refinishing;

(H) remove nibs or imperfections from basecoat;

(I) refinish rigid or semi-rigid plastic parts;

(J) refinish flexible plastic parts;

(K) apply multi-stage coats for panel blending and overall refinishing;

(L) identify and mix paint using a formula;

(M) identify poor hiding colors and determine necessary action;

(N) tint color using formula to achieve a blendable match;

(O) identify alternative color formula to achieve a blendable match; and

(P) identify the materials, equipment, and preparation differences between petroleum and waterborne technologies.

(9) The student applies the technical knowledge and skills of final detailing to simulated or actual work situations. The student is expected to:

(A) apply decals, transfers, tapes, woodgrains, and pinstripes such as painted and taped;

(B) sand, buff, and polish fresh or existing finish to remove defects as required;

(C) clean vehicle interior, exterior, and glass;

(D) clean body openings such as door jambs and edges;

(E) remove overspray; and

(F) complete quality control using a checklist.

§127.882. Diesel Equipment Technology I (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 9-12. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Diesel Equipment Technology I includes knowledge of the function and maintenance of diesel systems. Rapid advances in diesel technology have created new career opportunities and demands in the transportation industry. This course provides the knowledge,

skills, and technologies required for employment in transportation systems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of diesel technology;

(B) participate in group and leadership activities related to citizenship and career preparation;

(C) identify employers' expectations and appropriate work habits;

(D) identify the competencies related to resources, information systems, and technology as it pertains to diesel equipment technology;

(E) demonstrate knowledge and skills related to health and safety in the workplace; and

(F) demonstrate workplace ethics in a variety of workplace scenarios.

(2) The student demonstrates academic skills related to the requirements of transportation technology. The student is expected to:

(A) demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;

(B) demonstrate effective written communication skills with individuals from various cultures such as fellow students, coworkers, and customers; and

(C) demonstrate mathematical skills and precision measurements using the metric and U.S. standard systems.

(3) The student demonstrates technical knowledge and skills of diesel equipment technology. The student is expected to:

(A) describe the function of the major components of diesel powered vehicles such as engines, fuel injection systems, lubrication, cooling, electrical, air-conditioning systems, air induction, exhaust, and emissions;

(B) describe the function of the chassis components such as braking, steering, transmission, drivetrain, suspension systems, pneumatics, and hydraulics;

(C) locate, read, and interpret documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair information and technical bulletins; and

(D) demonstrate precision measurement procedures to diagnose component wear, compare measurements to published specifications, and determine necessary repairs.

(4) The student learns the functions and applications of the tools, equipment, technologies, and materials used in diesel equipment service. The student is expected to:

(A) describe and demonstrate the safe use of hand and power tools and equipment commonly used in the diesel equipment field;

(B) discuss the proper handling and disposal of environmentally hazardous materials generated in the service of diesel equipment;

(C) describe new and emerging diesel technologies;

(D) identify and perform the use of diagnostic tools and equipment; and

(E) describe hydraulic/pneumatic properties, controls, and safety.

(5) The student applies the technical knowledge and skills of diesel equipment technology to simulated or actual work situations. The student is expected to:

(A) describe the parts management procedures such as ordering, stocking, and locating parts;

(B) demonstrate procedures for removal, inspection, and replacement of engine components;

(C) describe procedures for inspection and maintenance of ancillary systems such as braking, steering, suspension, and hydraulic/pneumatic systems;

(D) demonstrate and apply the concepts of electrical circuit testing, including Ohm's law, voltage drop, resistance, amperage, and voltage, as related to batteries and charging and starting systems;

(E) demonstrate and apply the concepts of wiring diagrams and related symbols and series and parallel circuits;

(F) discuss the proper procedures to inspect and maintain auxillary systems such as air-conditioning, heating, and accessory systems;

(G) demonstrate and apply the procedures to inspect and maintain chassis and power train systems;

(H) demonstrate and apply the procedures to inspect and maintain cooling and lubrication systems; and

(I) demonstrate an understanding of the process to perform regular audits and inspections to maintain compliance with appropriate regulations in areas such as safety, health, emissions, and environmental protection.

§127.883. Diesel Equipment Technology II (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Prerequisite: Diesel Equipment Technology I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Diesel Equipment Technology II includes knowledge of the function, diagnosis, and service of diesel equipment systems. Rapid advances in diesel technology have created new career opportunities and demands in the transportation industry. This course provides the advanced knowledge, skills, and technologies required for employment in transportation systems.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify employment opportunities, including entrepreneurship opportunities, and certification requirements for the field of diesel technology;

(B) participate in group and leadership activities related to citizenship and career preparation;

(C) identify employers' expectations and appropriate work habits;

(D) apply the competencies related to resources, information systems, and technology as it pertains to diesel equipment technology;

(E) demonstrate knowledge and skills related to health and safety in the workplace; and

(F) demonstrate workplace ethics in a variety of workplace scenarios.

(2) The student demonstrates academic skills related to the requirements of transportation technology. The student is expected to:

(A) demonstrate effective oral communication skills with individuals from various cultures such as fellow students, coworkers, and customers;

(B) demonstrate effective written communication skills with individuals from various cultures such as fellow students, coworkers, and customers; and

(C) demonstrate mathematical skills and precision measurements using the metric and U.S. standard systems.

(3) The student demonstrates technical knowledge and skills of diesel equipment service and repair. The student is expected to:

(A) describe the function of the major components of diesel powered vehicles and equipment such as engines; fuel injection systems; lubrication, cooling, electrical, and air-conditioning systems; and air induction, exhaust, and emissions systems;

(B) perform system diagnostics and failure analyses;

(C) describe the function of the chassis components such as braking, steering, transmission, drivetrain, suspension systems, pneumatics, and hydraulics;

(D) diagnose, repair, and replace auxiliary equipment such as power take offs, hydraulic components, and pneumatic components;

(E) locate, read, and interpret documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair information and technical bulletins; and

(F) perform precision measurements and use published specifications to diagnose component wear and determine necessary repair or replacement.

(4) The student demonstrates the application of the tools, equipment, technologies, and materials used in diesel equipment diagnosis, service, and repair. The student is expected to:

(A) demonstrate safe use of hand and power tools and equipment commonly employed in diesel equipment technology;

(B) demonstrate the proper handling and disposal of environmentally hazardous materials generated in the servicing of diesel equipment;

(C) describe emerging diesel technologies;

(D) perform the proper use of diagnostic tools and equipment; and

(E) demonstrate knowledge of hydraulic/pneumatic properties, controls, and safety.

(5) The student applies the technical knowledge and skills of diesel equipment technology to simulated or actual work situations. The student is expected to:

(A) demonstrate parts inventory management such as ordering parts, stocking parts, and locating parts;

(B) demonstrate procedures for the diagnosis, removal, repair, and replacement of engine components such as cylinder heads, engine blocks, timing components, crankshafts, intake and exhaust systems, and ancillary and auxiliary systems;

(C) diagnose, service, and repair diesel equipment systems such as braking, steering, suspension, pneumatic, and hydraulic systems;

(D) diagnose and repair electrical and electronic systems such as starting, charging, lighting, computer controls, and on board diagnostics systems and components such as modules, solenoids, sensors, actuators, relays, and switches;

(E) demonstrate an understanding of the diagnosis, service, and repair of air-conditioning, heating, and accessory systems;

(F) diagnose, service, and repair chassis and power train systems;

(G) service and repair cooling and lubrication systems such as water pumps, oil pumps, radiators, and oil coolers;

(H) use appropriate diagnostic equipment on various diesel equipment systems; and

(I) perform regular audits and inspections to maintain compliance with appropriate regulations in areas such as emissions, safety, health, and environmental protection.

§127.884. Energy and Power of Transportation Systems (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Transportation Systems. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Energy and Power of Transportation Systems will prepare students to meet the expectations of employers in this industry and to interact and relate to others. Students will learn the technologies used to provide products and services in a timely manner. The businesses and industries of the Transportation, Distribution, and Logistics Career Cluster are rapidly expanding to provide new career and career advancement opportunities. Performance requirements will include academic and technical skills. Students will need to understand the interaction between various vehicle systems, including engines, transmissions, brakes, fuel, cooling, and electrical. Students will also need to understand the logistics used to move goods and services to consumers, as well as the components of transportation infrastructure.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate the principles of group participation and leadership related to citizenship and career preparation;

(B) identify employers' expectations and appropriate work habits;

(C) identify career development, employment, and entrepreneurship opportunities and certification requirements for the field of energy and power of transportation systems;

(D) discuss certification requirements to meet state academic standards and qualifications for employment in selected fields of study;

(E) apply ethical reasoning to a variety of workplace scenarios in order to make ethical decisions;

(F) identify opportunities for leadership development and personal growth;

(G) describe and apply team dynamics principles in a project setting; and

(H) demonstrate effective oral and written communication skills with individuals from various cultures.

(2) The student knows the functions and applications of the tools, equipment, technologies, and materials used in the field of energy and power of transportation systems. The student is expected to:

(A) discuss the safe use of hand and power tools and equipment commonly used in the maintenance and repair of engines; and

(B) discuss the use of audits and inspections to maintain compliance with safety, health, and environmental regulations.

(3) The student applies technical knowledge and skills to simulated situations. The student is expected to:

(A) identify the major components in a vehicular system;

(B) identify necessary maintenance and service of vehicular systems; and

(C) discuss preventative maintenance plans and systems to keep vehicular systems in operation.

(4) The student describes the historical, current, and future significance of the energy and power of transportation systems. The student is expected to:

(A) identify the scope and effect upon society of the energy and power of transportation systems; and

(B) identify potential future scenarios for the energy and power of transportation systems.

(5) The student uses academic skills to document the requirements of the energy and power of transportation systems. The student is expected to:

(A) demonstrate communication skills related to working with customers, technicians, and others;

(B) prepare documentation such as quotes, invoices, bills of lading, work orders, and other reports;

(C) read and interpret appropriate documents such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair manuals and bulletins;

(D) perform precision measurements and use industry specifications to diagnose component shape and alignment issues and determine necessary repair;

(E) use critical-thinking skills to diagnose vehicular system malfunctions, solve problems, and make decisions; and

(F) demonstrate knowledge of regulations that govern the construction, maintenance, and service of energy and power of transportation systems.

§127.885. Management of Transportation Systems (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 2 course and is recommended for students in Grades 10-12. Recommended prereq-

uisite: Principles of Transportation Systems. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) In Management of Transportation Systems, students will gain knowledge and skills in material handling and distribution and proper application, design, and production of technology as it relates to the transportation industries. This course includes the safe operation of tractor-trailers, forklifts, and related heavy equipment. This course will allow students to reinforce, apply, and transfer their academic knowledge and skills to management of transportation systems and associated careers.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) adhere to policies and procedures;

(B) demonstrate positive work behaviors and attitudes, including punctuality, time management, initiative, and cooperation;

(C) accept constructive criticism;

(D) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(E) complete tasks with the highest standards to ensure quality products and services;

(F) model professional appearance, including dress, grooming, and personal protective equipment as appropriate; and

(G) comply with safety rules and regulations to maintain safe and healthy working conditions and environments.

(2) The student demonstrates an understanding of the transportation systems. The student is expected to:

(A) explain the history and development of the U.S. transportation systems such as railroads, highways, airports, water systems, and intermodal vans;

(B) examine logistics systems used for the transportation of products and services;

(C) define practices and terms commonly used in international sales contracts as published by the International Chamber of Commerce;

(D) summarize laws and regulations concerning interstate and international trade;

(E) explain the role of homeland security in interstate and international trade;

(F) evaluate risk factors and social and economic trends such as factors and trends related to risk mitigation, policy issues, security, and culture;

(G) evaluate documentation and other requirements for interstate and international transportation and logistics;

(H) describe transportation issues such as internal processing, product and supply storage, forecasting, scheduling, cost analysis, documentation confirmation, packing lists, materials safety data sheets, product seals, packaging types, packaging labels, and routing issues;

(I) identify employer's expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(J) demonstrate computer skills related to transportation and materials handling.

(3) The student demonstrates an understanding of the U.S. Department of Transportation, Environmental Protection Agency, and Occupational Safety and Health Administration hazardous materials regulations. The student is expected to:

(A) discuss U.S. Department of Transportation regulations, including procedures or policies, material designations, packaging requirements, and operational rules;

(B) explain U.S. Department of Transportation, Environmental Protection Agency, and Occupational Safety and Health Administration compliance requirements concerning hazardous materials, hazardous waste operations, medical surveillance, personnel training, adequate ventilation, confined space hazards, and emergency preparedness and response;

(C) examine personal protective equipment;

(D) compare specifications for accident prevention signs and tags, retention of U.S. Department of Transportation markings, and placards and labels for toxic and hazardous materials;

(E) research handling and storage requirements for liquid fuels, liquid petroleum gas, carbon monoxide, and toxic and hazardous substances;

(F) examine emergency action plans, employee training requirements, evacuation procedure requirements, and facility and equipment safety standards;

(G) explain fire prevention resources, including portable fire extinguishers, fire management systems, employee alarm systems, and hazard communication; and

(H) examine fire prevention plans and documentation.

(4) The student demonstrates an understanding of tractor-trailer knowledge and skills. The student is expected to:

(A) read and interpret control systems;

(B) perform vehicle inspections and maintenance such as checking vehicle systems and components, diagnosing potential problems, and developing malfunction reports and maintenance schedules and reports;

(C) perform visual search and inspection of a tractor-trailer;

(D) demonstrate operation of tractor-trailer controls such as shifting, backing, docking, coupling and uncoupling, and adjusting vehicle speed and conduct break-down procedures;

(E) explain the management and adjustment of vehicle speed and space relations;

(F) identify potential driving hazards and environmental conditions;

(G) examine emergency maneuvers, procedures, and accident reports; and

(H) discuss appropriate decision-making procedures for planning trips.

(5) The student demonstrates an understanding of forklift knowledge and skills. The student is expected to:

(A) explain Occupational Safety and Health Administration forklift safety standards, including equipment operation, battery maintenance, liquid propane tank maintenance, lift truck stability, load weight limits, seat belt requirements, overhead guards, tip over prevention, and ride-out procedures;

(B) perform visual inspection of forklifts and their operating environment;

(C) discuss proper start-up, shut-down, and traveling procedures;

(D) perform maintenance inspections and documentation procedures;

(E) discuss forklift attachments; and

(F) evaluate proper lifting, carrying, load stability, and stacking procedures for loading trailers, boxcars, and containers.

(6) The student demonstrates an understanding of heavy equipment knowledge and skills. The student is expected to:

(A) explain safety issues pertaining to heavy equipment operation;

(B) discuss principles and maintenance of heavy equipment components, including cooling systems, fuel systems, lubrication systems, electrical systems, air systems, power systems, braking systems, pneumatic systems, hydraulic systems, operator ergonomics systems, tires, tracks, and track frames;

(C) observe the operation of heavy equipment such as bull dozers, crawler tractors, backhoes, excavators, track hoes, graders, scrapers, skid steer loaders, mini excavators, dump trucks, trenchers, cranes, hoists, soil compactors, land planes, landscaping equipment, and quarry equipment;

(D) discuss safe transportation of heavy equipment; and

(E) discuss equipment theft prevention procedures.

§127.886. Distribution and Logistics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 3 course and is recommended for students in Grades 11 and 12. Recommended prerequisite: Principles of Distribution and Logistics. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Distribution and Logistics is designed to provide training for entry-level employment in distribution and logistics, This course focuses on the business planning and management aspects of distribution and logistics. To prepare for success, students will learn, reinforce, experience, apply, and transfer their knowledge and skills related to distribution and logistics.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities in distribution and logistics;

(B) identify careers in distribution and logistics;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in distribution and logistics;

(D) investigate certifications required to meet state requirements for selected fields;

(E) demonstrate knowledge of personal and occupational safety, health, and first-aid policy in the workplace;

(F) develop response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) develop personal career goals, objectives, and strategies as part of a plan for future career and educational opportunities.

(2) The student identifies concepts related to cultural diversity. The student is expected to:

(A) identify similarities and differences in international cultures;

(B) explain the variety of world markets; and

(C) describe marketing factors and practices that impact other cultures.

(3) The student describes the historical, current, and future significance of the distribution and logistics industries. The student is expected to:

(A) define terms associated with the distribution and logistics industries;

(B) identify the scope of the distribution and logistics industries and the industries' effect on society;

(C) identify significant historical and current issues in the distribution and logistics industries;

(D) identify potential future scenarios for the distribution and logistics industries;

(E) describe how emerging technology and globalization impacts the distribution and logistics industries; and

(F) compare and contrast issues affecting the distribution and logistics industries such as international trade, employment, safety, and environmental issues.

(4) The student explains the distribution and logistics industries at local, state, national, and international levels. The student is expected to:

(A) identify reasons for world trade and globalization;

(B) identify the political impact of distribution and logistics;

(C) review regulations and major laws to evaluate their impact on the distribution and logistics industries;

(D) read appropriate written material to stay abreast of current issues;

(E) use critical-thinking skills to identify and organize alternatives and evaluate public policy issues; and

(F) evaluate performance and contract compliance of contractors and service providers.

(5) The student demonstrates appropriate personal and communication skills. The student is expected to:

(A) describe and apply workplace ethical and legal responsibilities;

(B) define the uses of proper etiquette and behavior;

(C) identify appropriate personal appearance and health habits;

(D) practice written and oral communication skills and employ effective listening skills;

(E) comprehend technical reading materials common to the distribution and logistics industries;

(F) employ sound writing and preparation skills for prepared and extemporaneous oral presentations, including presentations of technical information; and

(G) demonstrate speaking skills.

(6) The student applies appropriate research methods for distribution and logistics topics. The student is expected to:

(A) define major fields of research and development;

(B) demonstrate proficiency in using a variety of resources for both research and development; and

(C) describe the scientific method of research.

(7) The student applies problem-solving, mathematical, and organizational skills to maintain financial and logistical records. The student is expected to:

(A) discuss project proposals;

(B) develop and maintain records;

(C) collect and organize data in graphs, tables, charts, and plots;

(D) analyze and interpret data from graphs, tables, charts, and plots;

(E) maintain appropriate financial records such as journals, inventories, income and expense logs, and financial statements and balance sheets;

(F) conduct formative, summative, and financial analyses of project learning objectives and records in order to problem-solve for the future;

(G) review commercial driver license (CDL) preparation guidelines; and

(H) explain CDL guidelines in preparation for testing.

(8) The student uses information technology tools to access, manage, and create information. The student is expected to:

(A) use personal management software, email applications, and Internet applications;

(B) use word-processing, database, spreadsheet, and presentation software;

(C) use collaborative or virtual meeting software;

(D) use and explain the benefits of Geographic Information Systems (GIS) and Global Positioning Systems (GPS) hardware and applications;

(E) use computer-based equipment to manage human resources and physical assets;

(F) use technology applications such as barcode systems to identify and track goods and shipments; and

(G) use mobile applications such as GPS to track goods and shipments.

(9) The student uses data to optimize distribution and logistics business operations such as storage, distribution routes, equipment, and human resources. The student is expected to:

(A) use data to identify areas of operation that need improvement to optimize business operations;

(B) identify alternative processes and procedures to improve and optimize business operations; and

(C) make data-based decisions on optimizing storage space and distribution routes.

(10) The student assesses and implements methods to reduce sources of workplace hazards common in the industry in order to promote a safe and accident-free work environment. The student is expected to:

(A) identify, assess, and control hazards to maintain safe and healthy working conditions;

(B) state the role and summarize the benefits of each component in a health, safety, and environmental management system;

(C) demonstrate emergency procedures to reduce and mitigate workplace accidents;

(D) perform tool, equipment, facility, and personal protective equipment audits and inspections;

(E) identify rules and laws designed to promote safety and health in the workplace; and

(F) demonstrate knowledge of first aid and cardiopulmonary resuscitation procedures and proper use of safety equipment.

(11) The student examines the planning, preparation, processing, handling, and storing of goods and materials in warehouses and distribution centers. The student is expected to:

(A) determine risks or damage from normal rigors such as compression, shock, drop, moisture, corrosion, vibration, temperature, and motion during transportation and handling;

(B) discuss the transporting and handling of hazardous materials;

(C) explain size, weight, and shape requirements for packaging;

(D) discuss handling, storage, and shipping methods for various types of packaging and warehouse and shipping providers;

(E) assess requirements for various packaging types;

(F) analyze visual design and appearance requirements, including displaying required documentation, handling information, and warnings;

(G) create layout plans for processing incoming and outgoing, cross-docking, and storage of products;

(H) evaluate material handling and storage equipment;

(I) assess the processing of incoming goods and materials using standard industry protocols and procedures; and

(J) examine equipment and staffing requirements and develop traffic management plans and work schedules.

(12) The student reviews issues related to interstate and international trade. The student is expected to:

(A) define terms commonly used in sales contracts as published by the International Chamber of Commerce;

(B) summarize laws and regulations concerning interstate and international trade;

(C) explain the role of homeland security in interstate and international trade;

(D) evaluate risk factors and social and economic trends such as factors and trends related to risk mitigation, policy change, security, and culture;

(E) evaluate documentation and other requirements for interstate and international transportation and logistics; and

(F) describe transportation issues such as internal processing, product and supply storage, forecasting, scheduling, cost analysis, documentation confirmation, packing lists, material safety data sheets, product seals, packaging types, packaging labels, and routing issues.

§127.921. Practicum in Transportation Systems (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Transportation, Distribution, and Logistics Career Cluster. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Practicum in Transportation Systems is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as internships, mentorships, independent study, or laboratories. The Practicum can be either school lab based or worked based.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as related by business and industry. The student is expected to:

(A) identify career development and entrepreneurship opportunities related to transportation systems;

(B) identify careers in transportation systems;

(C) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation within transportation;

(D) discuss certification opportunities;

(E) demonstrate knowledge of personal and occupational health and safety;

(F) discuss response plans to emergency situations;

(G) identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and

(H) explore career goals, objectives, and strategies as part of a plan for future career opportunities.

(2) The student demonstrates professional standards as required by business and industry. The student is expected to:

(A) adhere to policies and procedures;

(B) demonstrate positive work attitudes and behaviors, including demonstrating punctuality, time management, initiative, and cooperation;

(C) accept constructive criticism;

(D) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(E) complete tasks with the highest standards to ensure quality products and services;

(F) model professional appearance, including using appropriate dress, grooming, and personal protective equipment; and

(G) comply with safety rules and regulations to maintain safe and healthy working conditions and environments in the practicum setting.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem to develop creative and innovative solutions;

(B) critically analyze information to determine its relevance to the problem-solving task;

(C) compare and contrast alternatives using a variety of problem-solving and critical-thinking skills; and

(D) conduct technical research to gather information necessary for decision making.

(4) The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:

(A) analyze leadership characteristics related to trusting others, maintaining a positive attitude and integrity, and accepting key responsibilities in a work situation;

(B) demonstrate teamwork skills through working cooperatively with others to achieve tasks;

(C) demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate responsibility for group and individual work tasks;

(E) establish and maintain effective working relationships in order to accomplish objectives and tasks;

(F) demonstrate effective working relationships using interpersonal skills;

(G) use positive interpersonal skills to work cooperatively with others;

(H) negotiate effectively to arrive at decisions;

(I) demonstrate respect for individuals, including those from different cultures, genders, and backgrounds; and

(J) demonstrate sensitivity to and value for diversity.

(5) The student demonstrates oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions;

(B) employ verbal skills when obtaining and conveying information;

(C) use informational texts, Internet websites, and technical materials to review and apply information sources for occupational tasks;

(D) evaluate the reliability of information from informational texts, Internet websites, and technical materials and resources;

(E) interpret verbal and nonverbal cues or behaviors to enhance communication;

(F) apply active listening skills to obtain and clarify information; and

(G) use academic skills to facilitate effective written and oral communication.

(6) The student demonstrates technical knowledge and skills required to pursue a career in the transportation systems. The student is expected to:

(A) develop advanced technical knowledge and skills related to the student's personal career goals;

(B) evaluate technical skill proficiencies; and

(C) accept critical feedback provided by the supervisor.

(7) The student documents technical knowledge and skills. The student is expected to:

(A) update a professional portfolio to include information such as:

(i) attainment of technical skill competencies, licensures or certifications, recognitions, awards, and scholarships;

(ii) extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;

(iii) abstract of technical competencies mastered during the practicum;

(iv) resume;

(v) samples of work; and

(vi) evaluation from the practicum supervisor; and

(B) present the portfolio to interested stakeholders.

§127.922. Extended Practicum in Transportation Systems (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Transportation, Distribution, and Logistics Career Cluster. Corequisite: Practicum in Transportation Systems. This course must be taken concurrently with Practicum in Transportation Systems and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant

technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Extended Practicum in Transportation Systems is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as internships, mentorships, independent study, or laboratories. Extended Practicum in Transportation Systems can be either school lab based or worked based.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to transportation systems;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications with increased fluency;

(E) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(F) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(D) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) understand and consistently follow workplace safety rules and regulations, including Occupational Safety and Health Administration regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in transportation systems. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a transportation systems experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised transportation systems experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate growth of technical skill competencies;

(D) evaluate strengths and weaknesses in technical skill proficiency; and

(E) collect representative work samples.

§127.923. Practicum in Distribution and Logistics (Two Credits), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the distribution and logistics industry. Students shall be awarded two credits for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant

technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Practicum in Distribution and Logistics is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as internships, mentorships, independent study, or laboratories. The Practicum can be either school lab based or work based.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) adhere to policies and procedures;

(B) demonstrate positive work attitudes and behaviors, including punctuality, time management, initiative, and cooperation;

(C) accept constructive criticism;

(D) apply ethical reasoning to a variety of situations in order to make ethical decisions;

(E) complete tasks with the highest standards to ensure quality products and services;

(F) model professional appearance, including using appropriate dress, grooming, and personal protective equipment; and

(G) comply with safety rules and regulations to maintain safe and healthy working conditions and environments in the practicum setting.

(2) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) analyze elements of a problem to develop creative and innovative solutions;

(B) critically analyze information to determine its relevance to the problem-solving task;

(C) compare and contrast alternatives using a variety of problem-solving and critical-thinking skills; and

(D) conduct technical research to gather information necessary for decision making.

(3) The student demonstrates leadership and teamwork skills in collaborating with others to accomplish goals and objectives. The student is expected to:

(A) analyze leadership characteristics related to trusting others, maintaining a positive attitude and integrity, and accepting key responsibilities in a work situation;

(B) demonstrate teamwork skills through working cooperatively with others to achieve tasks;

(C) demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution;

(D) demonstrate responsibility for group and individual work tasks;

(E) establish and maintain effective working relationships in order to accomplish objectives and tasks;

(F) demonstrate effective working relationships using interpersonal skills;

(G) use positive interpersonal skills to work cooperatively with others;

(H) negotiate effectively to arrive at decisions;

(I) demonstrate respect for individuals, including those from different cultures, genders, and backgrounds; and

(J) demonstrate sensitivity to and value for diversity.

(4) The student demonstrates oral and written communication skills in creating, expressing, and interpreting information and ideas, including technical terminology and information. The student is expected to:

(A) demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions;

(B) employ verbal skills when obtaining and conveying information;

(C) use informational texts, Internet websites, and technical materials to review and apply information sources for occupational tasks;

(D) evaluate the reliability of information from informational texts, Internet websites, and technical materials and resources;

(E) interpret verbal and nonverbal cues or behaviors to enhance communication;

(F) apply active listening skills to obtain and clarify information; and

(G) use academic skills to facilitate effective written and oral communication.

(5) The student demonstrates technical knowledge and skills required to pursue a career in the distribution and logistics industries. The student is expected to:

(A) develop advanced technical knowledge and skills related to the student's personal career goals;

(B) evaluate technical skill proficiencies; and

(C) accept critical feedback provided by the supervisor.

(6) The student documents technical knowledge and skills. The student is expected to:

(A) update a professional portfolio to include information such as:

(i) attainment of technical skill competencies, licensures or certifications, recognitions, awards, and scholarships;

(ii) extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;

(iii) abstract of technical competencies mastered during the practicum;

(iv) resume;

(v) samples of work; and

(vi) evaluation from the practicum supervisor; and

(B) present the portfolio to interested stakeholders.

§127.924. Extended Practicum in Distribution and Logistics (One Credit), Adopted 2015.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2017-2018 school year.

(b) General requirements. This course is a Level 4 course and is recommended for students in Grades 11 and 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Transportation, Distribution, and Logistics Career Cluster. Corequisite: Practicum in Distribution and Logistics. This course must be taken concurrently with Practicum in Distribution and Logistics and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

(3) Extended Practicum in Distribution and Logistics is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience such as internships, mentorships, independent study, or laboratories. Extended Practicum in Distribution and Logistics can be either school lab based or work based.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) participate in a paid or unpaid, laboratory- or work-based application of previously studied knowledge and skills related to distribution and logistics;

(B) participate in training, education, or preparation for licensure, certification, or other relevant credentials to prepare for employment;

(C) demonstrate professional standards and personal qualities needed to be employable such as self-discipline, positive attitude, integrity, leadership, appreciation for diversity, customer service, work ethic, and adaptability with increased fluency;

(D) use personal information management, email, Internet, writing and publishing, presentation, and spreadsheet or database applications with increased fluency;

(E) complete tasks with the highest standards to ensure quality products and services;

(F) employ teamwork and conflict-management skills with increased fluency to achieve collective goals; and

(G) employ planning and time-management skills and tools with increased fluency to enhance results and complete work tasks.

(2) The student implements advanced professional communications strategies. The student is expected to:

(A) demonstrate verbal and non-verbal communication consistently in a clear, concise, and effective manner;

(B) analyze, interpret, and effectively communicate information, data, and observations;

(C) observe and interpret verbal and nonverbal cues and behaviors to enhance communication; and

(D) apply active listening skills to obtain and clarify information.

(3) The student applies concepts of critical thinking and problem solving. The student is expected to:

(A) employ critical-thinking skills with increased fluency both independently and in groups to solve problems and make decisions;

(B) analyze elements of a problem to develop creative and innovative solutions; and

(C) demonstrate the use of content, technical concepts, and vocabulary when analyzing information and following directions.

(4) The student understands and applies proper safety techniques in the workplace. The student is expected to:

(A) understand and consistently follow workplace safety rules and regulations, including Occupational Safety and Health Administration regulations; and

(B) demonstrate knowledge of procedures for reporting and handling accidents and safety incidents.

(5) The student understands the professional, ethical, and legal responsibilities in distribution and logistics systems. The student is expected to:

(A) demonstrate a positive, productive work ethic by performing assigned tasks as directed;

(B) apply ethical reasoning to a variety of situations in order to make ethical decisions; and

(C) comply with all applicable rules, laws, and regulations in a consistent manner.

(6) The student participates in a distribution and logistics experience. The student is expected to:

(A) conduct, document, and evaluate learning activities in a supervised distribution and logistics experience;

(B) develop advanced technical knowledge and skills related to the student's occupational objective;

(C) demonstrate growth of technical skill competencies;

(D) evaluate strengths and weaknesses in technical skill proficiency; and

(E) collect representative work samples.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500581
Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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CHAPTER 127. TEXAS ESSENTIAL KNOWLEDGE AND SKILLS FOR CAREER DEVELOPMENT AND CAREER AND TECHNICAL EDUCATION

SUBCHAPTER I. ENGINEERING

19 TAC §§127.402 - 127.419, 127.452, 127.453

The State Board of Education (SBOE) proposes new §§127.402 - 127.419, 127.452, and 127.453, concerning Texas Essential Knowledge and Skills (TEKS) for engineering. The proposed new sections would add new courses and update existing courses that are being moved to Chapter 127, Subchapter I, in the civil engineering, engineering foundations, and mechanical and aerospace design programs of study to ensure the content of the courses remains current and supports relevant and meaningful programs of study.

BACKGROUND INFORMATION AND JUSTIFICATION: In accordance with statutory requirements that the SBOE identify by rule the essential knowledge and skills of each subject in the required curriculum, the SBOE follows a board-approved cycle to review and revise the essential knowledge and skills for each subject.

During the November 2022 meeting, the SBOE approved a timeline for the review of career and technical education (CTE) courses for 2022-2025. Also at the meeting, the SBOE approved a specific process to be used in the review and revision of the CTE TEKS. The CTE-specific process largely follows the process for TEKS review for other subject areas but was adjusted to account for differences specific to CTE. The 2022-2025 CTE cycle identified two reviews, beginning with the winter 2023 review of a small group of courses in career preparation and entrepreneurship. An abbreviated version of the new CTE TEKS review process was used for the winter 2023 review. The second review in the 2022-2025 CTE TEKS review cycle began in summer 2023. The complete CTE TEKS review process was used for the summer 2023 CTE TEKS review.

Texas Education Agency (TEA) staff began a CTE TEKS review process for engineering in December 2023. Applications to serve on the engineering 2024 CTE TEKS review work groups were collected by TEA from December 2023 through April 2024. TEA staff provided SBOE members with batches of applications for approval to serve on a CTE work group in February, March, and April 2024. Work groups convened to develop recommendations for the CTE courses in May, June, July, and August 2024. Additionally, work groups met for a final time in December 2024 to address feedback from the SBOE and to finalize their recommendations for the new standards. The proposal would ensure the standards for engineering support relevant and meaningful programs of study.

The SBOE approved the proposed new rules for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect (2025-2029), there are no fiscal implications to the state. However, in fiscal year 2024 there was a cost to the state of approximately $100,000 to convene work group members who traveled to Austin to draft recommendations for the CTE TEKS in engineering. In addition, there will be implications for TEA if the state develops professional development to help teachers and administrators understand the revised TEKS. Any professional development that is created would be based on whether TEA received an appropriation for professional development in the next biennium.

There may be fiscal implications for school districts and charter schools to implement the proposed new TEKS, which may include the need for professional development and revisions to district-developed databases, curriculum, and scope and sequence documents. Since curriculum and instruction decisions are made at the local district level, it is difficult to estimate the fiscal impact on any given district.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: TEA staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would create new regulations by adding new CTE TEKS required to be taught by school districts and charter schools offering the courses.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not expand, limit, or repeal an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to better align the TEKS and add additional course options for students to support relevant and meaningful programs of study. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

STATUTORY AUTHORITY. The new sections are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments; TEC, §28.002(j), which allows the SBOE to require by rule laboratory instruction in secondary science courses and require a specific amount or percentage of time in a secondary science course that must be laboratory instruction; TEC, §28.025(a),which requires the SBOE to determine by rule the curriculum requirements for the foundation high school graduation program that are consistent with the required curriculum under the TEC, §28.002; and TEC, §28.025(b-2)(2), which requires the SBOE to allow a student by rule to comply with the curriculum requirements for the third and fourth mathematics credits under TEC, §28.025(b-1)(2), or the third and fourth science credits under TEC, §28.025(b-1)(3), by successfully completing a career and technical education (CTE) course designated by the SBOE as containing substantially similar and rigorous content.

CROSS REFERENCE TO STATUTE. The new sections implement Texas Education Code, §§7.102(c)(4); 28.002(a), (c), and (j); and 28.025(a) and (b-2)(2).

§127.402. Engineering Design Process (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 9 and 10. Prerequisite: Algebra I. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Engineering Design Process is an engineering course applicable to all engineering fields. Students use an iterative engineering design process to solve problems, make decisions, and manage a project. Professional practices are addressed, including development of a problem statement, maintenance of documentation, use of an engineering notebook, research, project management, internal and external communication, and creation of technical drawings and prototypes. The student delivers a professional presentation detailing the experience of working through each step of the engineering design process.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;

(D) identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities and how these practices optimize efficiency and results;

(E) define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;

(F) identify and discuss the importance of professionalism, standards of conduct, and ethics as defined by the Texas Engineering Practice Act and rules concerning the practice of engineering and surveying;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and

(K) describe the roles and responsibilities of managers.

(2) The student understands there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:

(A) explain the importance of defining an engineering problem as an initial step in the engineering design process;

(B) describe the research stage of the engineering design process;

(C) define and discuss the roles of ideation and conceptualization in innovation and problem solving;

(D) explain the criteria for selecting an idea or concept for detailed prototype design, development, and testing;

(E) explain the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;

(F) describe the relevance of experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;

(G) explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and

(H) explain the purpose of effective communication throughout the entirety of the engineering design process to various audiences.

(3) The student explores and develops skills to solve problems, make decisions, and manage a project. The student is expected to:

(A) discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;

(B) identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;

(C) define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;

(D) identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and

(E) identify strategies to solve problems and describe how problem solving is utilized to accomplish personal and team objectives.

(4) The student understands the foundations of occupational safety and health. The student is expected to:

(A) explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;

(B) explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;

(C) identify and explain the appropriate use of types of personal protective equipment used in industry;

(D) demonstrate safe practices for preventing or reducing slips, trips, and falls in the workplace;

(E) describe types of risks of and control methods to prevent electrical hazards in the workplace; and

(F) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace.

(5) The student understands the value of maintaining documentation using an engineering notebook. The student is expected to:

(A) explain the purpose and legal value of maintaining an engineering notebook as intellectual property;

(B) describe the proper implementation of an engineering notebook, including notebook type, documentation, signatures, adding external materials, sealing, and dating;

(C) create and maintain an engineering notebook by recording ideas, notes, decisions, findings, deficiencies, and corrections throughout the entire design process; and

(D) communicate progress during the engineering design process at regular intervals using various methods such as written reports, informal presentations, and formal presentations.

(6) The student understands how to conduct research in the engineering design process. The student is expected to:

(A) describe the advantages and disadvantages of emerging technologies and practices in the research process;

(B) explain the importance of identifying and synthesizing information from a variety of sources in the research process;

(C) explain the ethical acquisition and use of digital information;

(D) demonstrate use and citation of source material ethically and appropriately;

(E) define and discuss intellectual property laws such as patent, copyright, and trade secret law and their role in protecting proprietary information in the research process; and

(F) identify limitations in information and research such as outdated, conflicting, proprietary, or limited access.

(7) The student understands the process of creating and refining a problem statement in the engineering design process. The student is expected to:

(A) explain the essential components of a problem statement such as who the problem affects, when it is a problem, where the problem happens, and the magnitude of the problem;

(B) describe different methods for creating and refining a problem statement such as questioning, observation, and client needs;

(C) create a problem statement that is concise, specific, and measurable;

(D) collect, analyze, and interpret information relevant to a problem statement;

(E) modify a problem statement based on information acquired from using processes or various analysis tools such as fishbone charts, root-cause analysis, 80-20 rule, heat maps, survey results, and end-user input;

(F) explain the purpose of a technical document such as a design brief or design basis that compiles the objectives, constraints, data, alternatives, and design solutions in the engineering design process; and

(G) compile a technical document that includes a problem statement, constraints, resources, budget, timeline, deliverables, and solution criteria such as quality, risk, and extent to which problem is solved.

(8) The student understands the importance of conceptualizing a solution in the engineering design process. The student is expected to:

(A) discuss the importance of creativity in engineering, innovation, and problem solving;

(B) explain and use various techniques for idea generation such as brainstorming, mapping, storyboarding, sketching, questioning, reverse engineering, and natural solutions to create solution concepts;

(C) explain the similarities and differences between designing a solution in the classroom versus designing a solution in the real world;

(D) analyze and evaluate solutions using the established criteria;

(E) explain the importance of capturing client feedback to refine solution concepts; and

(F) explain and use various techniques for gathering end-user input such as focus groups, interviews, and surveys to refine solution concepts.

(9) The student creates technical drawings in the engineering design process. The student is expected to:

(A) explain the role of freehand sketching, freehand modeling, technical drawing, and technical modeling in the development of a prototype or solution;

(B) create nontechnical representations such as sketches, drawings, or models of a solution with relevant annotations;

(C) develop a technical model of the solution using a nontechnical representation of a solution; and

(D) create technical drawings, including single-view projections, multi-view projections, and orthographic views, using industry standards.

(10) The student creates prototypes in the engineering design process. The student is expected to:

(A) identify different types of prototypes and explain the role of a prototype in the development of a solution;

(B) identify and describe the steps needed to produce a prototype;

(C) identify and use appropriate tools, equipment, machines, and materials to produce a prototype; and

(D) present a prototype using presentation software.

(11) The student tests and evaluates a prototype or solution using experiments, data, and end-user feedback. The student is expected to:

(A) explain the purpose of conducting tests on a prototype or solution;

(B) design appropriate protocols for testing a prototype or solution;

(C) analyze, evaluate, and critique a prototype or solution by using observational testing, experimental testing, empirical evidence, and statistical analysis;

(D) collect end-user feedback using appropriate protocols such as focus groups, interviews, and surveys to evaluate a prototype or solution; and

(E) identify the successes and failures of a prototype or solution based on the criteria established in the testing protocols and technical document to determine next steps in the engineering design process.

(12) The student understands the iterative nature of the engineering design process to develop a solution. The student is expected to:

(A) analyze design flaws of a prototype or solution using various tools such as fishbone charts, root-cause analysis, 80-20 rule, heat maps, survey results, and end-user feedback;

(B) iterate steps of the design process, as necessary, to improve and optimize a solution; and

(C) evaluate the potential impact of a solution on the original problem identified during the design process.

(13) The student prepares and delivers a professional presentation detailing the experience of working through each step of the engineering design process to create a viable solution. The student is expected to:

(A) prepare and deliver a presentation detailing the experience of working through each step of the engineering design process to create a viable solution;

(B) solicit and evaluate feedback on implementation of the design process and the presentation; and

(C) present learning experiences such as essential skills gained, areas of personal growth, and challenges encountered throughout the design process.

§127.403. Programming for Engineers (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. Prerequisite: Algebra I and Principles of Applied Engineering, Physics for Engineering, Introduction to Computer-Aided Design and Drafting, or Introduction to Engineering Design. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Programming for Engineers focus on understanding, writing, evaluating, and troubleshooting code to solve engineering problems. Students use the engineering process and computational thinking to write computer programs for real-world solutions. Students explore autonomous systems, sensors, and careers to integrate computational thinking within their engineering mindset. Students spend at least 40% of the instructional time completing hands-on, real-world projects.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Computational thinking--foundations. The student explores the core concepts of computational thinking related to engineering solutions, a set of problem-solving processes that involve decomposition, pattern recognition, abstraction, and algorithms. The student is expected to:

(A) decompose real-world engineering problems into structured parts by using visual representation;

(B) analyze and use industry-specific symbols, patterns, and sequences found in visual representations such as flow-charts, pseudocode, concept maps, or other representations of data;

(C) define and practice abstraction in the context of writing a program to solve an engineering problem;

(D) design a plan using visual representation to document a problem, possible solutions, and an expected timeline for the development of a coded engineering solution;

(E) analyze different techniques used in debugging and apply them to an algorithm;

(F) analyze the benefits of using iteration such as code and sequence repetition in algorithms, including loops and functions;

(G) define and analyze Boolean expressions;

(H) define and analyze conditional statements;

(I) write code that uses conditional statements such as (if), (then), (while), and (else);

(J) compare the differences between scripting and programming languages such as interpretation versus compiling; and

(K) identify and demonstrate when to use a compiler and editor for programming design.

(5) Computational thinking--applications. The student applies the fundamentals of programming within the context of engineering. The student is expected to:

(A) analyze how programming parallels iterative design within the engineering design process such as problem solving and critical thinking illustrated in an engineering notebook;

(B) modify previously written code and implement the modified code to develop improved programs;

(C) solve an engineering problem by creating block-based or text-based programs that include sequences, functions, loops, conditionals, and events;

(D) identify and label variables that relate to a program or algorithm;

(E) manipulate and rename variables and describe different data types;

(F) write comments while coding programs for engineering solutions to enhance readability and functionality such as descriptive identifiers, internal comments, white space, spacing, punctuation, indentation, and standardized programming style;

(G) write code that uses comparison operators such as greater than, less than, equal to, and modulus to perform mathematical computations;

(H) write code that uses strings to sort different data types such as Boolean operators, floats, and integers; and

(I) perform user testing on code to assess and improve a program.

(6) The student understands physical computing systems to integrate input and output functions in engineering concepts. The student is expected to:

(A) write programming to process data and control physical devices for efficient and optimized solutions;

(B) apply coding to demonstrate the correct operation of the output device such as motors, video displays, speakers, rapid prototype machines, and lights;

(C) apply coding to demonstrate the correct operation of the input device such as buttons, sensors, and switches;

(D) apply critical problem-solving skills to troubleshoot any errors and miscommunication such as wiring, code, and physical hardware;

(E) apply basic circuit theory as it pertains to ground and power systems for diagramming input and output devices and use tools such as a multimeters, microcontrollers, sensors, and LEDs; and

(F) use script writing to develop engineering solutions such as automatic data collecting, data analysis, programmable logic controllers, power system programming, robotics, and scripting for commercial engineering related software.

(7) The student understands the roles of sensors and programming sensors in engineering. The student is expected to:

(A) describe how sensors were used in the past and are used currently in real-world engineered products, including innovative applications for sensors;

(B) identify the proper input sensors to measure light, distance, sound, and color such as photoresistors, thermistors, sonar, switches, and buttons;

(C) identify the specifications of sensors and other input devices used in engineering problems, including units of measurement, upper limits, lower limits, and errors;

(D) select the proper sensor and defend the choice in developing a solution to an engineering problem;

(E) write code that will control sensors and accurately collect relevant information pertaining to the function of sensors;

(F) debug, asses, and test code to evaluate and improve sensor performance; and

(G) document the steps of sensor integration in an engineering notebook using flowcharts or technical drawings.

(8) The student understands how automation plays a role in engineering and manufacturing. The student is excepted to:

(A) research and explain how automated machines are used in engineering and manufacturing;

(B) research and explain different job roles and required level of education in the field of automation;

(C) compare the roles of engineers, technicians, and technologists in automation;

(D) describe the role of safety and ethics related to the use of automation within engineering; and

(E) convert a manual mechanical system to an automated system using code and hardware.

(9) The student uses appropriate tools and demonstrates safe work habits. The student is expected to:

(A) demonstrate lab safety as prescribed by the instructor in compliance with local, state, and federal regulations;

(B) recognize the classification of hazardous materials and wastes;

(C) dispose of hazardous materials and wastes appropriately;

(D) describe the implications of negligent or improper maintenance of tools in engineering solutions;

(E) demonstrate the use of precision measuring instruments;

(F) analyze a circuit design and identify specific areas where quality, reliability, and safety features can be implemented; and

(G) identify governmental and organizational regulations for health and safety in the workplace related to electronics.

§127.404. Engineering Design and Presentation I (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I and at least one credit in a course from the Engineering Career Cluster. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Engineering Design and Presentation I demonstrate knowledge and skills of the design process as it applies to engineering fields and project management using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Through implementation of the design process, students transfer advanced academic skills to component designs. Additionally, students explore career opportunities in engineering, technology, and drafting and learn what is required to gain and maintain employment in these areas.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student understands the value of maintaining documentation using an engineering notebook. The student is expected to:

(A) explain the legal value of maintaining an engineering notebook as intellectual property;

(B) describe the proper implementation of an engineering notebook, including notebook type, documentation, signatures, adding external materials, sealing, and dating; and

(C) create and maintain an engineering notebook by recording ideas, notes, decisions, findings, and corrections.

(4) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(5) The student gains knowledge of and demonstrates the skills necessary for success in the engineering workplace. The student is expected to:

(A) describe and compare the roles of an industry technician, engineering technologist, and engineer;

(B) identify educational requirements and career opportunities for engineers, engineering technologists, and industry technicians;

(C) research and describe various engineering disciplines such as mechanical, civil, aerospace, biomedical, chemical civil, computer, electrical, petroleum, and other related and emerging fields;

(D) investigate and describe the requirements of engineering licensure and industry-based certifications;

(E) investigate and describe elements of teamwork critical for success in the engineering and technology industries such as communication, active listening, and time management;

(F) research and describe industry standards and governmental regulations such as health and safety and environmental regulations applicable to a design problem; and

(G) analyze and discuss ethical issues related to engineering and technology.

(6) The student understands the roles and responsibilities of individual team members, how successful teams function, and how to constructively contribute to the team. The student is expected to:

(A) describe the various roles and responsibilities of a project team;

(B) identify the strengths of individual team members to assign roles and distribute tasks within a team; and

(C) describe and demonstrate appropriate behaviors such as active listening and clear communication while serving as a team leader and member on projects.

(7) The student practices safe and proper work habits. The student is expected to:

(A) identify and explain the appropriate use of types of personal protective equipment used in industry;

(B) explain and comply with safety guidelines and procedures as described in relevant manuals, instructions, and regulations;

(C) discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;

(D) describe the various types of electrical hazards in the workplace and the risks associated with electrical hazards;

(E) describe the various control methods to prevent electrical hazards in the workplace;

(F) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and explain how emergency plans and Safety Data Sheets are used to make decisions in the workplace;

(G) describe the appropriate disposal of selected hazardous materials and wastes;

(H) perform routine maintenance on selected tools, equipment, and machines;

(I) demonstrate proper handling, use, and storage of tools and materials; and

(J) research and describe the consequences of negligent or improper equipment maintenance.

(8) The student understands how visual and spatial reasoning applies to engineering design. The student is expected to:

(A) describe and compare characteristics and dimensional changes of two-dimensional (2D) and three-dimensional (3D) figures;

(B) draw and manipulate geometric shapes in three dimensions;

(C) create 2D views of a 3D object; and

(D) explain the symmetry of figures through the proportionate transformation of objects.

(9) The student uses sketching and computer-aided design and drafting (CADD) to represent 3D objects in a 2D format needed for manufacturing an object. The student is expected to:

(A) use single and multi-view projections to represent 3D objects in a 2D format;

(B) use appropriate line types in engineering drawings to represent 3D objects in a 2D format;

(C) use orthographic and pictorial views to represent 3D objects in a 2D format;

(D) use auxiliary views to represent 3D objects in a 2D format;

(E) use section views to represent 3D objects in a 2D format;

(F) prepare and revise annotated multi-dimensional production drawings in computer-aided design and drafting to industry standards;

(G) apply best practices for file structure and management to efficiently retrieve and edit files;

(H) use advanced dimensioning techniques, including annotation scale; and

(I) construct and use CADD drawings to develop a model or prototype for presentation.

(10) The student designs products using appropriate engineering design processes and techniques. The student is expected to:

(A) design product components using a variety of technologies;

(B) research and analyze the applications of different types of CADD software for various engineering problems;

(C) create and interpret engineering drawings using industry standards;

(D) describe how quality, reliability, and safety can be designed into specific products;

(E) identify specific requirements of users with special needs and modify a product design to accommodate users with special needs;

(F) research and explain the patenting process and analyze opportunities for potential patents related to a project; and

(G) use multiple software applications for concept presentations.

(11) The student builds a prototype(s) using the appropriate tools, materials, and techniques. The student is expected to:

(A) identify and describe the steps needed to produce a prototype;

(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype;

(C) present the prototype and explain how the prototype meets the project requirements; and

(D) evaluate the successes and failures of the prototype(s) in the context of an iterative design process.

(12) The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:

(A) identify and define an engineering problem;

(B) formulate goals, objectives, and requirements to solve an engineering problem;

(C) investigate and select appropriate materials for a particular product to be designed;

(D) explain the importance of manufacturability and maintainability when designing a product;

(E) determine design constraints such as personnel, resources, funding, feasibility, and time associated with an engineering problem;

(F) identify requirements, including health, safety, social, environmental, ethical, regulatory, and legal constraints, defining an engineering problem;

(G) identify alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;

(H) test and evaluate proposed solutions using engineering practices such as experiments, simulations, statistical analysis, and critical design review; and

(I) select and justify a preferred solution to a problem using structured techniques such as a decision tree, design matrix, or cost-benefit analysis.

(13) The student presents a solution derived through the engineering design process. The student is expected to:

(A) present the solution in a professional manner;

(B) solicit and evaluate feedback on the solution and presentation; and

(C) present learning experiences, including essential skills gained, areas of personal growth, challenges, and solutions, encountered throughout the design process.

§127.405. Engineering Design and Presentation II (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Algebra I, Geometry, and Principles of Applied Engineering or Engineering Design and Presentation I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Engineering Design and Presentation II is a continuation of knowledge and skills learned in Engineering Design and Presentation I. Students enrolled in this course demonstrate advanced knowledge and skills of a system design process as it applies to engineering fields and project management using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Students expand on the use of a variety of computer hardware and software applications to complete assignments and projects. Through implementation of a system design process, students transfer advanced academic skills to component designs and engineering systems. Emphasis is placed on transdisciplinary and integrative approaches using skills from ideation, prototyping, and project management methods.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and

audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how interested parties impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule, influence an engineering design, and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) The student practices safe and proper work habits. The student is expected to:

(A) identify and explain the appropriate use of types of personal protective equipment used in industry;

(B) explain and comply with safety guidelines and procedures as described in relevant manuals, instructions, and regulations;

(C) explain the importance of lock out tag out (LOTO) procedures in preventing the release of hazardous energy;

(D) explain the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;

(E) describe the various types of electrical hazards in the workplace and the risks associated with electrical hazards;

(F) describe the various control methods to prevent electrical hazards in the workplace;

(G) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and explain how health and safety resources are used to make decisions in the workplace;

(H) describe the appropriate disposal of selected hazardous materials and wastes;

(I) perform routine maintenance on selected tools, equipment, and machines;

(J) handle, use, and store tools and materials correctly; and

(K) research and describe the consequences of negligent or improper equipment maintenance.

(5) The student demonstrates the roles and responsibilities of individual team members, how successful teams function, and how to constructively contribute to the team. The student is expected to:

(A) demonstrate the various roles and responsibilities of a project team;

(B) create a plan to improve team member's skillsets based on strengths of individual team members;

(C) demonstrate appropriate behaviors of a successful team such as active listening, development of consensus, and clear communication while serving as a team leader and member on projects; and

(D) describe and demonstrate the roles and responsibilities specific to team leaders such as assigning roles and responsibilities, facilitating decision making, tracking progress, and soliciting and providing timely feedback to team members.

(6) The student uses and documents engineering design processes. The student is expected to:

(A) use idea generation techniques such as brainstorming, sketching, rapid prototyping, and mind mapping during conceptual stages and for resolving problems of an engineering project;

(B) analyze and evaluate solution constraints;

(C) develop or improve a solution using evidence-based decision-making;

(D) compare solutions using analysis tools such as a decision matrix or paired comparison analysis;

(E) create and maintain an organized engineering notebook to record findings and corrections, including deficiencies in the design process and decisions throughout the entire design process; and

(F) develop an engineering notebook or portfolio to record and justify the final design, construction, and manipulation of finished projects.

(7) The student understands how systems impact the design, integration, and management of engineering solutions. The student is expected to:

(A) analyze and document systems such as electrical, mechanical, or information processes within a product or design concept in engineering;

(B) explain ethical reverse engineering;

(C) reverse engineer a multi-system product and explain how the systems work together; and

(D) modify a system design to meet a newly identified need or to improve performance.

(8) The student demonstrates proficiency using computer-aided design and drafting (CADD) software as part of the engineering design process. The student is expected to:

(A) research and explain the features and benefits of different types of CADD software applications for use in design systems and problem solving;

(B) identify and describe industry graphic standards such as American National Standards Institute (ANSI) and International Organization for Standardization (ISO) standards;

(C) create drawings that meet industry standards using CADD software;

(D) customize CADD software user interface options such as buttons, tabs, and ribbons to match different digital work environments;

(E) prepare and use advanced views such as auxiliary, section, and break-away using CADD software;

(F) draw detailed parts, assembly diagrams, and sub-assembly diagrams using CADD software;

(G) indicate tolerances and standard fittings using appropriate library functions within CADD software;

(H) setup and apply annotation styles by defining fonts, dimension styles, and leader lines using CADD software;

(I) identify and incorporate the use of advanced layout techniques and viewports using paper-space and modeling areas using CADD software;

(J) create and use layers to organize objects in drawings using CADD software;

(K) create and use custom templates using CADD software for advanced project management;

(L) use advanced polar tracking and blocking techniques using CADD software to increase drawing efficiency;

(M) create drawings that incorporate external referencing using CADD software;

(N) create and render objects using parametric modeling tools within CADD software; and

(O) model individual parts or assemblies and produce rendered or animated output using CADD software.

(9) The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:

(A) delineate and implement the steps such as defining the problem and generating concepts needed to produce a prototype;

(B) develop a prototype safely using tools, equipment, machines, or precision measuring instruments;

(C) select and justify the use of materials for prototyping and manufacturing;

(D) describe how design quality concepts, including performance, usability, accessibility, reliability, and safe use, affect prototype development;

(E) document quality-control requirements in the design and production of a prototype;

(F) evaluate prototype quality and performance to meet design criteria;

(G) fabricate a prototype using a systems engineering approach to compare the actual prototype performance to the required performance; and

(H) present a prototype and explain how the prototype meets the project requirements.

(10) The student creates justifiable solutions to open-ended real-world problems within a multitude of engineering disciplines using engineering design practices and processes. The student is expected to:

(A) identify and define a multi-system engineering problem requiring a complex solution from different engineering disciplines such as aerospace, biomedical, chemical, civil, electrical, industrial, mechanical, petroleum, robotics, or structural engineering;

(B) formulate and document goals, objectives, and requirements to solve a multi-system engineering problem;

(C) determine the design constraints such as materials, personnel, resources, funding, manufacturability, feasibility, and time associated with a multi-system engineering problem;

(D) identify parameters, including health, safety, social, environmental, ethical, regulatory, and legal constraints, defining a multi-system engineering problem;

(E) identify or create alternative solutions to a multi-system engineering problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;

(F) test and evaluate proposed multi-system engineering solutions using tools such as models, prototypes, and mockups and methods such as simulations, critical design review, statistical analysis, and experiments; and

(G) select and justify a preferred solution to a multi-system engineering problem using a structured technique such as a decision tree, design matrix, or cost-benefit analysis.

(11) The student presents a solution derived through the engineering design process. The student is expected to:

(A) develop and deliver a presentation describing the solution to a multi-system engineering problem in a professional manner to an appropriate audience such as peers, educators, potential clients, potential employers, community members, or engineering professionals;

(B) solicit and evaluate feedback from the audience on the multi-system engineering solution and presentation; and

(C) present learning experiences, including essential skills gained, areas of personal growth, challenges, and solutions encountered throughout the design process for a multi-system engineering solution.

§127.406. Engineering Design and Problem Solving (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grade 12. Prerequisites: Algebra I, Geometry, and at least one credit in a Level 2 or higher course in the Engineering Career Cluster. Recommended prerequisites or corequisites: Engineering Science, Chemistry, Physics, or Physics for Engineering. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) The Engineering Design and Problem Solving course extends students' problem solving skills by identifying needs and then devising solutions using scientific and engineering practices. Students apply prior knowledge to develop a multi-system product or solution for a complex problem. Students demonstrate project management skills by collaborating as part of a team, conducting research, and analyzing data that culminates in a comprehensive report and presentation. Technical drawings, models, and prototypes are created using the appropriate tools, materials, and techniques. Structured decision-making processes are used to select and justify a preferred, multi-system solution to an authentic problem. Students develop, implement, and document repeated trials of experiments and tests using scientific and engineering practices to determine whether a prototype meets design requirements.

(4) Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.

(5) Scientific hypotheses and theories. Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as dial caliper, micrometer, protractor, compass, scale rulers, multimeter, and circuit components;

(E) collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of various scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field.

(6) The student understands how to implement an engineering design process to develop a multi-system product or solution for a complex problem. The student is expected to:

(A) implement the stages of an engineering design process to construct a model of a multi-system product or solution;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, affect stages of the engineering design process;

(C) explain how interested parties affect an engineering design process; and

(D) discuss how lessons learned from failure is often an essential component of the engineering design process.

(7) The student explores and implements the methods and aspects of project management for complex, multi-phase, multi-system projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) create a resource-loaded project schedule for an engineering project;

(D) maintain a resource-loaded project schedule for the life of an engineering project;

(E) develop and implement a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(F) describe how project requirements, constraints, and deliverables affect the project schedule and influence and are influenced by an engineering design;

(G) create a budget that includes materials, equipment, and labor for an engineering project;

(H) describe the importance of management of change (MOC) and how MOC applies throughout the life of an engineering project;

(I) create and implement a project management plan for an engineering project; and

(J) describe how techniques such as Monte Carlo simulation, risk matrices, and tornado diagrams are used to evaluate risk.

(8) The student conducts research and analyzes data to create a problem statement in the engineering design process. The student is expected to:

(A) create an organized engineering notebook to record research and findings for an engineering project;

(B) select an open-ended real-world problem that can be solved using scientific and engineering practices and the engineering design process;

(C) collect, organize, analyze, and summarize scientific and technical articles, data, and information to support the development of a problem statement;

(D) define and use relevant scientific and engineering vocabulary as it relates to the problem statement;

(E) evaluate information from sources for quality, accuracy, completeness, and reliability and conduct additional research as appropriate in the context of an iterative design process; and

(F) create a problem statement that is concise, specific, and measurable.

(9) The student identifies potential solutions and uses structured techniques to select and justify a preferred solution using scientific and engineering practices and the engineering design process. The student is expected to:

(A) identify or create alternative solutions to a problem using a variety of techniques such as sketching, brainstorming, reverse engineering, and researching engineered and natural solutions;

(B) select a preferred solution to a problem by applying structured techniques such as a decision tree, design matrix, or cost-benefit analysis;

(C) evaluate whether the preferred solution meets the requirements of the problem statement in the context of an iterative design process;

(D) identify material properties that are important to the solution design such as physical, mechanical, chemical, electrical, and magnetic properties and explain how material properties affect material selection;

(E) explain how different engineering solutions can have significantly different effects on individuals, society, and the natural world; and

(F) document concepts, solutions, findings, and structured decision-making techniques in the engineering notebook.

(10) The student creates technical drawings, models, and prototypes using the appropriate tools, materials, and techniques. The student is expected to:

(A) determine and explain the type of technical drawing that best represents the solution;

(B) create a technical drawing(s) that includes dimensions, scale, views, annotations, tolerances, legends, symbols, and material specifications;

(C) create a mathematical or physical model(s) to make predictions, identify limitations, and optimize design criteria;

(D) create a prototype for testing;

(E) evaluate the successes and failures of the prototype(s) in the context of an iterative design process; and

(F) revise technical drawings, models, and prototype(s) as the solution evolves to better meet objectives.

(11) The student develops, implements, and documents repeated trials of experiments and tests using scientific and engineering practices to determine whether a prototype meets design requirements. The student is expected to:

(A) design and conduct experiments and tests to determine whether the prototype meets the requirements of the problem statement;

(B) document and evaluate quantitative and qualitative data obtained through experiments and tests of the prototype in the engineering notebook;

(C) create and analyze charts, data tables, or graphs to organize information collected during experiments on the prototype;

(D) determine acceptable limits of error in data from experiments and tests of the prototype;

(E) explain the purpose of regression analysis as a method to model and investigate relationships between independent and dependent variables from experiments and tests of the prototype;

(F) identify linear and nonlinear relationships in data and situations where regression is appropriate;

(G) identify sources of random error and systematic error and differentiate between both types of error from experiments and tests of the prototype; and

(H) evaluate and determine whether the prototype meets the requirements of the problem statement by analysis of data collected in the context of an iterative design process.

(12) The student develops and presents a comprehensive report that describes the problem, research and information collected and analyzed, concepts and solutions considered, prototypes developed and tested, and final results. The student is expected to:

(A) create and present the comprehensive report in a professional manner to an appropriate audience such as peers, educators, potential clients, potential employers, community members, or engineering professionals;

(B) solicit and evaluate feedback from the audience on the comprehensive report and presentation;

(C) present learning experiences such as essential skills gained, areas of personal growth, and challenges and solutions encountered throughout the design process; and

(D) predict the local and global impacts or risks of an engineering solution to segments of the society such as the economy or the environment.

§127.407. Environmental Engineering (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisites: At least one credit in a course from the Engineering or Energy Career Cluster. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) In Environmental Engineering, students research, develop, and design solutions related to water, land, and energy problems, with consideration to ethics and regulations. Using technology and the engineering design process, students devise innovative solutions to address current and future engineering challenges.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations, organizations that foster leadership and career development in the profession such as student chapters of related professional associations, and work-based experiences.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Engineering ethics. The student applies ethical consideration to analyze resilient engineered systems. The student is expected to:

(A) compare the Texas Engineering Practices Act to the code of ethics of other engineering societies such as the American Society of Civil Engineers and the National Society of Professional Engineers to explain how engineers demonstrate the responsibility they have to serve the public interest, their clients, and the profession with a high degree of honesty, integrity, and accountability;

(B) research the New London school explosion and explain how this event led to the development of the Texas Engineering Practice Act and other regulations such as odorization of natural gas;

(C) evaluate and explain an engineering ethical dilemma between environmental considerations and the needs and wants of society; and

(D) explain how engineering solutions can have significantly different impacts on an individual, society, and the natural world.

(5) Models. The student builds a model using the appropriate tools, materials, and techniques. The student is expected to:

(A) identify and describe the steps needed to produce a model of a system such as hydrological, watershed management, or geospatial analysis models;

(B) identify advantages and limitations of models such as size, scale, properties, and materials;

(C) identify and use appropriate tools, equipment, and materials to produce a model;

(D) describe the use of a model to accurately represent the key aspects of a physical system, including the identification of constraints such as cost, time, or expertise, that may influence the selection of a model;

(E) develop a design proposal using a variety of media to produce a model; and

(F) evaluate the successes and failures of a model in the context of an iterative design process.

(6) Critical and creative problem-solving. The student examines environmental challenges and gathers assumptions to synthesize a meaningful, well-defined problem and ideates multiple solutions. The student is expected to:

(A) collect, analyze, and interpret information relevant to an environmental engineering problem;

(B) document a design process according to best practices in an engineering notebook;

(C) identify and define visual, functional, and design requirements with realistic constraints against which solution alternatives can be evaluated;

(D) list potential appropriate criteria for a defined problem that may impact the success of a design solution such as economic, environmental, ethical, health and safety, technical feasibility, and design;

(E) represent concepts using a variety of visual tools such as sketches, graphs, and charts to communicate the details of an idea;

(F) develop, design, and test alternatives to generate valid quantitative data to inform decision making and demonstrate solutions; and

(G) explain why there are often multiple viable solutions.

(7) Critical and creative problem-solving. The student selects the optimal design solution for real-world environmental problems based on engineering judgement. The student is expected to:

(A) evaluate competing solutions paths using a decision matrix to compare solutions based on design criteria;

(B) formulate a risk analysis matrix using a spreadsheet to evaluate threats and opportunities, including cost, time, and environmental impacts;

(C) identify data needed to address an environmental engineering research question and the appropriate tools necessary to collect, record, analyze, and evaluate the data; and

(D) evaluate evidence and arguments to identify deficiencies, limitations, and biases for appropriate next steps in the pursuit of a better solution.

(8) Engineering tools and technology. The student uses a variety of techniques to measure and report quantities appropriate for an environmental analysis. The student is expected to:

(A) research and determine appropriate units of measure, including acres, miles, and hectares, for environmental analysis;

(B) measure and estimate a large-scale area such as a wetland, streamline, or floodplain using maps or digital resources;

(C) perform dimensional analysis and unit conversions to transform data to units appropriate for a particular purpose or model; and

(D) select and effectively use appropriate tools for accurately measuring specific volumes.

(9) Water resources. The student analyzes environmental factors related to safe drinking water. The student is expected to:

(A) research and describe the Texas State Water Plan, including the sources of water, floodplain management, and recycling;

(B) analyze the relationship between population growth and water resources;

(C) describe how human health is affected by the quality of drinking water sources;

(D) describe and compare the most common sources of drinking water such as desalination, aquifers, surface water, and reclaimed water in developed and developing countries;

(E) explain the characteristics of potable water;

(F) describe common sources of drinking water contamination, including stormwater runoff;

(G) explain contaminant cycling through an ecosystem; and

(H) describe the infrastructure components of private wells and public drinking water systems.

(10) Water quality. The student evaluates water quality and uses a variety of chemical and biological assays to describe water quality. The student is expected to:

(A) research and describe Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) surface water quality standards for rivers, lakes, and estuaries;

(B) research and describe annual water quality compliance reports and compare water quality between the different reports;

(C) explain how water quality is quantitatively measured using chemical and biologically based testing processes;

(D) perform and analyze a culture assay to detect coliform in water;

(E) collect a water sample and determine water turbidity and pH;

(F) outline the stages of treatment that a typical septic system and modern sewage treatment plant use to treat sewage water;

(G) explain the role of bacteria in wastewater treatment;

(H) research and describe emerging contaminants such as microplastics and pharmaceuticals in water;

(I) describe the interacting roles of bacteria, protozoa, and rotifers in a wastewater treatment ecosystem;

(J) describe and provide examples of how physical, chemical, and biological processes work in the process of purifying contaminated water;

(K) explain how plants remove nitrates from contaminated water;

(L) use the engineering design process to design, build, and test a water filtration system;

(M) design and perform an experiment to use phytoremediation to remove contaminants from water; and

(N) design and conduct a scientific experiment to test a variable affecting the bacteria's ability to decompose oil.

(11) Energy. The student demonstrates a working knowledge of various sources of energy and their environmental and economic impact. The student is expected to:

(A) explain the differences between and cost of renewable and non-renewable sources of energy and provide examples of each;

(B) identify and measure the amount and types of energy that students use in their daily lives;

(C) compare the fuel efficiency of various fuel sources;

(D) analyze the results of software simulations and models that vary the amounts and types of energy used to predict future energy needs;

(E) perform a full life cycle assessment (LCA) of material and energy sources; and

(F) identify the variables and the methods for completing an LCA.

(12) Engineering resilient systems. The student understands the environmental impacts to infrastructure systems and the need to support system performance with resilient solutions. The student is expected to:

(A) describe mitigation techniques and their associated costs for air pollutants and greenhouse gas emissions;

(B) analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms;

(C) research and explain how engineering design can be more resilient to environmental impacts to limit additional impacts to the natural environment; and

(D) research and explain elements of natural environmental resilience.

(13) Land management. The student understands land management and land management practices. The student is expected to:

(A) explain the value of a healthy ecosystem and the impact of biodiversity on the environment;

(B) research and explain ecological value of the land such as direct products and provisioning, regulating, supporting, and cultural services;

(C) identify land conservation and preservation restorative measures using industry practice standards such as the United States Department of Agriculture (USDA) National Resources Conservation Services (NRCS) Conservation Practice Standards for a given land area;

(D) research changes in land use and land cover over time using geospatial tools;

(E) analyze and report environmental impacts due to changes in land use such as urbanization over time; and

(F) explain the role of protected areas and lands to safeguard natural ecosystems.

(14) Waste management. The student understands the role and importance of waste management. The student is expected to:

(A) analyze the impacts of reduction, reuse, and recycling in waste management;

(B) explain the impact of individual practices of waste reduction on resource management;

(C) explain the capture and use of methane gas from landfills;

(D) analyze the waste breakdown cycle of various waste products that enter landfills; and

(E) research and describe hazardous waste products and impacts on the environment, including long-term storage needs and pollution.

(15) Regulations. The student understands the role of national and local standards and regulations in environmental design. The student is expected to:

(A) research and describe the functions of the EPA and U.S. Fish and Wildlife Service;

(B) research and describe the functions of the TCEQ and the Texas Parks and Wildlife Department; and

(C) describe the relationship between the National Environmental Policy Act, the EPA, and TCEQ.

(16) Future challenges in environmental engineering. The student discusses and analyzes some of the persistent environmental engineering challenges to sustain growing populations and the natural environment and improve quality of life. The student is expected to:

(A) explain why some environmental engineering challenges are persistent such as providing access to clean water, energy, sanitation, and health to growing populations;

(B) create a solution to a current challenge to meet the needs of society without compromising the ability to meet the needs of the future;

(C) identify principles that help guide development of solutions with considerations for sustainable development to include people and the planet; and

(D) describe the life cycle of a product or service and identify energy consumption, wastes, and emissions that are produced in the process.

§127.408. Fluid Mechanics (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: at least one credit in a course from the Engineering Career Cluster and Physics or Chemistry. Recommended prerequisite or corequisite: Algebra II. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Fluid Mechanics investigate the behavior and properties of fluids, including liquids and gasses. Through hands-on experiments, simulations, and real-world examples, students learn about concepts such as viscosity, pressure, buoyancy, and flow dynamics. Students explore how fluids interact with solid objects, understanding phenomena like lift and drag, which are critical to the operation of ships, airplanes, and vehicles. Students engage in case studies and problem-solving activities to gain insights into how fluid mechanics shape our everyday lives, technological advancements, and industrial applications. This course prepares students to progress in careers in engineering and scientific disciplines such as aerospace, mechanical, civil, chemical, materials, and physics.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as dial calipers, protractors, scale rulers, tape measures, load cells, micrometers, scales, tensiometer, multimeter, and thermometers;

(E) collect quantitative data using the System International (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of various scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field.

(6) The student explains the application of fluids in historical and modern applications. The student is expected to:

(A) describe the efficient storage and transportation of fluids, including gravity flow and natural phenomena such as aqueducts, water towers, winds, and currents;

(B) explain the use of fluids in power generation and power transmission such as hydraulics, pneumatics, pumps, compressors, and turbomachinery; and

(C) explain the impact of lift and drag on a moving object.

(7) The student describes basic concepts of fluid mechanics. The student is expected to:

(A) differentiate and compare the properties that distinguish a solid from a fluid;

(B) define the characteristics of a fluid and identify different types of fluids, including gasses, liquids, Newtonian, and non-Newtonian;

(C) define and list examples of compressible and incompressible fluids;

(D) explain the properties of fluids, including density, specific weight, specific gravity, viscosity, and compressibility;

(E) describe methods to measure and calculate the density, specific weight, specific gravity, viscosity, and compressibility of a Newtonian fluid;

(F) calculate density, specific weight, and specific gravity for a variety of fluids from measured data;

(G) explain the appropriate use of material reference frames and spatial reference frames, including boundary conditions, control surfaces, and control volumes;

(H) identify and explain the variables in the ideal gas law and apply the ideal gas law to constructed problems;

(I) explain the laws of conservation of energy and conservation of mass, including the algebraic version of Reynold's Transport theorem; and

(J) identify appropriate boundary conditions, including no-slip and ambient pressure boundary conditions in fluid flow.

(8) The student demonstrates an understanding of pressure and hydrostatics and calculates values in a variety of systems. The student is expected to:

(A) describe the relationship between force, area, and pressure;

(B) calculate force proportionalities in hydraulic and pneumatic cylinders using Pascal's law and explain the impact of the cylinders' diameter on the resultant force;

(C) differentiate between atmospheric pressure, gauge pressure, and absolute pressure;

(D) describe the working principles of a pressure gauge and measure fluid pressure using dial gauges and manometers;

(E) calculate the buoyant force of floating and submerged objects according to Archimedes' principle; and

(F) define and calculate hydrostatic pressure.

(9) The student demonstrates an understanding of fluid flows in steady-state pipes, channels, and free jets. The student is expected to:

(A) compare developing, fully developed, and steady-state Newtonian fluid flows in pipes and channels;

(B) compare fluid flow profiles, including uniform and parabolic;

(C) describe experimental measurements of fluid flow field lines, including stream, streak, and pathlines;

(D) calculate volumetric flow rate in a steady state system using the continuity equation and conservation of mass;

(E) explain how Bernoulli's equation relates to the total energy of a steady-state system;

(F) calculate unknown variables in varying conditions, including changes in height, velocity, and cross-sectional area of a steady state system using Bernoulli's equation and the conservation of energy;

(G) derive Torricelli's equation from Bernoulli's equation and calculate the exit velocity and mass flow rates of free jets;

(H) calculate fluid flows in pipes, channels, and free jets using the Reynolds Transport theorem and conservation of mass; and

(I) calculate the resultant force of a free jet at the outlet based on the density of the fluid, cross-sectional area, pressure, and velocity of the fluid.

(10) The student demonstrates an understanding of the effects of an object moving through a fluid. The student is expected to:

(A) differentiate turbulent and laminar flows;

(B) calculate the Reynolds number of given flows to determine if the flows are turbulent or laminar;

(C) define lift and drag as applied to fluid flows;

(D) explain the relationship between viscosity and shear force in a fluid flow;

(E) explain the variables of lift and drag formulas and how the variables relate to fluid flow; and

(F) design an experiment to measure the drag coefficient for a solid body in a fluid flow.

(11) The student understands compressible flow and the relationship between sound transmission through a fluid and fluid compression. The student is expected to:

(A) differentiate between compressible and incompressible fluids and explain the effect of compressibility on the speed of sound through a fluid;

(B) explain how density impacts the speed of sound through a fluid;

(C) calculate and use the Mach number to model a fluid as compressible or incompressible; and

(D) explain the effects on fluid, including shock waves, when the sound barrier is broken.

(12) The student designs and analyzes fluid systems. The student is expected to:

(A) explain the function of weirs in an open channel and describe an application of weirs such as flow control or flow measurement;

(B) calculate the fluid flow in open channels with different shapes, slopes, and weirs;

(C) design an application of hydrostatics using the principle of buoyancy such as a boat, submarine, floating dock, or hot air balloon;

(D) analyze and design a fluid device such as a clepsydra, water tower, pressure regulator, or nozzle using the principles of fluid dynamics;

(E) describe applications and processes of different types of pumps, including centrifugal pumps, peristaltic pumps, gear pumps, and positive displacement pumps;

(F) describe the operation of a centrifugal pump and explain the data presented in a pump curve, including head, flow rate, efficiency, and power;

(G) design a hydraulics system with components, including hydraulic fluid, pump, reservoir, motor, cylinders, valves, and flow controllers;

(H) identify and compare different types of turbomachines, including pumps and turbines;

(I) describe and differentiate the applications of turbomachines, including pumps and turbines; and

(J) explain the concept of tribology and identify the associated variables of tribology such as film thicknesses and pressures.

§127.409. Mechanics of Materials (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: at least one credit from the Engineering Career Cluster and Physics. Prerequisite or corequisite: Algebra II. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for the successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Mechanics of Materials describe the mechanical behavior of engineering materials, including metals, ceramics, polymers, composites, welds, and adhesives, and the applications of load, deformation, stress and strain relationships for deformable bodies, and mechanical elements relevant to engineers. The course includes axially loaded members, buckling of columns, torsional members, beams, and failure.

(4) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside

the realm of science because they deal with phenomena that are not scientifically testable.

(5) Scientific hypotheses and theories. Students are expected to know that:

(A) hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and

(B) scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.

(6) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.

(A) Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.

(B) Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.

(7) Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(8) Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide tools for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(9) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(10) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:

(A) ask questions and define problems based on observations or information from text, phenomena, models, or investigations;

(B) apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;

(C) use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;

(D) use appropriate tools such as dial calipers, protractors, scale rulers, tape measures, load cells, micrometers, scales, tensometers, multimeters, and thermometers;

(E) collect quantitative data using the System International (SI) and United States customary units and qualitative data as evidence;

(F) organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;

(G) develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and

(H) distinguish between scientific hypotheses, theories, and laws.

(3) The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:

(A) identify advantages and limitations of models such as their size, scale, properties, and materials;

(B) analyze data by identifying significant statistical features, patterns, sources of error, and limitations;

(C) use mathematical calculations to assess quantitative relationships in data; and

(D) evaluate experimental and engineering designs.

(4) The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:

(A) develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

(B) communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and

(C) engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.

(5) The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:

(A) analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing to encourage critical thinking by the student;

(B) relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of various scientists and engineers as related to the content; and

(C) research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field.

(6) The student examines the historical developments that led to the field of mechanics of materials and material science. The student is expected to:

(A) describe the contribution to the field of mechanics by historical scientists such as Pascal, Galileo, Euler, Navier, Lame, Poisson, Hooke, and Young;

(B) describe key historical advancements related to the development of different materials such as bronze, iron, steel, Damascus steel, and Roman concrete;

(C) explain how materials have influenced historical events and products such as the steel in the Titanic, the space race, and smartphones;

(D) evaluate and explain the impact of modern development of materials to manufacturing such as composites, nanotechnology, semi-conductors, and alloys and the effects of processes on materials such as subtractive manufacturing, additive manufacturing, and welding; and

(E) describe the development of shapes in architectural structures such as columns, arches, domes, keystones, and suspension bridges.

(7) The student identifies and measures different properties of an object. The student is expected to:

(A) classify properties of an object as geometric, structural, or material;

(B) identify and describe the application of tools, including rulers, calipers, micrometers, weighing scales, tensile testers (tensometers), and thermometers;

(C) measure common properties of materials, including length, width, height, and mass;

(D) measure and observe intrinsic properties of materials such as hardness, thermal conductivity, and impact resistance;

(E) calculate density, cross-sectional area, specific gravity, thermal expansion, modulus of elasticity, Poisson's ratio, bulk modulus, yield, and ultimate stress using data from a table or graph;

(F) differentiate material properties, including ductility, malleability, resilience, toughness, and reflectivity;

(G) classify material properties as geometric (extrinsic), material (intrinsic), or structural; and

(H) classify types of materials, including metals and alloys, polymers, ceramics, biomaterials, composites, and semiconductors.

(8) The student understands various manifestations of forces acting on solids. The student is expected to:

(A) illustrate forces, including axial, radial, normal, torsional, and shear and identify different units such as newtons, pounds, and kips used in force measurement;

(B) explain force intensity of distributed forces, including forces distributed over a line, area, and volume;

(C) calculate and simplify multiple loads to a single combined load;

(D) distinguish between normal forces and shear forces; and

(E) identify and calculate different types of stress, including axial stress, shear stress, and bending stress.

(9) The student evaluates the effect of temperature on the properties of a material. The student is expected to:

(A) describe engineering applications of thermo-mechanical properties such as thermometers, thermocouples, thermistors, thermostatic valves and controllers, and fuses;

(B) explain the atomic origin of thermal expansion resulting in measurable effects such as building height change and material distortion;

(C) describe potential failure modes due to thermal expansion for kinematically constrained structures;

(D) explain how to accommodate thermal expansion in construction such as buckling of railroad rails, U-runs in piping, and expansion joints; and

(E) explain the effect of temperature on the mechanical properties of materials, including modulus of elasticity, yield strength, ductility, and toughness.

(10) The student determines the material properties from different mechanical material tests and how they are graphically represented. The student is expected to:

(A) describe a tensile test, the various possible shapes of tensile testing specimens, and tensile test measurements, including force, elongation, and change in thickness;

(B) analyze data from a tensile test to calculate engineering stress and strain for various materials such as aluminum, brass, cast iron, steel, and nylon at significantly different temperatures;

(C) plot engineering stress and strain on a two-dimensional graph;

(D) identify regions of a stress-strain curve, including elastic deformation, plastic deformation, resilience, strain hardening, fracture, and tension toughness;

(E) estimate the values from a stress-strain curve, including 0.2% offset, modulus of elasticity, yield stress, ultimate stress, resilience, and tension toughness;

(F) compare and explain differences in testing plots based on differences in specimen geometry and material;

(G) compare different types of material testing, including compression tests, tensile tests, and three-point bending tests;

(H) analyze testing results from compression and three-point bending tests with different specimen geometries, including length, cross-sectional shape, and cross-sectional area; and

(I) describe modern mechanical testing such as digital image correlation, thermography, acoustic emission, and x-ray diffraction.

(11) The student analyzes the impact of the cross-sectional geometry on the second moment of area for beams and shafts. The student is expected to:

(A) calculate the area and the second moment of area for primitive shapes, including rectangles, triangles, circles, and semicircles;

(B) explain the parallel-axis theorem and use the parallel axis theorem to calculate the second moment of area for complex shapes;

(C) calculate area, centroid, and second moment of area for complex shapes composed of primitive shapes such as an H-beam, square tubes, round tubes, and angle iron; and

(D) hypothesize the best cross-sectional shape for different types of loads such as tension, compression, torsion, bending, and combinations of these loads.

(12) The student represents point and distributed forces on a sketch and calculates the maximum deflection and factor of safety of bars, cables, columns, beams, and shafts using algebraic equations. The student is expected to:

(A) describe the consequences of stresses such as elastic deformation, plastic deformation, and fracture on solid objects with mass;

(B) calculate the maximum deflection of various homogenous prismatic beams, including simply supported, cantilever, and overhang beams, using algebraic formulas;

(C) calculate the factor of safety of various homogenous prismatic beams, including simply supported, cantilever, overhang beams, and columns, using algebraic formulas;

(D) analyze the impact of cross-sectional area and length on the potential for various homogenous prismatic columns to buckle under load;

(E) explain the impact of and the reason for using a tapered object in structural applications; and

(F) describe why pre-stress is used in applications such as shot-peening, tempered glass, wheel spokes, flatbed trailers, and bridges.

(13) Students demonstrate an understanding of stress, strain, and displacement fields throughout a structure, including bars and beams. The student is expected to:

(A) identify compression and tension regions in a bent beam;

(B) describe the kinematics of a bent member, including elongation due to tension, shortening due to compression, the neutral axis, and the linear displacement profile; and

(C) identify regions of compression and tension in digital image correlation data.

(14) The student understands that the mechanics of materials are required to analyze a multi-member structure for strength and stability in real-world applications. The student is expected to:

(A) compare permanent and non-permanent joints, including welding, brazing, soldering, adhesives, bolting, screwing, and riveting joints;

(B) analyze a bolted connection for pre-stress, load, factor of safety, grade, size, yield stress, and applied torque; and

(C) design a structure to support a specified load with materials of adequate properties, size, and geometry and with an appropriate factor of safety.

§127.410. Statics (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: at least one credit in a course from the Engineering Career Cluster and Physics. Prerequisite or corequisite: Algebra II.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science,

technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Statics is a gateway course into most engineering majors such as aerospace, mechanical, civil, and biomedical engineering. Students learn the elements of statics that include the forces in structures that are in equilibrium and usually not moving. This includes forces calculated in two dimensions, free-body diagrams, distributed loads, centroids, and friction as applied to cables, trusses, beams, machines, gears, and mechanisms. Students explore scenarios where objects remain stationary, emphasizing the importance of balance and stability in engineering design. This course not only equips students with theoretical knowledge but also empowers them with practical skills that are indispensable in real-world engineering scenarios.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student describes milestones in structural design and construction throughout history. The student is expected to:

(A) research and evaluate the significance of pioneering structures such as the Eiffel Tower, pyramids, Roman aqueducts, ferris wheel, Sydney Opera House, and St. Louis Bridge to the field of structural design;

(B) analyze how locally available materials and technology have impacted the construction of structures through time;

(C) identify the contributions of structural design pioneers such as Archimedes, Leonardo DaVinci, Galileo, René Descartes, and Albert of Saxony; and

(D) identify careers that use the field of statics and predict the future application of statics.

(3) The student measures and converts units in the System International (SI) units and United States (US) customary systems of measurement. The student is expected to:

(A) measure objects using different units of measurement such as feet, inches, centimeters, meters, pounds force, Newtons, slugs, and kilograms in decimal and fractional measurements;

(B) apply prefixes to units of measure and convert between units in U.S. customary and SI systems such as kilograms and kips; and

(C) identify physical examples of different units of measurement, including one Newton, one pound, and one kip.

(4) The student develops an understanding of point and distributed forces and moments, including torque and couples and their respective units. The student is expected to:

(A) explain how Newton's third law of motion applies to static systems;

(B) explain the purpose and operation of mechanical components, including gears, sprockets, pulleys, and simple machines;

(C) explain how mechanical components, including gears, sprockets, pulley systems, and simple machines, are used in mechanisms;

(D) explain distributed loads and simplify distributed loads to point loads;

(E) compare a two-dimensional distributed load applied over a line to a distributed load applied over an area and a volume;

(F) calculate and use applicable units for forces, torque, distances, and mechanical advantages related to levers, gears, and pulleys;

(G) define and calculate the efficiency of mechanical systems; and

(H) identify and explain couples in a static system.

(5) The student applies vector algebra to calculate the equivalent force and moment vectors. The student is expected to:

(A) differentiate between scalar and vector quantities;

(B) identify properties of a vector, including magnitude and direction;

(C) convert forces represented graphically to vector notation;

(D) represent a force vector in its horizontal and vertical components;

(E) calculate resultant vectors from multiple vectors using a strategy, including vector addition and the parallelogram rule;

(F) simplify free-body diagrams by using strategies, including the principle of transmissibility, couples, and the summation of moments;

(G) calculate moments of a rigid body system using strategies, including multiplying force by the perpendicular distance to a specified axis and the right-hand rule;

(H) calculate moments from component forces using Varignon's principle; and

(I) apply equivalent transformation to simplify external loads in a structural system.

(6) The student locates and applies the geometric centroid and the center of mass of homogenous and heterogeneous objects. The student is expected to:

(A) explain the difference between geometric centroid and center of mass;

(B) locate the geometric centroid of simple and complex shapes using the composite parts method; and

(C) locate the center of mass for two-dimensional and three-dimensional homogeneous and heterogeneous objects.

(7) The student determines the stability of simple and complex objects with a variety of applied forces. The student is expected to:

(A) identify potential pivot points at which objects could potentially rotate leading to a tip-over;

(B) determine the stability of simple and complex objects with only frictional force using the relative location of the center of mass and the object pivot point;

(C) calculate the stability of simple and complex objects with external forces applied at different locations on the object and a reaction force caused by friction; and

(D) describe how the friction reaction forces when combined with applied forces at different locations affect the stability of an object and how to stabilize systems subject to tipping.

(8) The student differentiates supports, including fixed, pin, and roller supports, for structures. The student is expected to:

(A) define and compare the applications of different structural supports, including fixed, pin, and roller supports, and describe which support is utilized in a cantilevered beam;

(B) explain the degrees of freedom for fixed, pin, and roller supports;

(C) describe how fixed, pin, and roller supports affect a structural system; and

(D) describe and sketch the different reaction forces and moments for structural supports, including fixed, pin, and roller supports.

(9) The student constructs free-body diagrams of particles and rigid bodies around various supports and determines the reaction forces of the static body. The student is expected to:

(A) sketch a complete free-body diagram that includes applied and reaction forces for a structure;

(B) define static equilibrium;

(C) formulate translational and rotational static equilibrium equations into a system of algebraic equations; and

(D) solve for unknown forces in a structure using equations of equilibrium.

(10) The student analyzes statically determinant plane trusses. The student is expected to:

(A) test if a plane truss is statically determinant;

(B) apply the method of sections and method of joints to calculate the internal forces of a statically determinant plane truss;

(C) explain the difference between tension and compression forces;

(D) describe capabilities of members, including beams, cables, ropes, bars, and columns, to bear tension, compression, or both tension and compression;

(E) identify internal members as being in tension or compression, the members bearing the maximum loads, and the member most likely to fail; and

(F) design structures such as bridges, tensegrity structures, or trusses to support external loads.

(11) The student recognizes the limitations of a two-dimensional model. The student is expected to:

(A) identify the differences between a two-dimensional and three-dimensional system;

(B) explain the implications of adding a third dimension to a structure and how a two-dimensional analysis is insufficient to model a three-dimensional structure; and

(C) describe how a third dimension can cause instability in a structure.

§127.411. Mechanical Design I (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I and at least one credit in a course from the Engineering Career Cluster. Recommended corequisite: Geometry. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Mechanical Design I demonstrate knowledge and skills associated with design and manufacture of mechanical systems. Fundamental mechanisms are introduced such as gears, belts, threaded elements, and four-bar mechanisms. Basic manufacturing processes such as stamping, injection molding, casting, machining, and assembly are explored through reverse engineering. The mechanisms encountered through reverse engineering enable the exploration of product functionality. Students compare engineering choices made for components, materials, and manufacturing processes. Emphasis is placed on team collaboration and professional documentation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Collaboration. The student develops teamwork skills. The student is expected to:

(A) discuss principles of critique such as describing, analyzing, interpreting, and evaluating;

(B) identify and demonstrate teamwork skills such as sensemaking where a team member recognizes another team member who requires additional clarity and then addresses the team member by providing clarity;

(C) identify methods for structuring projects such as Gantt charts, work breakdown structure, Agile, and critical path method; and

(D) discuss the importance of contributing to positive and productive group dynamics to enhance teamwork.

(5) Documentation. The student documents information gathered and interpretation developed throughout engineering processes. The student is expected to:

(A) create documents such as executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages aligned with professional industry standards;

(B) select the document format to communicate essential information to identified stakeholders; and

(C) explain and justify the structure and sequence of how information is presented in engineering documents.

(6) Applications for mechanical design. The student examines domestic, commercial, and industrial applications of mechanical design. The student is expected to:

(A) explain applications of mechanical design in various industries, including medical, aeronautical, automotive, naval, and robotics industries;

(B) research and identify commercial applications for mechanical design such as heating and cooling systems and robotics; and

(C) identify and discuss household items that are impacted by mechanical design such as environmental controls, refrigerators, washing machines, and clothes dryers.

(7) Mechanisms. The student investigates and understands mechanisms that convert motion such as gears, belts, threaded elements, linkages, or linear actuators. The student is expected to:

(A) create virtual models of physical mechanisms using appropriate tools;

(B) predict how different inputs affect the motion of a mechanism such as gears and linkages and compare the predictions with physical models;

(C) classify mechanisms into different types such as gears, belts, threaded elements, linkages, or linear actuators; and

(D) explain how changes in the dimensions of a mechanism influence the relationship between input and output.

(8) Reverse engineering. The student systematically disassembles and analyzes a system to identify the concepts involved in function and manufacture. The student is expected to:

(A) use appropriate simple tools and methods to disassemble consumer products such as can openers, mixers, or drills;

(B) document the reverse engineering process using appropriate documentation tools and methods;

(C) identify mechanisms of a product such as drive systems and gears and how their function contributes to the overall function of the product;

(D) identify elements of a product such as housings, covers, and controls and how their attributes contribute to the product;

(E) use appropriate measurement tools and methods to capture and document information about the sub-assemblies and components in a product;

(F) identify and evaluate the choice of particular materials in the elements of a product;

(G) identify and evaluate the choice of the process used to manufacture the element of a product; and

(H) identify and evaluate the choice of the process to assemble a product.

(9) Manufacturing. The student identifies different manufacturing processes such as stamping, injection molding, casting, sintering, and machining and assembly. The student is expected to:

(A) explain and compare common manufacturing processes such as stamping, casting, injection molding, and machining;

(B) identify and describe stamping manufacturing process elements such as press, tool, and blank and process steps such as shearing, bending, and perforating;

(C) identify and describe injection molding elements such as hopper, heater, platen, and mold and process steps such as heating and injecting;

(D) identify and describe casting elements such as mold, furnace, parting plane, sprue, and gate and process steps such as heating, pouring, cooling, and removal;

(E) identify and describe sintering elements such as mold, furnace, binder, and powder and process steps such as heating, pressing, cooling, and post-processing;

(F) identify and describe material removal elements such as workpiece, tool, jigs, and fixtures; the machine used such as mill, lathe, or drill; and process steps such as holding, locating, and cutting;

(G) identify and describe assembly process elements such as jigs and fixtures, tolerances, fasteners, and tools and related process steps such as locating, holding, joining, and automating; and

(H) identify and explain which material types are appropriate for manufacturing processes such as stamping, injection molding, casting, sintering, material removal, and assembly.

(10) Assembly. The student explores the assembly process. The student is expected to:

(A) explain the purposes of joining methods such as welding, adhesive bonding, fastening, riveting, and snap fitting;

(B) evaluate the choice of joining methods found in a consumer product and generate requirements based on the evaluation; and

(C) compare different assembly strategies such as assembly line, automation versus manual, or batch versus pull.

(11) Design. The student applies appropriate professional design tools. The student is expected to:

(A) define industry relevant terminology, including Failure Modes Effects Analysis (FMEA), Design for Manufacturing (DFM), Design for Assembly (DFA), Lean Manufacturing, Design of Experiments (DOE), benchmarking, reverse engineering, and Life Cycle Analysis (LCA);

(B) use design tools such as FMEA, Quality Functional Deployment (QFD), root cause analysis, five whys, or decision matrices to extract information about a reverse engineered product;

(C) develop an engineering requirements list to justify the selection of materials, processes, parts, and features from a reverse engineered product;

(D) identify opportunities for manufacturing and assembly improvement from a reverse engineered consumer product; and

(E) design and conduct tests to collect information needed to understand the engineers' design decisions, including material, manufacturing process, and mechanism choices, during a reverse engineering project.

(12) Key concepts. The student understands key concepts of mechanical engineering. The student is expected to:

(A) define heat transfer concepts such as conduction, convection, or radiation;

(B) define thermodynamic concepts such as systems boundary, conservation, or entropy;

(C) define mechanics of materials concepts such as strain, stress, elasticity, brittleness, or fatigue;

(D) define dynamics concepts such as vibrations, dampening, or spring coefficients;

(E) define material concepts such as strength, hardness, metallics, polymers, or ceramics;

(F) define fluids concepts such as mass flow rate, viscosity, compressibility, turbulence, or boundary layer;

(G) define statics concepts such as free body diagrams, force, torque, moment, or equilibrium;

(H) define controls concepts such as open loop, closed loop, or systems modeling; and

(I) identify and use engineering computational tools such as computer-aided design (CAD), finite element analysis (FEA), or computational fluid dynamics (CFD).

§127.412. Mechanical Design II (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: Mechanical Design I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Mechanical Design II demonstrate knowledge and skills associated with the design development and validation of a prototype solution to meet a given set of requirements. Students identify project stakeholders; manage projects; evolve requirements; model system solutions; develop, test, and refine prototypes; and validate project solutions. Emphasis is placed on budget management, professional documentation, conducting project status updates, critiquing design reviews, and team collaboration.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Collaboration. The student develops teamwork skills. The student is expected to:

(A) explain and apply sensemaking skills such as recognizing team members who require additional clarity and addressing team members to provide clarity;

(B) apply methods such as Gantt charts, work breakdown structure, Agile, and critical path method to structure a project;

(C) apply principles of critique within the team such as describing, analyzing, interpreting, and evaluating;

(D) develop and present action plans to positively support the team's work relationships;

(E) explain and model how to provide an effective critique of team members on topics such as team performance, test performance, project development, or presentation;

(F) explain and model how to provide an effective critique of other teams on topics such as presentation, problem definition, schedule, and solution justification;

(G) analyze and evaluate critique received from team members and other teams; and

(H) develop a design review presentation to provide status and solicit feedback on the design problem and solution.

(5) Documentation. The student documents information gathered and interpretations developed throughout the applied engineering process. The student is expected to:

(A) generate documents such as executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages by applying professional standards and templates;

(B) select the appropriate document format for the information being communicated based on the audience;

(C) explain and justify the structure and sequence of how the information is presented in the engineering documents;

(D) create assembly and user manuals for peer review; and

(E) generate a final design report that focuses on the project scope and solution with appendices to capture all relevant design information such as the design process used, requirements compliance matrix, concept reports, and test reports.

(6) Project management. The student reviews and applies basic project management strategies following a proposal-justification-approval process for each significant model considered. The student is expected to:

(A) generate a project management plan that includes time and deliverable estimates;

(B) review and update periodically the project management plan based on appropriate industry standard practices such as stage-gate and Agile Project Management; team structure and formation; and project modeling such as flow charts, Gantt charts, Program Evaluation Review Technique (PERT), critical path method, and work breakdown structures;

(C) create model or test proposals for review; and

(D) compare project management approaches such as stage-gate and Agile.

(7) Stakeholder. The student understands how to engage stakeholders, including end user, consumer, fabricator, maintenance, the design team, and other engineers. The student is expected to:

(A) describe how an engineer's professional responsibility applies to stakeholders;

(B) develop a journey map or equivalent tool to model how the stakeholder interacts with the product; and

(C) explain the importance of maintaining engagement with the stakeholder throughout the project.

(8) Design requirements. The student understands the importance of the role of requirements in the mechanical engineering design process. The student is expected to:

(A) identify and solicit stakeholder requirements;

(B) generate, refine, and document product and project requirements throughout the project;

(C) document requirements in correct format with appropriate standards such as National Aeronautics and Space Administration (NASA), military, and International Council on Systems Engineering (INCOSE);

(D) verify that each requirement can be associated to at least one stakeholder;

(E) verify that each stakeholder can be associated to at least one requirement;

(F) discuss the importance of the relation between requirements and respective stakeholders;

(G) analyze how key mechanical design concepts such as heat transfer, mechanics of materials, statics, or fluids impact the design process, design requirements, and design decisions; and

(H) explain how requirements drive the project.

(9) System modeling. The student generates multiple abstract models of mechanical systems using representations such as

schematic diagramming and function structure modeling. The student is expected to:

(A) create models of various mechanical system concepts;

(B) compare different models against the appropriate requirements;

(C) extract new system requirements from the models;

(D) create models to communicate engineering design solutions to stakeholders for a project;

(E) discuss conservation principles of energy, matter, and motion; and

(F) apply conservation principles throughout the system model.

(10) Design space modeling. The student models conceptual design spaces using morphological matrices. The student is expected to:

(A) select the key requirements for the problem;

(B) generate multiple means to address each key requirement to populate a morphological matrix;

(C) generate multiple integrated solutions by selecting means from each requirement for further modeling and refinement; and

(D) calculate the total number of possible solutions captured in the generated morphological matrix.

(11) Concept generation. The student generates multiple systematic concepts using appropriate ideation tools. The student is expected to:

(A) explain the rules of ideation tools such as brainstorming, 6-3-5, Gallery Method, C-Sketch, and concept mapping;

(B) apply ideation tools to generate multiple concepts for a problem; and

(C) compare the ideation tools based on the rules, number of people, representation, and purpose.

(12) Concept pruning. The student prunes sets of concepts using design tools such as decision matrices, pair-wise comparison, and pro-con lists. The student is expected to:

(A) use and explain absolute or relative decision matrices to prune a set of concepts;

(B) use and explain pair-wise comparisons to prune a set of concepts;

(C) use and explain pro-con lists to prune a set of concepts;

(D) explain why it is important to use multiple pruning tools in design; and

(E) explain why the pruning tools are not for selecting concepts.

(13) Prototyping and testing. The student fabricates multiple physical prototypes ranging from parts to subsystems to final integrated prototypes to gather information needed to support mechanical engineering design decision making. The student is expected to:

(A) develop prototyping proposals that include cost, time, and effort estimates; desired information; and testing plans;

(B) use appropriate tools and materials to fabricate prototypes;

(C) evaluate and execute testing plans for each prototype to gather information or check requirement satisfaction;

(D) extract and document new requirements from prototyping and testing; and

(E) justify the purpose for each physical or virtual model constructed against the cost of making the model.

(14) Embodiment and refinement. The student refines design solutions by selecting and sizing components appropriately. Students justify material choices based on the requirements defined. The student is expected to:

(A) construct geometric models and drawings to represent designed system;

(B) justify and use appropriate analytical and simulation tools to correlate the changes in parameters of the models with changes in the performance of the modeled system;

(C) justify design decisions using requirements such as functionality, cost, performance, or time;

(D) use appropriate tools and materials to fabricate a final prototype;

(E) develop final product documents such as bill of materials, assembly models, user manual, and assembly instructions; and

(F) explain the evolution of requirements between earlier and final prototypes.

(15) Solution validation. The student tests and verifies requirements throughout the project. The student understands the importance of discovering new requirements through testing and simulation. The student is expected to:

(A) analyze information gained from testing and simulation to document new or refined requirements;

(B) document simulations or tests using an appropriate report template;

(C) design and execute simulations or tests to validate functional requirements are met;

(D) explain why engineering design processes are iterative; and

(E) discuss how continuous improvement and design iteration are related.

(16) Budget. The student plans, monitors, and updates project budgets throughout the design project. The student is expected to:

(A) create budgets for initial project costs such as raw materials, purchased parts, salvaged parts, hardware, taxes, shipping, and handling categories;

(B) create a Bill of Materials cost report for the final build;

(C) compare and explain any differences between the final product build cost and the project budget;

(D) monitor and update the project budget throughout the duration of the project;

(E) prepare budget status reports that include explanations of spenddown rates and changes to the budget; and

(F) explain the importance of budget tracking in design projects.

§127.413. Aerospace Design I (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I and at least one credit in a course from the Engineering Career Cluster. Recommended corequisite: Geometry. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Aerospace Design I demonstrate knowledge and skills associated with the design evolution and emerging trends of aircraft and aerospace systems. Fundamental concepts such as forces of flight, structures, aerodynamics, propulsion, stability and control, and orbital mechanics are introduced as related to design decisions for atmospheric and space flight. These concepts are related to mission requirements and solution approaches.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Collaboration. The student engages in multiple team projects and activities. The student is expected to:

(A) discuss principles of critique such as describing, analyzing, interpreting, and evaluating;

(B) identify and demonstrate teamwork skills such as sensemaking where a team member recognizes another team member who requires additional clarity and then addresses the team member by providing clarity;

(C) identify methods for structuring projects such as Gantt charts, work breakdown structure, Agile, and critical path method; and

(D) discuss the importance of contributing to positive and productive group dynamics to enhance teamwork.

(5) Documentation. The student documents information and interpretation developed throughout engineering processes. The student is expected to:

(A) use professional standards and templates to generate documents such as executive summaries, test reports, failure documents, system black box models, engineering notebooks, and drawing packages;

(B) select the document format to communicate essential information for identified stakeholders; and

(C) explain and justify the structure and sequence of how the information is presented in the engineering documents.

(6) History of flight. The student understands the history and evolution of human flight, including flight within and outside the Earth's atmosphere. The student is expected to:

(A) identify and discuss successes and failures in human efforts to fly prior to powered flight;

(B) research and discuss innovations in aircraft prior to the jet age and explain how world events impacted these innovations;

(C) research and discuss innovations in aircraft after the beginning of the jet age and explain how world events impacted these innovations;

(D) research and discuss innovations in rockets prior to human spaceflight and explain how world events impacted these innovations;

(E) research and discuss innovations in rockets after the first human spaceflight and explain how world events impacted these innovations; and

(F) discuss the history of regulation of aircraft and the role of the Federal Aviation Administration (FAA).

(7) Introduction to aircraft. The student explains the FAA categories for aircraft and categorizes the different types of aircraft such as airplanes, rotorcraft, lighter-than-air or aerostats, glider, powered-lift, powered parachutes, weight-shift aircraft, ground-effect vehicles (GEV), air-cushion vehicles (ACV), and rockets. The student is expected to:

(A) identify and describe classes of aircraft such as single-engine land (SEL), gyroplane, powered-lift, and glider using the FAA categories;

(B) categorize aircraft by attributes such as piston engine, turboprop, powered or unpowered, and drones or piloted;

(C) compare aircraft categories and use cases for each category; and

(D) research and discuss emerging trends in aircraft such as airships, rotary powered aircraft, and alternative energy powered aircraft.

(8) Atmospheric flight. The student identifies and relates the three axes of an aircraft, the four forces of flight, and the components used for stability and control of the aircraft. The student is expected to:

(A) explain the relationships between atmospheric temperature, pressure, density, and altitude;

(B) identify and describe the motion about the three axes of an aircraft, including yaw, pitch, and roll;

(C) identify and describe ways to control motion about the three axes;

(D) identify and explain the four forces acting on aerospace vehicles in flight, including lift, drag, thrust, and weight;

(E) explain the relationship between weight, mass, gravity, and acceleration and identify their corresponding units such as pounds-force, pound-mass, kilogram, and Newton;

(F) discuss the difference between g-force and weight;

(G) draw the forces of flight for a straight and level flight and a level banked turn;

(H) identify different ways to control the forces that change the pitch, roll, and yaw of an aircraft;

(I) identify and explain the major fixed and movable components of various aircraft to enable stability and control within the atmosphere; and

(J) define and discuss aerodynamics as a subset of aerospace.

(9) Lift and drag. The student explains how lift and drag are generated by an aircraft and how they change during flight. The student is expected to:

(A) explain how an airfoil generates lift;

(B) explain how the angle of attack (AoA) influences lift;

(C) explain how to interpret a "Lift Coefficient (CL) versus AoA" chart;

(D) define and discuss stall for an airfoil;

(E) explain the types of drag, including profile/form, skin friction, interference, trim, and induced;

(F) explain how the AoA influences drag;

(G) explain how to interpret a "Drag Coefficient (CD) versus AoA" chart;

(H) explain how changes in drag during flight impact performance such as range, altitude, and power requirements;

(I) define and discuss Lift-to-Drag (L/D) ratio;

(J) explain how to interpret an L/D chart;

(K) identify the maximum L/D ratio from a chart to determine the optimal glide speed for maximum range;

(L) research and discuss other systems that use airfoils such as windmills, fans, and propelling aircraft; and

(M) explain how a plane can fly without engine power and in some cases can gain altitude to stay aloft for extended time and distance.

(10) Weight and balance. The student recognizes that components have mass, weight, and location resulting in moments that are balanced by control surfaces. The student is expected to:

(A) identify and calculate moments created by the forces of flight;

(B) define and discuss center of gravity (CG);

(C) define and discuss center of pressure (CP);

(D) explain how the locations of the CP and CG influence the stability of an aircraft; and

(E) create a model of an aircraft with variable configurations for CG and CP to determine stability of an aircraft.

(11) Computerized design tools. The student understands that computerized technology is available for design and analysis. The student is expected to:

(A) identify engineering computational tools such as computer-aided design (CAD), finite element analysis (FEA), or computational fluid dynamics (CFD); and

(B) explain the applications of engineering computational tools used in mechanical design.

(12) Mission requirements. The student understands how mission requirements influence the type and form of aircraft. The student is expected to:

(A) analyze a mission to generate a list of atmospheric mission requirements such as payload, range, cruise, take-off length, landing length, climb gradient, altitude, and land or sea;

(B) analyze a mission to generate a list of space mission requirements such as payload, altitude, vibration sensitivity, launch conditions, environmental conditions, and recovery;

(C) explain how the mission requirements are interrelated;

(D) discuss how the mission requirements relate to the aircraft and spacecraft categories;

(E) discuss how mission requirements relate to the overall aircraft design; and

(F) interpret a mission profile and explain how it impacts mission requirements.

(13) Propulsion. The student explains and evaluates different types of propulsion systems such as piston engine, turboprop, jet, and rocket. The student is expected to:

(A) identify and explain how a piston powered aircraft delivers thrust with respect to altitude limits and speed limitations;

(B) identify and explain how a turboprop powered aircraft delivers thrust with respect to design requirements such as cost, operation cost, reliability, power, altitude limits, and speed limitations;

(C) identify and explain how a jet powered aircraft delivers thrust with respect to design requirements such as cost, operation cost, reliability, power, altitude limits, and speed limitations;

(D) explore and explain how a rocket engine is different from a jet engine;

(E) research and discuss the applications for solid-fuel rockets; and

(F) research and discuss the applications for liquid-fuel rockets.

(14) Material selection. The student explains why a particular material is used in an aircraft application, taking into account cost, density, strength, and mission requirements. The student is expected to:

(A) research and discuss material classes used in aerospace design such as woods, composites, metals, and plastics;

(B) explain why specific materials might have been chosen for components on different aircraft;

(C) discuss methods for manufacturing aircraft components such as landing gears, wings, fuselage, or canopies;

(D) explain the impact of material and manufacturing costs on design decisions; and

(E) explain how material requirements relate to mission requirements.

(15) Aerospace structures. The student explains and compares and contrasts types of structures such as truss, semi-monocoque, monocoque. The student is expected to:

(A) identify and discuss truss, semi-monocoque, and monocoque structures;

(B) explain why different structure types are used in various aircraft categories;

(C) discuss how mission requirements impact the selection of the structural types for an aircraft;

(D) identify structural components in the fuselage such as stringers, bulkheads, and skin;

(E) identify structural components in the wings and empennage such as ribs, spars, stringers, and skin; and

(F) compare structures used in atmospheric flight and space flight.

(16) Space flight and orbital mechanics. The student knows properties of orbital mechanics as they relate to space flight and the impact of the space environment on design. The student is expected to:

(A) identify and describe orbits based on the six Keplerian Elements;

(B) explain how changes in Keplerian Elements change the orbit;

(C) explain how mission requirements determine specific orbit types;

(D) describe the unique environmental conditions of operating in space for human or autonomous missions;

(E) research and discuss methods to reach and recover a spacecraft from space; and

(F) research and discuss emerging trends in space flight.

(17) Alternate applications for aerospace design. The student examines alternate applications for aerospace design in various industries, including the automotive, naval, and other commercial industries. The student is expected to:

(A) research and discuss how aerospace engineers contribute to automotive and naval applications to improve performance;

(B) research and identify commercial applications for aerospace design such as heating and cooling systems, building design, and wind turbines; and

(C) identify and discuss items at home that are impacted by aerodynamics such as fans, convection ovens, and heating and cooling systems.

(18) Aircraft systems. The student explores and discusses other aircraft systems such as navigation, communication, entertainment, flight control, actuation, energy storage and management, and propulsion. The student is expected to:

(A) explain basic functionality for aircraft systems such as navigation, communication, entertainment, flight control, and propulsion; and

(B) research and discuss different implementations for aircraft systems such as navigation, communication, entertainment, flight control, and propulsion.

§127.414. Aerospace Design II (Two Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Geometry and Aerospace Design I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Aerospace Design II demonstrate knowledge and skills associated with the design and prototyping of aerospace systems. Through aerospace projects, students apply fundamental concepts such as managing an engineering project to meet mission requirements, prototyping, testing, and validating requirements. Students explore choices made for propulsion, material, and structural design as well as various ways aircraft can navigate. Emphasis is placed on team collaboration and professional documentation.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) Collaboration. The student engages in multiple team projects and activities. The student is expected to:

(A) explain and apply sensemaking skills such as recognizing team members who require additional clarity and addressing team members to provide clarity;

(B) apply methods such as Gantt charts, work breakdown structure, Agile, and critical path method to structure a project;

(C) apply principles of critique within the team such as describing, analyzing, interpreting, and evaluating;

(D) develop and present action plans to positively support the team's work relationships;

(E) explain and model how to provide an effective critique of team members on topics such as team performance, test performance, project development, or presentation;

(F) explain and model how to provide an effective critique of other teams on topics such as presentation, problem definition, schedule, and solution justification;

(G) analyze and evaluate critique received from team members and other teams; and

(H) develop a design review presentation to provide status and solicit feedback on the design problem and solution.

(5) Documentation. The student documents information and interpretation developed throughout engineering processes. The student is expected to:

(A) generate documents such as executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages by applying professional standards and templates;

(B) select the appropriate document format for the information being communicated based on the audience;

(C) explain and justify the structure and sequence of how the information is presented in the engineering documents;

(D) create assembly and user manuals for peer review; and

(E) generate a final design report that focuses on the project scope and solution with appendices to capture all relevant design information such as the design process used, requirements compliance matrix, concept reports, and test reports.

(6) Designing to mission requirements. The student generates conceptual aircraft solutions to meet a set of given requirements. The student is expected to:

(A) analyze given mission requirements such as altitude, speed, and payload to derive sub-requirements;

(B) generate and document additional sub-requirements for the mission considering various factors such as maintainability, producibility, operational cost, and safety;

(C) generate and document conceptual aircraft solutions to address mission and sub-requirements;

(D) classify the generated conceptual aircraft solutions into appropriate categories such as single-engine land (SEL), gyroplane, powered-lift, and glider using the Federal Aviation Agency (FAA) classification system;

(E) select, justify, and document a conceptual solution that addresses the mission and sub-requirements; and

(F) create a model such as a graph or matrix that displays the relationships between the documented requirements.

(7) Managing aerospace engineering projects. The student applies project management techniques to aerospace projects. The student is expected to:

(A) generate a project plan that includes time, deliverable, and cost estimates;

(B) review and update periodically a project plan according to a stage gate process;

(C) document and execute test plans to evaluate prototypes against requirements;

(D) justify and present design choices through periodic design reviews; and

(E) generate a final design report with an executive summary, a body with problem and solution descriptions, and appendices with additional relevant information such as the design process used, requirements compliance matrix, concept reports, and test reports.

(8) Prototyping aerospace vehicles. The student creates a prototype to address a set of mission requirements. The student is expected to:

(A) generate a list of design parameters based on the mission and sub-requirements;

(B) generate and document design concepts to address design parameters;

(C) use appropriate tools such as decision matrices, pro-con lists, and pair-wise comparison to evaluate, downselect, and justify design concepts to prototype;

(D) create and document prototypes to test, validate, and modify design concepts;

(E) use appropriate tools such as decision matrices, pro-con lists, and pair-wise comparison to evaluate, downselect, and justify a prototype to develop as the solution;

(F) evaluate a prototype to identify areas of improvement for iteration;

(G) test, evaluate, and document performance of the revised prototype in meeting project requirements; and

(H) compose and present a project debrief, including lessons learned.

(9) Atmospheric flight. The student relates the three axes of an aircraft, the four forces of flight, and the components used for stability and control. The student is expected to:

(A) research and discuss ways to control motion about the three axes;

(B) calculate and explain changes in motion due to the four forces acting on aircraft during flight;

(C) explain why loads acting on aircraft change during different flight scenarios;

(D) draw and calculate the forces of flight for a straight and level flight and a level banked turn; and

(E) describe which aircraft components control and provide stability with respect to the six degrees of freedom.

(10) Lift and drag. The student explains how lift and drag are generated by an aircraft and how they change during flight. The student is expected to:

(A) explain the lift equation and illustrate the relationships between its variables;

(B) explain the drag equation and illustrate the relationships between its variables;

(C) calculate the changes to lift and drag based on changes to atmospheric conditions such as temperature, density, and pressure;

(D) describe how aircraft control surfaces, including leading edge flaps, trailing edge flaps, ailerons, and spoilers, influence lift;

(E) describe how aircraft control surfaces, including leading edge flaps, trailing edge flaps, ailerons, and spoilers, influence drag;

(F) define and discuss how the stall angle and stall speed can be changed; and

(G) research and present contemporary developments reducing drag such as winglets, boundary layer control, and surface effects.

(11) Weight and balance. The student recognizes that components have mass, weight, and location resulting in moments that are balanced by control surfaces. The student is expected to:

(A) calculate an aircraft's estimated center of gravity throughout a mission profile considering factors such as fuel consumption, payload, and passengers;

(B) estimate the location of an aircraft's center of pressure;

(C) calculate the static margin throughout a flight profile to verify positive stability margin;

(D) generate and document solutions to improve positive static stability in the event of a negative stability margin; and

(E) revise and document static margin calculations reflecting proposed solutions.

(12) Propulsion. The student evaluates various propulsion solutions to downselect the solutions to meet mission requirements. The student is expected to:

(A) evaluate and select a propulsion solution that meets requirements such as piston, jet, turboprop, and rocket;

(B) evaluate and select the number of engines to meet mission and sub-requirements; and

(C) calculate propulsion weight of the selected solution to meet mission and sub-requirements.

(13) Material selection. The student evaluates various materials to meet mission and sub-requirements. The student is expected to:

(A) analyze component material requirements to select materials that meets mission and sub-requirements; and

(B) document the justification for the materials selected to meet component requirements.

(14) Aerospace structures. The student evaluates and selects structure types to meet mission and sub-requirements. The student is expected to:

(A) analyze structural requirements to select structure types that meets mission and sub-requirements; and

(B) document the justification for the structure types selected to meet structural requirements.

(15) Navigation. The student defines and explains types of navigation used for flight. The student is expected to:

(A) explain dead reckoning navigation using an aeronautical chart, compass, clock, and airspeed indicator;

(B) explain navigation using radio radials such as Automatic Direction Finder (ADF) and VHF Omnidirectional Range (VOR);

(C) explain navigation using an Inertial Navigation System (INS); and

(D) explain navigation using Global Positioning Systems (GPS).

§127.415. Civil Engineering I (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. Prerequisite: Algebra I and Introduction to Computer-Aided Design and Drafting or Principles of Applied Engineering. Recommended prerequisite: Geometry. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students in Civil Engineering I are introduced to the basic principles and practices essential to the field of civil engineering. Throughout this course students investigate different career paths in civil engineering, explore the various specializations within the field,

and understand the phases and life cycle of civil engineering projects. They also delve into the functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of effective project document structure and project management, ethical considerations, and the impact of civil engineering on the natural and built environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;

(D) identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities and how these practices optimize efficiency and results;

(E) define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;

(F) identify and discuss the importance of professionalism, standards of conduct, and ethics as defined by the Texas Engineering Practice Act and rules concerning the practice of engineering and surveying;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and

(K) describe the roles and responsibilities of managers.

(2) The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:

(A) explain the importance of defining an engineering problem as an initial step in the engineering design process;

(B) describe the research stage of the engineering design process;

(C) define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;

(D) explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;

(E) describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;

(F) describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;

(G) explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and

(H) describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.

(3) Students explore and develop skills to solve problems, make decisions, and manage a project. The student is expected to:

(A) discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;

(B) identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;

(C) define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;

(D) identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and

(E) identify strategies to solve problems and describe how problem solving is utilized to accomplish personal and team objectives.

(4) The student understands the foundations of occupational safety and health. The student is expected to:

(A) explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;

(B) explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;

(C) explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;

(D) identify and explain the appropriate use of types of personal protective equipment used in industry;

(E) discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;

(F) describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;

(G) analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;

(H) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;

(I) describe the elements of a safety and health program, including management leadership, worker participation, and education and training;

(J) explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;

(K) explain the components of a hazard communication program; and

(L) explain and give examples of safety and health training requirements specified by standard setting organizations.

(5) The student investigates different career paths in civil engineering. The student is expected to:

(A) explain the licensing requirements for an engineer in training and a professional engineer;

(B) identify various career options related to civil engineering such as surveyors, architects, construction contractors, urban and regional planners, inspectors, and regulators;

(C) identify and explain the requirements to obtain professional credentials such as certified flood plain manager (CFM), project management professional (PMP), professional engineer (PE), Autodesk certifications, SolidWorks certifications, certified surveying technician (CST), registered professional land surveyor (RPLS), certified quality engineer (CQE), and certified quality inspector (CQI) associated with civil engineering; and

(D) describe sub-disciplines within civil engineering, including water resources, environmental, geotechnical, structural, transportation, material sciences, coastal, land development, urban development, and infrastructure.

(6) The student examines the functional mathematics used in civil engineering. The student is expected to:

(A) calculate the mean, median, and mode of a given data set;

(B) calculate the standard deviation of a given data set;

(C) identify parts of a normal distribution curve;

(D) define the Empirical Rule and analyze the distribution of a data set using the Empirical Rule;

(E) define systematic, gross, and random error;

(F) define accuracy and precision in a data set;

(G) analyze the accuracy and precision of a data set;

(H) identify the types and properties of various polygons;

(I) solve for the parts of a triangle using the Pythagorean theorem, the law of sines, and the law of cosines;

(J) identify the properties of circles;

(K) solve for the measurements of a circle, including diameter, radius, circumference, area, chord, arclength, delta, and tangent;

(L) solve linear functions on a Cartesian Coordinate System using standard form, slope-intercept form, point-slope form, and the distance between two points; and

(M) calculate the volumes of three-dimensional shapes such as cylinders, spheres, and trapezoidal and triangular prisms.

(7) The student understands methods of measurement and associated errors. The student is expected to:

(A) define units of linear measurement, including U.S. survey feet, international feet, chains, rods, miles, fathoms, furlongs, varas, and other metric units commonly used in the surveying and civil engineering industry;

(B) define the different units of angular measurement, including vertical angles, horizontal angles, bearings, azimuths, degrees-minutes-seconds, decimal degrees, seconds of arc, and gradians;

(C) define the different units of volumetric measurement, including cubic feet, cubic yards, tons, and acre-feet;

(D) calculate and define area measurements such as acre, hectare, square feet, square mile, league, or sitio;

(E) convert linear, angular, and area measurements between different units;

(F) determine a change in elevation between two or more points by performing a differential level loop;

(G) measure the distance between two points on a plane using methods such as taping, electronic distance meter, total station, pacing, odometer, tacheometry, and stadia;

(H) compare the errors from two or more methods of calculating distance between two points such as comparing pacing and taping; and

(I) identify and analyze various types of errors associated with survey data.

(8) The student researches civil engineering throughout history. The student is expected to:

(A) describe the significance and development of historic civil engineering projects such as the Panama Canal, Roman aqueducts, and Hadrian's wall;

(B) describe the significance and development of a major Texas civil engineering project; and

(C) describe the significance and development of a major U.S. civil engineering project.

(9) The student understands a civil engineering project life cycle. The student is expected to:

(A) explain the civil engineering project conception, scope, proposal, contract, design planning and development, construction documents, bid and specifications, construction, and closeout phase; and

(B) identify and sequence the phases of a project life cycle.

(10) The student understands and develops a civil engineering project scope of work and proposal. The student is expected to:

(A) identify and describe the importance of potential components in a feasibility report, including soil analysis, existing land entitlements, existing topography, federal emergency management

agency (FEMA) floodplain location and elevation, existing utility and locations, environmental studies, and adjacent rights-of-way;

(B) identify and quantify costs and benefits associated with a proposed civil engineering project, including initial investments, operational expenses, and anticipated returns;

(C) conduct a cost-benefit analysis for a small civil engineering project;

(D) identify common risks associated with civil engineering projects, including technical, financial, environmental, and regulatory risks;

(E) describe methodologies for conducting risk analysis such as probability assessment, impact analysis, and risk prioritization;

(F) develop a feasibility report for a small civil engineering project;

(G) explain the purpose of a request for qualifications (RFQ);

(H) evaluate RFQs based on a project's scope;

(I) identify relevant codes and regulations impacting civil engineering projects;

(J) define the fundamental components of a scope of work document, including project description, stakeholders, objectives, deliverables, scope exclusions, milestones, schedule, and signature block; and

(K) develop a scope of work document for a small civil engineering project.

(11) The student understands and develops the components of civil engineering designs. The student is expected to:

(A) identify various conceptual schematic design drawings, sketches, and diagrams that explore design solutions and communicate design concepts;

(B) generate a conceptual schematic design drawing, sketch, or diagram that effectively communicates a design concept;

(C) explain the purpose and application of common civil engineering calculations such as superelevation, flow line, beam analysis, cost amortization, materials testing, plasticity index, and differential leveling;

(D) evaluate engineering plans and specifications using quality control and quality assurance (QCQA) processes; and

(E) prepare a design quantity take-off and estimate of probable construction cost.

(12) The student researches the use and application of technology in civil engineering. The student is expected to:

(A) identify the tools and technology used in civil engineering throughout history such as abacus, compass, scale, measuring tape, slide rule, calculator, computer-aided drafting and design, level, auto-level, grade rod, plumb bob, transit, theodolite, total station, GPS, lidar, and drones;

(B) explain the evolution of technology used in civil engineering; and

(C) explain the uses of design analysis and computer-aided drafting software.

(13) The student understands and researches the components of project closeout processes. The student is expected to:

(A) identify the main stakeholders involved in final inspections such as owner, utility provider(s), designer(s), contractors, municipalities, and regulatory agencies;

(B) develop a punch list that is organized by trade, area, or priority and identifies deficiencies in a substantially completed project; and

(C) evaluate the completed project to identify project successes and deficiencies.

(14) The student understands and navigates civil engineering construction documents. The student is expected to:

(A) identify the sections of a construction document set, including plat, existing conditions, site plan, fire protection plan, dimensional control plan, grading plan, drainage plan, utility plan, paving plan, erosion control plan, and project detail sheets;

(B) research and describe the purpose of a fire protection plan;

(C) describe the components of a paving plan, including pavement sections, material types, and design details;

(D) identify and locate construction specification documents relevant to a given project;

(E) explain and locate the fundamental components of a construction document's legend, including symbols, line types, and typical abbreviations;

(F) explain the process of drafting a construction document to scale;

(G) determine and demonstrate which scale best fits a standard size drawing sheet;

(H) explain the relationship between a construction document's specifications, plans, legend, and scale; and

(I) identify and explain the differences between design drawings and record drawings.

(15) The student applies best practices for effective project document structure and management. The student is expected to:

(A) explain the significance of systematic organizational structure for project documents;

(B) develop a systematic organizational structure for project documents that considers factors such as project phase, discipline, and document type;

(C) develop a consistent naming convention for project documents; and

(D) implement and maintain a uniform naming convention for project documents.

(16) The student describes and exhibits characteristics that lead to a successful civil engineering team. The student is expected to:

(A) research and describe time management techniques such as using Gantt charts, schedules, critical paths, and man-power projections for project management;

(B) demonstrate effective communication skills in written and oral formats to facilitate collaboration in a project team; and

(C) explain how project team dynamics impact project outcomes and member morale.

(17) The student researches and describes ethics pertaining to civil engineering. The student is expected to:

(A) research and identify the fundamental engineering ethics established by the Texas Board of Professional Engineers and Land Surveyors and other professional organizations such as American Society of Civil Engineers, the National Society of Professional Engineers, the National Council of Examiners for Engineering and Surveying, and the National Institute of Engineering Ethics; and

(B) analyze root causes and lessons learned from historical examples or case studies involving ethical misconduct in civil engineering projects.

(18) The student explores the impact of engineering in the natural world and built environment. The student is expected to:

(A) describe the potential impacts, costs, and benefits of sustainable practices on local and global communities, environments, and economies;

(B) describe sustainability standards used throughout the project life cycle;

(C) describe governmental agencies that regulate environmental impact at the federal, state, and local level;

(D) describe the potential impacts of construction on the natural world, including flora, fauna, groundwater, surface water, soil, Earth's atmosphere, air quality, and waterways; and

(E) describe methods used by engineers to mitigate and remediate the effects of construction on the natural world.

(19) The student understands the methods environmental engineers use to supply water, dispose of waste, and control pollution. The student is expected to:

(A) describe methods of population projection for sizing water and wastewater facilities;

(B) describe water quality standards using prescribed units of measure;

(C) research and explain regulations for water quantity design requirements by jurisdiction;

(D) research and explain regulations for wastewater quantity design requirements by jurisdiction;

(E) research and describe methods of water and wastewater treatment;

(F) research and describe methods of solid waste management;

(G) research and describe methods of controlling hazardous waste; and

(H) research and describe methods of measuring and managing air quality.

§127.416. Civil Engineering II (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Geometry and Civil Engineering I. Recommended prerequisite: Introduction to Computer-Aided Design and Drafting. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students in Civil Engineering II apply the principles and practices essential to various subdisciplines within civil engineering. Throughout this course, students develop knowledge and skills essential to the design development and construction of a civil engineering project. The students explore the impacts and constraints on the design of a project. They also delve into the functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of effective project document structure and project management, ethical considerations, and the impact of civil engineering on the natural and built environment.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers;

(K) identify the components of a safety plan and why a safety plan is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) The student recognizes project stakeholders and industry organizations in civil engineering. The student is expected to:

(A) describe the roles and objectives of project stakeholders, including engineer, owner, architect, contractor, subcontractors, project manager, end users, regulatory agencies, and the public; and

(B) describe the mission and membership benefits of industry organizations such as the American Society of Civil Engineers, the National Society of Professional Engineers, and the Society of Women Engineers.

(5) The student explores various disciplines within civil engineering. The student is expected to:

(A) describe the essential technical knowledge and functions in a variety of civil engineering subdisciplines, including environmental, geotechnical, transportation, structural, water resources, and construction;

(B) explain how different types of projects within civil engineering subdisciplines, including public works, transportation, urban development, water resources, and utility projects, impact the built environment; and

(C) identify and describe types of civil engineering projects.

(6) The student explores how codes, regulations, and plats impact a civil engineering project. The student is expected to:

(A) research and describe regulations established by the American Disabilities Act relevant to site design;

(B) identify local codes and regulations for a civil engineering project;

(C) describe the potential impacts of local codes and regulations on civil engineering projects; and

(D) describe the purpose of a plat and easements for a civil engineering project.

(7) The student develops a proposal for a civil engineering project such as a park, a parking lot, or a storm drain. The student is expected to:

(A) analyze or develop a feasibility report for a civil engineering project;

(B) develop and analyze the scope of work document for a civil engineering project;

(C) calculate monetary value for engineering efforts on a given project;

(D) revise and archive the draft project proposal for scope of work changes;

(E) develop a client deliverable package that contains a fee proposal, project schedule, organizational chart, exclusions, and an engineering contract;

(F) communicate effectively a final proposal for a civil engineering project; and

(G) identify and evaluate lessons learned from the project proposal process.

(8) The student develops a civil engineering project schedule. The student is expected to:

(A) identify and prioritize project tasks to determine the critical path of a project;

(B) create a project critical path diagram;

(C) evaluate project tasks and the critical path to develop a project schedule;

(D) create a Gantt chart for all the project activities in a project; and

(E) assess a project schedule for opportunities to improve project efficiencies.

(9) The student develops a civil engineering design for a project site. The student is expected to:

(A) create a concept site plan using existing schematics, survey data, and regulatory design manuals;

(B) identify existing and proposed utility providers, including electric, water, sewer, gas, and telecommunications providers, at a project site;

(C) research and identify existing plats and easements for a project site; and

(D) revise and finalize a project site plan to reflect analyzed site data, including utilities, geotechnical, right-of-way, water resources, environmental, survey, and transportation data.

(10) The student explores concepts and calculations for storm water events used by water resources engineers. The student is expected to:

(A) describe storm event probability based on historical models;

(B) describe methods used, including Rational method, Natural Resources Conservation Service (NRCS), Soil Conservation Service (SCS), and unit hydrograph, to calculate flow rate;

(C) analyze existing topography at the project site to determine drainage patterns;

(D) delineate existing and proposed drainage areas impacting a project site to determine the change in stormwater runoff generated by a project design;

(E) research and describe methods of stormwater mitigation and water quality treatment;

(F) calculate the existing flow rates for a 5-year and a 100-year storm event for a project site using the Rational method;

(G) analyze and calculate the proposed flow rates for a 5-year and a 100-year storm event for a project design;

(H) determine the required stormwater remediation techniques for a 100-year storm event by comparing existing and proposed runoff quantities;

(I) describe methods of stormwater conveyance, including channel, culvert, and pipe;

(J) calculate the hydraulics of a stormwater conveyance using the continuity equation, energy equation, and Bernoulli's equation;

(K) design a conveyance system such as a pipe, culvert, or open channel to convey stormwater runoff for a 100-year storm event using the calculated data;

(L) create a plan and profile sheet of a drainage system, including surface elevations, slopes, conveyance system dimensions, material, and pipe invert elevations; and

(M) describe potential impacts of a drainage analysis for a project.

(11) The student explores concepts and calculations used by geotechnical engineers. The student is expected to:

(A) identify and explain the components of a geotechnical report, including boring samples and logs, soil types and classifications, pavement recommendations, foundations recommendations, and soil preparations;

(B) identify and determine the soil classifications at a project site using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS);

(C) calculate the plasticity index of soil from a project site;

(D) research and describe methods of soil preparation;

(E) research and explain how geotechnical results impact pavement recommendations used in civil engineering projects;

(F) research and select the most effective pavement section for a project; and

(G) describe the impact of a geotechnical analysis for a project.

(12) The student explores concepts and calculations used by structural engineers. The student is expected to:

(A) identify and analyze the various types of building foundations, including raft, monolithic slab, slab on grade, pier and beam, spread footing, mat footing, drilled piers, pylons, waffle slab, and post-tension slab;

(B) describe the forces common to structural engineering calculations, including gravity, tension, compression, flexure, and torsion;

(C) describe the loads common to structural engineering calculations, including dead load, live load, environmental loads, and other loads such as lateral and concentrated loads;

(D) diagram and explain how applied loads and forces are resisted in a structure and transferred to the Earth;

(E) diagram a simply supported beam subjected to loading conditions to determine reaction forces;

(F) sketch diagrams to determine the maximum shear and moment resulting in the beam;

(G) identify the different types of trusses, including simple, planar, and space frame trusses;

(H) diagram a truss subjected to loading conditions to determine reaction forces and identify the zero force members;

(I) explain why design loads are dictated by building codes; and

(J) describe potential impacts of a structural analysis for a project.

(13) The student explores concepts and calculations used by transportation engineers. The student is expected to:

(A) identify and describe various types of transportation engineering specializations such as rail, aviation, roadway, highway, and marine;

(B) research and explain the benefits of having a professional transportation engineering certification;

(C) research and explain the benefits of membership in a transportation engineering organization such as Institute for Transportation Engineers (ITE), American Society of Highway Engineers (ASHE), American Association of State Highway and Transportation Officials (AASHTO), and WTS International;

(D) determine stopping sight distance of a roadway given the design speed and grade;

(E) research and describe the impacts of transportation design elements, including grades, superelevation, design speed, friction factor, lane widths, vertical curves, horizontal curves, roadway classification, acceleration, and deceleration;

(F) analyze the level of service of a roadway to determine if operating conditions are adequate;

(G) identify and explain the components of a traffic impact analysis (TIA), including data collection summary, trip analysis, turn lane analysis, project phasing, and sight visibility analysis;

(H) research and identify methods of traffic data collection;

(I) collect and calculate traffic count data at a project site and analyze the results of the traffic count to determine peak hour trips and traffic mitigation;

(J) determine the peak hour trips generated by a given land use from a ITE Trip Generation Manual;

(K) research and describe traffic level of service for various roadways;

(L) determine if a turn lane is warranted based on peak hour trips and traffic volume; and

(M) describe potential impacts of a transportation analysis for a project.

(14) The student develops construction documents for a civil engineering project. The student is expected to:

(A) develop project construction documents that includes design plans, specifications, and a cost estimate for a civil engineering project;

(B) develop the analysis reports for a civil engineering project;

(C) generate a demolition sheet that contains existing topography, property lines, easements, utilities, rights-of-way, drainage infrastructure, and structures, and identifies items to be demolished;

(D) develop a fire protection plan for a project;

(E) generate a paving plan that shows the limits and types of pavement necessary for a project;

(F) generate a site plan that labels proposed improvements for a project;

(G) generate a site dimensional control plan containing measurements for all site improvements for a project;

(H) generate a grading plan that documents proposed elevations and topography in comparison to existing topography for a project;

(I) generate drainage plans that document the existing drainage patterns, proposed drainage plan, and drainage infrastructure for a project;

(J) generate a utility plan that documents existing and proposed utility types, locations, and materials for a project;

(K) generate an erosion control plan that identifies erosion control best management practices (BMP) defined by the Texas Commission on Environmental Quality (TCEQ) for a project; and

(L) explain the importance of a quality control review and complete a quality control review of the construction documents of the project.

(15) The student develops documents for support of the construction bid. The student is expected to:

(A) identify components of a bid tabulation, including item description, material quantity, unit measure, unit price, and total price;

(B) compare a project bid tabulation with corresponding construction documents to verify all items are included;

(C) create a project bid tabulation; and

(D) identify and compile the parts of civil engineering project manual.

(16) The student works as an individual and a team member to complete projects. The student is expected to:

(A) track team goals to verify completion of project milestones;

(B) explain various methods to resolve conflict within a project team;

(C) explain how leadership impacts project outcomes and team members; and

(D) evaluate team member performance and effectiveness in a project.

(17) The student researches and understands the code of ethics pertaining to civil engineering. The student is expected to:

(A) research and describe the impact of the State of Texas Engineering Practice Act and Rules; and

(B) analyze and discuss ethical case studies using Texas Administrative Code, Title 22, Part 6, Chapter 137, Subchapter C (relating to Professional Conduct and Ethics).

(18) The student understands the fundamental sustainable design approaches and practices in civil engineering projects. The student is expected to:

(A) research and describe sustainable building materials and methods;

(B) identify and explain the programs and certifications that establish design criteria for engineering projects such as Leadership in Energy and Environmental Design (LEED);

(C) explain how sustainable programs and certifications potentially impact the design elements and costs of a project;

(D) explain how design choices potentially impact human health, the environment, and the cost of a project; and

(E) explain how elements of the construction process potentially impact human health and the environment.

§127.417. Engineering Project Management (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I. Recommended prerequisite: English II. Students shall be awarded one credit for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Engineering Project Management develop cursory knowledge and essential skills to lead an engineering team through the development and construction of a project. Students assess project documentation for compliance with best management practices. They engage in project planning, risk management, team management, and stakeholder communication to ensure project completion, adherence to safety guidelines, and continuous improvement.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;

(D) identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities and how these practices optimize efficiency and results;

(E) define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;

(F) identify and discuss the importance of professionalism, standards of conduct, and ethics as defined by the Texas Engineering Practice Act and rules concerning the practice of engineering and surveying;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and

(K) describe the roles and responsibilities of managers.

(2) The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:

(A) explain the importance of defining an engineering problem as an initial step in the engineering design process;

(B) describe the research stage of the engineering design process;

(C) define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;

(D) explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;

(E) describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;

(F) describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;

(G) explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and

(H) describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.

(3) The student explores and develops skills to solve problems, make decisions, and manage a project. The student is expected to:

(A) discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;

(B) identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;

(C) define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;

(D) identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and

(E) identify strategies to solve problems and describe how problem solving is utilized to accomplish personal and team objectives.

(4) The student understands the foundations of occupational safety and health. The student is expected to:

(A) explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;

(B) explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;

(C) explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;

(D) identify and explain the appropriate use of types of personal protective equipment used in industry;

(E) discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;

(F) describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;

(G) analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;

(H) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;

(I) describe the elements of a safety and health program, including management leadership, worker participation, and education and training;

(J) explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;

(K) explain the components of a hazard communication program; and

(L) explain and give examples of safety and health training requirements specified by standard setting organizations.

(5) The student explores the methods and aspects of project management in relation to engineering projects. The student is expected to:

(A) identify and prioritize engineering tasks for an engineering project plan;

(B) identify and outline the critical path of a set of tasks in an engineering project;

(C) develop a project budget based on billable hours and engineering tasks in a project;

(D) track and maintain time spent on engineering tasks for a given project;

(E) generate a Gantt chart for an engineering project, including project tasks, time to complete tasks, critical path, and schedule of tasks;

(F) develop and implement a systematic folder structure for organizing project documents considering factors such as project phase, discipline, and document type;

(G) apply naming conventions consistently to all project documents to facilitate efficient identification and retrieval;

(H) research and describe best management practices such as quality control and quality assurance, risk management, and project management plan for an engineering project;

(I) evaluate an engineering project for adherence to local, state, and federal regulations;

(J) evaluate an engineering project for adherence to best management practices; and

(K) evaluate an engineering project for implementation of sustainable practices.

(6) The student explores processes involved in the construction phase of an engineering project. The student is expected to:

(A) identify parts of an engineering project manual associated with a construction bid, including bid schedule, bid tabulation, construction plan set, and material specifications;

(B) explain the bid process for a project, including timeline, value engineering, request for information (RFI), request for qualifications (RFQ), request for price (RFP), interview process, bid opening, bid evaluations, and bid award;

(C) develop a quantity take-off for an engineering project; and

(D) identify applicable materials based on the engineering project specifications to conduct a material quantity take-off.

(7) The student researches and identifies methods and divisions of project documentation. The student is expected to:

(A) compare shop drawings and construction documents to identify and rectify variances;

(B) identify and justify applicable material specifications for a given project;

(C) compile and organize material specifications to create a submittal log;

(D) analyze a construction drawing to develop applicable design questions and create an RFI document;

(E) identify and explain the permitting process for an engineering project;

(F) identify permitting stakeholders and explain stakeholder roles in the permitting process;

(G) identify permitting entities and create a permit request;

(H) identify and explain the purpose and parts of a change order for a project;

(I) develop a method of documentation to track project changes, including field changes, design changes, and change orders, and analyze cost and schedule impacts of project changes; and

(J) identify and draft applicable completion documents, including certificate of occupancy, temporary certificate of occupancy, field changes, as-built or plan of record documents, and engineer's certification of substantial completion.

(8) The student explores applicable federal, state, and local regulations as they pertain to engineering projects. The student is expected to:

(A) research federal regulatory agencies and describe the role federal regulatory agencies serve in relation to engineering projects such as the Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), and Army Corps of Engineers;

(B) research state regulatory agencies such as the Texas Department of Transportation (TxDOT), Texas Commission on Environmental Quality (TCEQ), and the Texas Railroad Commission (TRC) and describe the role these agencies serve in relation to engineering projects;

(C) research local regulatory agencies such as cities and counties and describe the role local regulatory agencies serve in relation to engineering projects; and

(D) describe local codes and ordinances affecting construction and development activities.

(9) The student explores methods of risk management and the effects on engineering projects. The student is expected to:

(A) identify and describe various methods of risk management related to engineering projects;

(B) identify and analyze the potential risks in a project with respect to the project stakeholders;

(C) develop and communicate a job hazard analysis (JHA) for a given project task;

(D) identify factors of contingency related to an engineering project;

(E) create a contingency estimate analyzing events that can cause potential losses to a project; and

(F) present a risk management plan for a given project.

(10) The student examines components of value engineering practices in relation to an engineering project. The student is expected to:

(A) describe value engineering;

(B) identify and analyze common areas of engineering projects that are susceptible to value engineering;

(C) analyze an existing project design and cost estimate to identify potential cost saving areas;

(D) describe an opinion of probable cost (OPC) associated with an engineering project;

(E) generate an OPC for an engineering project, including construction mobilization, material cost, material quantities, waste disposal, contingency, and total price; and

(F) create a cost-benefit analysis of an engineering project that compares the monetary cost of the project to the benefit to end user.

(11) The student demonstrates effective leadership and communications skills necessary to manage engineering projects. The student is expected to:

(A) identify and describe the various team roles for an engineering project;

(B) research and describe various project management methodologies;

(C) create a schedule of roles for team members in an engineering project;

(D) conduct an effective kick-off meeting to communicate the project management plan for a given engineering project;

(E) evaluate how project team dynamics impact the successful completion of a project;

(F) prepare and document effective meeting agendas;

(G) record, prepare, and distribute clear and accurate meeting minutes;

(H) research and describe effective leadership qualities;

(I) research and identify examples of effective leadership styles;

(J) identify and describe personal leadership styles and strengths; and

(K) evaluate how student leadership styles impact the success of the project team.

§127.418. Architectural Engineering (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 11 and 12. Prerequisite: Civil Engineering I. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Architectural Engineering use principles of engineering and design tools to create innovative, functional, and sustainable buildings. Students develop cursory knowledge and essential skills to understand the design of buildings, including the mechanical, electrical, plumbing, and structural systems, while also planning the construction process. They engage in project planning, building and system analysis, site investigation, and the integration of sustainable design and construction practices for an architectural engineering project.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:

(A) describe and implement the stages of an engineering design process to construct a model;

(B) explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, maintainability, and technology, impact stages of the engineering design process;

(C) explain how stakeholders impact an engineering design process; and

(D) analyze how failure is often an essential component of the engineering design process.

(3) The student explores the methods and aspects of project management in relation to projects. The student is expected to:

(A) research and explain the process and phases of project management, including initiating, planning, executing, and closing;

(B) explain the roles and responsibilities of team members, including project managers and leads;

(C) research and evaluate methods and tools available for managing a project;

(D) discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;

(E) describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;

(F) explain how a project budget, including materials, equipment, and labor, is developed and maintained; and

(G) describe the importance of management of change (MOC) and how MOC applies to project planning.

(4) The student explores the origin and application of basic building types. The student is expected to:

(A) identify and describe the fundamental parts of a building, including foundations, floors, walls, roof, and utility systems;

(B) identify and describe the visual design elements of various building types, including residential, commercial, institutional, and industrial buildings; and

(C) research and describe the evolution of the built space and development of building forms.

(5) The student understands the properties of common building materials and construction methods. The student is expected to:

(A) identify and describe common building materials such as wood, masonry, concrete, metal, glass, aggregate, and plastic;

(B) identify and describe common roofing materials such as thatch, wood, metal, sod, and asphalt;

(C) describe traditional construction methods such as wood framing, tilt-wall, masonry, and steel;

(D) describe contemporary construction methods such as prefabricated, modular, and additive construction (3D printing);

(E) identify and describe standard building methods such as casting, cutting, drilling, driving, and fastening for the construction of buildings;

(F) research and describe sustainable building materials, methods, and costs; and

(G) describe how building material selection is impacted influenced by certifications such as Leadership in Energy and Environmental Design (LEED) or Energy Star.

(6) The student understands the application of codes and regulations to building projects. The student is expected to:

(A) explain the purpose of local building codes, including public health and safety, structural, and utility codes;

(B) describe land use regulations to identify zoning ordinances and allowable uses of real property;

(C) describe how zoning regulations are used to control land use and development;

(D) identify standard accessibility features such as ramps, elevators, parking, handrails, and fire alarm horn strobe as specified in codes and regulations such as the American Disability Act (ADA) and the Texas Accessibility Standards (TAS);

(E) explain how codes and building regulations constrain aspects of building design, including the structure, site design, utilities, and building usage;

(F) explain how codes and building regulations constrain aspects of building construction, including the structure, site construction, utilities, and building usage; and

(G) classify a building according to its use type, occupancy, and construction type using the International Building Code.

(7) The student explores the various building systems. The student is expected to:

(A) identify and describe various building envelopes such as tilt-wall, glazing, brick, and Exterior Insulation Finishing System (EIFS);

(B) describe the components of building envelopes, including foundation, walls, wall openings, roofs, roof penetrations, insulation, and building membranes;

(C) research and describe different types of insulating materials;

(D) describe different types of windows and doors;

(E) identify the main components and describe the purpose of mechanical systems within a building, including heating ventilation and air conditioning (HVAC), air handler, boiler, fire protection and suppression, lift, chilled water equipment, and emergency power systems;

(F) describe how programs and certifications such as LEED potentially impact the selection of building systems;

(G) identify the main components and describe the purpose of electrical systems within a building, including meters, panels, lighting, receptacles, transformers, generators, and low-voltage systems; and

(H) identify the main components and describe the purpose of plumbing systems within a building, including meters, main supply lines, branch lines, sewer lines, traps, risers, fire suppression, appurtenances, and fixtures.

(8) The student examines building foundations and structures. The student is expected to:

(A) identify and analyze the various types of building foundations, including slab on grade, pier and beam, spread footing, mat footing, drilled piers, pylons, waffle slab, and post-tension slab;

(B) classify a soil sample according to grain size and plasticity;

(C) calculate the plasticity index of a soil sample;

(D) determine the united soil classification system designation from a site soil sample analysis;

(E) describe the forces common to structural engineering calculations, including gravity, tension, compression, flexure, and torsion;

(F) describe the loads common to structural engineering calculations, including dead load, live load, environmental, and other load paths such as lateral and concentrated;

(G) diagram and explain how applied loads and forces are resisted in a structure and transferred to the Earth;

(H) diagram a simply supported beam subjected to loading conditions to determine reaction forces;

(I) sketch diagrams to determine the maximum shear and moment resulting in the beam;

(J) identify the different types of trusses, including simple, planar, and space frame trusses;

(K) diagram a truss subjected to loading conditions to determine reaction forces and identify the zero force members;

(L) explain why design loads are dictated by building codes;

(M) identify the composition and describe the ratios of ingredients in different concrete mixtures;

(N) describe the purpose of various concrete admixtures, including air entrainer, reducer, retarder, and accelerator;

(O) explain why various admixtures are selected for a project such as curing time, ambient climate, and permeability;

(P) conduct concrete compression and splitting-tension tests and compare strength and failures in a concrete mixture; and

(Q) analyze a concrete mixture by performing a slump test.

(9) The student designs and develops plans for the building systems. The student is expected to:

(A) develop a stormwater management system for a building that includes roof drainage calculations, roof drain design, and downspout sizing and location;

(B) design ingress and egress for a building that complies with local, state, and federal codes and regulations;

(C) develop building design and engineering plans that incorporate energy conservation techniques;

(D) recommend and defend an appropriate foundation design for a building type;

(E) design, modify, and plan structures using 3D software;

(F) construct building drawings using advanced computer-aided design drafting skills;

(G) create three-dimensional views of a building design;

(H) create three-dimensional solid models of the building;

(I) design and present a final effective building design for critique;

(J) develop preliminary drawings of a building or structural design;

(K) develop a site plan using maximum orientation of the building relative to views, sun, and wind direction;

(L) draw schematic site plans, floor plans, roof plans, building elevations, sections, and perspectives using design development techniques;

(M) draw scaled wall thickness plans, interior elevations, and sections;

(N) develop details, floor and wall sections, ceiling and roof sections, door and window sections, and other sections as required within a building design;

(O) review and revise draft construction documents to incorporate results from structural analysis such as beam, truss, and foundation calculations conducted for the project; and

(P) review and revise draft construction documents to incorporate results from building system analysis such as mechanical, electrical, and plumbing calculations conducted for the project.

(10) The student designs and develops plans for the building site. The student is expected to:

(A) identify and describe various site constraints, including utilities, grading, drainage, transportation access, environmental, regulatory requirement, and rights-of-way constraints;

(B) explain the purpose of low impact development techniques in site development such as to reduce the impact on stormwater runoff quantity and quality;

(C) develop preliminary drawings of a building site design;

(D) develop building site design and engineering plans that integrate solutions to site constraints as appropriate;

(E) describe how soil characteristics impact building design;

(F) determine the type, sizing, and placement of site features, including parking lots, entrance and exits road, pedestrian and handicap access, and storm water facilities, that comply with local codes and regulations;

(G) evaluate a site to appropriately locate and orient a building or structure;

(H) develop site drawings using advanced computer-aided design drafting skills; and

(I) design and present a final effective site design for critique.

(11) The student explores construction phase processes for a building design project. The student is expected to:

(A) calculate quantities of building components such as the total square units of wall covering, the total cubic units of concrete, linear units of wire, and doors and windows;

(B) develop a material quantity take-off for a building project;

(C) develop an Opinion of Probable Cost (OPC) for a building project;

(D) document elements of the building construction that comply with design criteria such as those outlined in LEED;

(E) identify components of a bid tabulation, including item description, material quantity, unit measure, unit price, and total price;

(F) compare a project bid tabulation with corresponding construction documents to verify all items are included;

(G) create a project bid tabulation;

(H) identify and describe the parts of a construction project manual, including invitation to bidders, instruction for bidders, project information, construction contracts, bid tabulation, maintenance bonds, performance bonds, payment bonds, specifications, insurance certificates, and legal requirements; and

(I) develop an organizational chart and Gantt chart for the construction of a project.

§127.419. Surveying and Geomatics (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I. Recommended prerequisites: Geometry and Introduction to Computer-Aided Design and Drafting. Students shall be awarded two credits for successful completion of this course.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Students enrolled in Surveying and Geomatics are introduced to the principles and practices essential to the field of surveying. Throughout this course students investigate different tools, applications, and techniques used to capture and process geospatial data. They also use functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of visual representations of data in multiple mediums, ethical considerations, and the legal or regulatory impact of surveying on the community and society.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;

(D) identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities and how these practices optimize efficiency and results;

(E) define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;

(F) identify and discuss the importance of professionalism, standards of conduct, and ethics as defined by the Texas Engineering Practice Act and rules concerning the practice of engineering and surveying;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and

(K) describe the roles and responsibilities of managers.

(2) The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:

(A) explain the importance of defining an engineering problem as an initial step in the engineering design process;

(B) describe the research stage of the engineering design process;

(C) define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;

(D) explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;

(E) describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;

(F) describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;

(G) explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and

(H) describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.

(3) The student explores and develops skills to solve problems, make decisions, and manage a project. The student is expected to:

(A) discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;

(B) identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;

(C) define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;

(D) identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and

(E) identify strategies to solve problems and describe how problem solving is utilized to accomplish personal and team objectives.

(4) The student understands the foundations of occupational safety and health. The student is expected to:

(A) explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;

(B) explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;

(C) explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;

(D) identify and explain the appropriate use of types of personal protective equipment used in industry;

(E) discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;

(F) describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;

(G) analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;

(H) identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;

(I) describe the elements of a safety and health program, including management leadership, worker participation, and education and training;

(J) explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;

(K) explain the components of a hazard communication program; and

(L) explain and give examples of safety and health training requirements specified by standard setting organizations.

(5) The student examines the functional mathematics of surveying. The student is expected to:

(A) calculate central tendencies of a given data set, including mean, median, and mode;

(B) calculate standard deviation of a given data set;

(C) identify parts of a normal distribution curve;

(D) define the Empirical Rule and analyze the distribution of a data set using the Empirical Rule;

(E) define systematic and random error;

(F) identify and describe the relationship between accuracy and precision;

(G) identify the types and properties of various polygons;

(H) solve for the parts of a triangle, including Pythagorean theorem, sine, cosine, tangent, arcsine, arccosine, and arctangent;

(I) identify the properties of circles;

(J) solve for the parts of a unit circle, including diameter, radius, circumference, area, chord, arclength, delta, and tangent;

(K) identify and solve for linear functions, including standard form, slope-intercept form, point-slope form, and the distance between two points, on a Cartesian Coordinate System; and

(L) identify and solve for volumetric calculations of three-dimensional shapes, including a cylinder, sphere, rectangular prisms, trapezoidal prisms, and triangular prisms.

(6) The student researches and understands global positioning systems (GPS) used in surveying. The student is expected to:

(A) identify and explain data terminology related to GPS such as latitude, longitude, datum, ellipsoid, geoid, orthometric height, World Geodetic System 1984, Earth Centered Earth Fixed (ECEF), 3D coordinate geometry, and state plane coordinate system;

(B) explain the different types and applications of GPS surveying, including static, differential, and real-time kinematic (RTK);

(C) tie down a point and derive a geographic latitude and longitude coordinate using GPS;

(D) identify and explain GPS components, including the space segment, control segment, and the user segment;

(E) describe the functions of a GPS satellite;

(F) describe the functions of GPS ground stations;

(G) describe the functions of GPS receivers; and

(H) generate a map using geodetic coordinates.

(7) The student researches and understands the industry standard methods and means of collecting various topographical data used in the civil engineering and construction professions. The student is expected to:

(A) research and explain the components of optomechanical equipment, including vertical and horizontal plates and optics;

(B) explain the types of optomechanical equipment, including theodolite, level, and total station, and their application;

(C) explain methods of remote sensing, including unmanned aerial vehicle (UAV), light detection and ranging (LiDAR), sonar, ground penetrating radar, underwater remotely operated vehicle (ROV), photogrammetry, and gravity satellite;

(D) identify the tools used to make distance measurements, including steel tape, electric distance meter, pacing, odometer, stadia, and estimating;

(E) explain the various methods to measure the distance between two points on the surface of the Earth;

(F) measure the distance between two points on the surface of the Earth using different methods and tools;

(G) compare the data collected from different methods used to measure the distance between two points on the surface of the Earth for accuracy;

(H) identify the tools used to make angular measurements, including protractor, compass, theodolite, total station, and estimating;

(I) explain the various methods to measure the angle between two vectors;

(J) measure the angle between two vectors using different methods and tools;

(K) compare the data collected from different methods used to measure the angles between two vectors for accuracy;

(L) describe the use of control points and National Geodetic Survey (NGS) monuments;

(M) identify the tools used to measure elevation, including level, theodolite, total station, barometer, and estimating;

(N) measure and calculate the height of an object using a theodolite;

(O) establish the elevation of a point assuming the elevation of a relative point is zero using various methods and tools;

(P) compare the data collected from different methods used to measure elevation between two points for accuracy;

(Q) identify and adhere to regulations of UAV piloting and control specified by the Federal Aviation Administration Small UAS Rule (Part A107); and

(R) explain the purposes of specialized surveys used in engineering, including engineering topographic, control, construction, boundary, hydrographic, optical tooling, American Land Title Association (ALTA), photogrammetric, and as-built survey.

(8) The student records meta-data associated with surveying measurements and data collection. The student is expected to:

(A) create and maintain field notes within a comprehensive field book that includes a cover page and field data;

(B) describe the necessary components of a field book cover page, including weather data, project site data, personnel data, equipment data, and type of survey conducted; and

(C) record surveying information in a field book, including differential level notes, collected horizontal and vertical angles, site sketches, and topographic data.

(9) The student researches and understands the industry standard methods and means of analyzing various topographical data used in the civil engineering and construction professions. The student is expected to:

(A) explain the process to generate a control survey;

(B) identify and explain symbols found on survey drawings; and

(C) identify and describe software used to create drawings and analyze survey data.

(10) The student develops and communicates visual representations of topographical data used in civil engineering and construction documentation and presentations. The student is expected to:

(A) explain the process of drafting a construction document to scale;

(B) determine and demonstrate which scale best fits a standard size drawing sheet;

(C) explain the relationship between a construction document's specifications, plans, legend, and scale;

(D) explain the difference between grid and surface distances;

(E) identify the local scale factor that transforms collected grid distances to surface distances for a given survey;

(F) generate a scaled topography map using collected field data;

(G) create a surface profile from a baseline drawn on a topographic map; and

(H) stake out points from design files, maps, or real-property descriptions.

(11) The student explores how a practicing surveyor follows in the footsteps of the original surveyor. The student is expected to:

(A) explain why and how surveyors defer to the work of existing surveys;

(B) define boundary monumentation;

(C) research and explain natural and artificial monuments;

(D) explain the methods to adjust real-property boundaries for the change in natural monuments over time, including riparian and littoral boundaries;

(E) interpret a legal description of a real property;

(F) identify an original survey boundary by conducting land record research using the Texas General Land Office (GLO);

(G) explain the historical significance of land grants in Texas;

(H) explain how a boundary survey protects the public;

(I) create a property boundary drawing using collected field data; and

(J) explain the dignity of calls, including natural objects, artificial objects, courses, distances, and acreage, as specified in Texas Administrative Code, Title 31, Part 1, Chapter 7, §7.5 (relating to Dignity of Calls).

(12) The student understands the different methods of measurements and associated errors. The student expected to:

(A) define the different units of linear measurement, including U.S. feet, international feet, chains, rod, mile, fathom, furlong, varas, and metric units, commonly used in the surveying and civil engineering industry;

(B) define the different units of angular measurement, including vertical angles, horizontal angles, bearings, azimuths, degrees-minutes-seconds, decimal degrees, seconds of arc, and gradians;

(C) define the different units of volumetric measurement, including cubic feet, cubic yards, tons, and acre-feet;

(D) calculate and define area measurements such as acre, hectare, square feet, square mile, league, or sitio;

(E) convert linear, angular, and area measurements between different units;

(F) determine a change in elevation between two or more points by performing a differential level loop;

(G) measure the distance between two or more points using industry acceptable methods such as taping, electronic distance meter, total station, pacing, odometer, tacheometry, GPS, and stadia;

(H) compare the errors from two or more methods of calculating the distance between two or more points; and

(I) calculates various types of errors associated with survey data.

(13) The student researches and understands surveying and geomatics throughout history. The student is expected to:

(A) explain how Eratosthenes first derived the circumference of the Earth;

(B) research and describe the change in methods and precision used to calculate the circumference of the Earth; and

(C) describe the surveying that contributed to great works of civil engineering before and after the Age of Exploration.

(14) The student researches and understands the code of ethics pertaining to civil engineering and surveyors. The student is expected to:

(A) research and identify the legal definitions and descriptions surveyors use to delineate and report survey data; and

(B) research and identify engineering ethics established by organizations such as the American Society of Civil Engineers, the National Society of Professional Engineers, the Texas Board of Professional Engineers and Land Surveyors, the National Council of Examiners for Engineering and Surveying, and the National Institute of Engineering Ethics.

§127.452. Practicum in Engineering (Two Credits), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grade 12. Prerequisites: Algebra I and Geometry and a minimum of two credits with at least one course in a Level 2 or higher course from the Engineering Career Cluster.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Practicum in Engineering is designed to give students supervised practical application of knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experiences such as employment, independent study, internships, assistantships, mentorships, or laboratories. To prepare for careers in engineering, students must attain academic knowledge and skills, acquire technical knowledge and skills related to the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and

audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how a professional engineer serves the local and global community. The student is expected to:

(A) research and identify student and professional engineering organizations and the benefits of membership such as networking platforms, training and educational opportunities, and participating in community initiatives;

(B) explain an engineer's role and how various engineering roles serve the organization, community, and society; and

(C) evaluate how the work of student or professional engineering organizations impact the local or global community such as recommended practices and issuing standards.

(3) The student uses critical thinking and problem solving in the work-based learning experience. The student is expected to:

(A) conduct technical research to gather information, identify gaps, and make decisions in the work-based learning experience;

(B) develop creative and innovative solutions to problems in the work-based learning experience;

(C) analyze and compare alternative designs for an effective solution to a problem in the work-based learning experience; and

(D) evaluate and present solutions to problems in the work-based learning experience.

(4) The student understands and demonstrates how effective leadership and teamwork skills enable the accomplishment of goals and objectives. The student is expected to:

(A) analyze leadership characteristics such as trustworthiness, positive attitude, integrity, and work ethic;

(B) explain and demonstrate effective characteristics of teamwork;

(C) explain and demonstrate responsibility for shared group and individual work tasks in the work-based learning experience;

(D) describe and analyze how strategies such as meeting deadlines, showing respect for all individuals, and communicating clearly and timely contribute to effective working relationships and accomplishing objectives; and

(E) research and identify opportunities to participate in extracurricular engineering activities.

(5) The student demonstrates oral and written communication skills in delivering and receiving information and ideas. The student is expected to:

(A) apply appropriate content knowledge, technical concepts, and vocabulary to analyze information and follow directions;

(B) use professional communication skills such as using technical terminology, email etiquette, and following the organization or team communication plan and hierarchy when delivering and receiving information in the work-based learning experience;

(C) identify and analyze information contained in informational texts, internet sites, or technical materials in the work-based learning experience;

(D) describe and analyze verbal and nonverbal cues and behaviors such as body language, tone, and interrupting to enhance communication in the work-based learning experience; and

(E) apply active listening skills to receive and clarify information in the work-based learning experience.

(6) The student reflects on the work-based learning experience to prepare for postsecondary and employment success. The student is expected to:

(A) assess and evaluate personal strengths and weaknesses in knowledge and skill proficiency and contributions to a project related to the work-based learning experience;

(B) develop and maintain a professional portfolio to include:

(i) attainment of technical skill competencies;

(ii) licensures or certifications;

(iii) recognitions, awards, and scholarships;

(iv) extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;

(v) abstract of key points of the practicum;

(vi) resume;

(vii) samples of work; and

(viii) evaluation from the practicum supervisor; and

(C) present the professional portfolio to interested stakeholders.

(7) The student develops a presentation describing the culmination of skills and knowledge gained from the work-based learning experience. The student is expected to:

(A) develop a professional presentation to display and communicate the work-based learning experience, including goals and objectives, levels of achievement, skills and knowledge gained,

areas for improvement and personal growth, challenges encountered throughout the experience, and a plan for future goals;

(B) identify an appropriate audience and coordinate the presentation of findings related to the work-based learning experience;

(C) present findings in a professional manner using concise language, engaging content, relevant media, and clear speech; and

(D) analyze feedback received from a presentation.

§127.453. Extended Practicum in Engineering (One Credit), Adopted 2025.

(a) Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.

(b) General requirements. This course is recommended for students in Grade 12. The practicum course is a paid or unpaid capstone experience for students participating in a coherent sequence of career and technical education courses in the Engineering Career Cluster. Prerequisites: Algebra I and Geometry and a minimum of two credits with at least one course in a Level 2 or higher course from the Engineering Career Cluster. This course must be taken concurrently with Practicum in Engineering and may not be taken as a stand-alone course. Students shall be awarded one credit for successful completion of this course. A student may repeat this course once for credit provided that the student is experiencing different aspects of the industry and demonstrating proficiency in additional and more advanced knowledge and skills.

(c) Introduction.

(1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

(2) The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and mapping technician.

(3) Extended Practicum in Engineering is designed to give students supervised practical application of previously studied knowledge and skills. Practicum experiences can occur in a variety of locations appropriate to the nature and level of experience.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

(5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(d) Knowledge and skills.

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;

(B) analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;

(C) present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;

(D) use time-management skills independently and in groups to prioritize tasks, follow schedules, and tend to goal-relevant activities in a way that optimizes efficiency and results;

(E) describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;

(F) explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers apply to engineering practice;

(G) demonstrate respect for differences in the workplace;

(H) identify the importance and benefits of meritocracy, a hard work ethic, and equal opportunity in the workplace;

(I) identify consequences relating to discrimination and harassment;

(J) analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;

(K) identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and

(L) compare skills and characteristics of managers and leaders in the workplace.

(2) The student understands how a professional engineer serves the local and global community. The student is expected to:

(A) research and identify student and professional engineering organizations and the benefits of membership such as networking platforms, training and educational opportunities, and participating in community initiatives;

(B) explain an engineer's role and how various engineering roles serve the organization, community, and society; and

(C) evaluate how the work of student or professional engineering organizations impact the local or global community such as recommended practices and issuing standards.

(3) The student uses critical thinking and problem solving in the work-based learning experience. The student is expected to:

(A) conduct technical research to gather information, identify gaps, and make decisions in the work-based learning experience;

(B) develop creative and innovative solutions to problems in the work-based learning experience;

(C) analyze and compare alternative designs for an effective solution to a problem in the work-based learning experience; and

(D) evaluate and present solutions to problems in the work-based learning experience.

(4) The student understands and demonstrates how effective leadership and teamwork skills enable the accomplishment of goals and objectives. The student is expected to:

(A) analyze leadership characteristics such as trustworthiness, positive attitude, integrity, and work ethic;

(B) explain and demonstrate effective characteristics of teamwork;

(C) explain and demonstrate responsibility for shared group and individual work tasks in the work-based learning experience;

(D) describe and analyze how strategies such as meeting deadlines, showing respect for all individuals, and communicating clearly and timely contribute to effective working relationships and accomplishing objectives; and

(E) research and identify opportunities to participate in extracurricular engineering activities.

(5) The student demonstrates oral and written communication skills in delivering and receiving information and ideas. The student is expected to:

(A) apply appropriate content knowledge, technical concepts, and vocabulary to analyze information and follow directions;

(B) use professional communication skills such as using technical terminology, email etiquette, and following the organization or team communication plan and hierarchy when delivering and receiving information in the work-based learning experience;

(C) identify and analyze information contained in informational texts, internet sites, or technical materials in the work-based learning experience;

(D) describe and analyze verbal and nonverbal cues and behaviors such as body language, tone, and interrupting to enhance communication in the work-based learning experience; and

(E) apply active listening skills to receive and clarify information in the work-based learning experience.

(6) The student reflects on the work-based learning experience to prepare for postsecondary and employment success. The student is expected to:

(A) assess and evaluate personal strengths and weaknesses in knowledge and skill proficiency and contributions to a project related to the work-based learning experience;

(B) develop and maintain a professional portfolio to include:

(i) attainment of technical skill competencies;

(ii) licensures or certifications;

(iii) recognitions, awards, and scholarships;

(iv) extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;

(v) abstract of key points of the practicum;

(vi) resume;

(vii) samples of work; and

(viii) evaluation from the practicum supervisor; and

(C) present the professional portfolio to interested stakeholders.

(7) The student develops a presentation describing the culmination of skills and knowledge gained from the work-based learning experience. The student is expected to:

(A) develop a professional presentation to display and communicate the work-based learning experience, including goals and objectives, levels of achievement, skills and knowledge gained, areas for improvement and personal growth, challenges encountered throughout the experience, and a plan for future goals;

(B) identify an appropriate audience and coordinate the presentation of findings related to the work-based learning experience;

(C) present findings in a professional manner using concise language, engaging content, relevant media, and clear speech; and

(D) analyze feedback received from a presentation.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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CHAPTER 130. TEXAS ESSENTIAL KNOWLEDGE AND SKILLS FOR CAREER AND TECHNICAL EDUCATION

(Editor's note: In accordance with Texas Government Code, §2002.014, which permits the omission of material which is "cumbersome, expensive, or otherwise inexpedient," the Figure: 19 TAC Chapter 130 - Preamble is not included in the print version of the Texas Register. The figure is available in the on-line version of the February 28, 2025, issue of the Texas Register.)

The State Board of Education (SBOE) proposes the repeal of §§130.1 - 130.12, 130.15 - 130.32, 130.41 - 130.72, 130.81 - 130.127, 130.131 - 130.144, 130.180 - 130.182, 130.184 - 130.190, 130.271 - 130.276, 130.279 - 130.287, 130.301 - 130.307, 130.311 - 130.318, 130.351 - 130.367, 130.381 - 130.383, 130.385 - 130.389, 130.441 - 130.447, 130.449 - 130.466, and 130.485 - 130.491, concerning Texas Essential Knowledge and Skills (TEKS) for career and technical education (CTE). The proposed repeals would move the TEKS to 19 TAC Chapter 127 in order to ensure that all CTE TEKS are in the same chapter in administrative rule.

BACKGROUND INFORMATION AND JUSTIFICATION: In accordance with statutory requirements that the SBOE identify by rule the essential knowledge and skills of each subject in the required curriculum, the SBOE follows a board-approved cycle to review and revise the essential knowledge and skills for each subject.

The TEKS for courses associated with 14 CTE career clusters are codified by subchapter in 19 TAC Chapters 127 and 130. In December 2020, the SBOE began initial steps to prepare for

the review and revision of CTE courses in programs of study for the education and training; health science; and science, technology, engineering, and mathematics career clusters. Two additional courses eligible to satisfy a graduation requirement in science were also part of the review. The board approved for second reading and final adoption new TEKS for these courses in November 2021 and January, April, and June 2022.

At the November 2023 SBOE meeting, the board approved new CTE TEKS in Chapter 127 for courses in career preparation and entrepreneurship, which became effective February 13, 2024, and were implemented beginning in the 2024-2025 school year. At the April 2024 meeting, the board approved new CTE TEKS in Chapter 127 for courses in agribusiness, animal science, plant science, and aviation maintenance and for two CTE courses that can satisfy a graduation requirement in science that will be implemented beginning in the 2025-2026 school year.

Due to the current structure of Chapter 130, there are not enough sections to add new CTE courses under consideration in their assigned subchapters. To accommodate the addition of new and future courses, the board began the process of moving the CTE TEKS from Chapter 130 to Chapter 127 in order to keep all the TEKS together in administrative rule and avoid confusion.

The proposed repeals would move all remaining courses in Chapter 130 to Chapter 127. The related implementation sections would be repealed and not re-proposed. Instead, implementation information would be added to each individual course. Additionally, each new course would include the level for the course in a CTE program of study, if applicable, and language would be added to encourage students to participate in extended learning experiences like organizations that foster leadership and career development in the profession such as student chapters of related professional associations.

The following figure provides a crosswalk between the current TEKS in Chapter 130 and the new location of those TEKS in Chapter 127. The proposed new sections can be found in the Proposed Rules section of this issue of the *Texas Register*.

Figure: 19 TAC Chapter 130 - Preamble

The SBOE approved the proposed repeals for first reading and filing authorization at its January 31, 2025 meeting.

FISCAL IMPACT: Monica Martinez, associate commissioner for standards and programs, has determined that for the first five years the proposal is in effect, there are no additional costs to state or local government, including school districts and open-enrollment charter schools, required to comply with the proposal.

LOCAL EMPLOYMENT IMPACT: The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code, §2001.022.

SMALL BUSINESS, MICROBUSINESS, AND RURAL COMMUNITY IMPACT: The proposal has no direct adverse economic impact for small businesses, microbusinesses, or rural communities; therefore, no regulatory flexibility analysis specified in Texas Government Code, §2006.002, is required.

COST INCREASE TO REGULATED PERSONS: The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code, §2001.0045.

TAKINGS IMPACT ASSESSMENT: The proposal does not impose a burden on private real property and, therefore, does not constitute a taking under Texas Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT: Texas Education Agency (TEA) staff prepared a Government Growth Impact Statement assessment for this proposed rulemaking. During the first five years the proposed rulemaking would be in effect, it would repeal existing regulations by transferring existing CTE TEKS from Chapter 130 to new locations in Chapter 127.

The proposed rulemaking would not create or eliminate a government program; would not require the creation of new employee positions or elimination of existing employee positions; would not require an increase or decrease in future legislative appropriations to the agency; would not require an increase or decrease in fees paid to the agency; would not create a new regulation; would not expand or limit an existing regulation; would not increase or decrease the number of individuals subject to its applicability; and would not positively or adversely affect the state's economy.

PUBLIC BENEFIT AND COST TO PERSONS: Ms. Martinez has determined that for each year of the first five years the proposal is in effect, the public benefit anticipated as a result of enforcing the proposal would be to improve access to and organization of the CTE TEKS and avoid confusion regarding the revised TEKS. There is no anticipated economic cost to persons who are required to comply with the proposal.

DATA AND REPORTING IMPACT: The proposal would have no data or reporting impact.

PRINCIPAL AND CLASSROOM TEACHER PAPERWORK REQUIREMENTS: TEA has determined that the proposal would not require a written report or other paperwork to be completed by a principal or classroom teacher.

PUBLIC COMMENTS: The public comment period on the proposal begins February 28, 2025, and ends at 5:00 p.m. on March 31, 2025. The SBOE will take registered oral and written comments on the proposal at the appropriate committee meeting in April 2025 in accordance with the SBOE board operating policies and procedures. A request for a public hearing on the proposal submitted under the Administrative Procedure Act must be received by the commissioner of education not more than 14 calendar days after notice of the proposal has been published in the *Texas Register* on February 28, 2025.

SUBCHAPTER A. AGRICULTURE, FOOD, AND NATURAL RESOURCES

19 TAC §§130.1 - 130.12, 130.15 - 130.32

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.1. Implementation of Texas Essential Knowledge and Skills for Agriculture, Food, and Natural Resources, Adopted 2015.

§130.2. Principles of Agriculture, Food, and Natural Resources (One Credit), Adopted 2015.

§130.3. Professional Standards in Agribusiness (One-Half Credit), Adopted 2015.

§130.4. Agribusiness Management and Marketing (One Credit), Adopted 2015.

§130.5. Mathematical Applications in Agriculture, Food, and Natural Resources (One Credit), Adopted 2015.

§130.6. Equine Science (One-Half Credit), Adopted 2015.

§130.7. Livestock Production (One Credit), Adopted 2015.

§130.8. Small Animal Management (One-Half Credit), Adopted 2015.

§130.9. Veterinary Medical Applications (One Credit), Adopted 2015.

§130.10. Advanced Animal Science (One Credit), Adopted 2015.

§130.11. Energy and Natural Resource Technology (One Credit), Adopted 2015.

§130.12. Advanced Energy and Natural Resource Technology (One Credit), Adopted 2015.

§130.15. Food Technology and Safety (One Credit), Adopted 2015.

§130.16. Food Processing (One Credit), Adopted 2015.

§130.17. Wildlife, Fisheries, and Ecology Management (One Credit), Adopted 2015.

§130.18. Forestry and Woodland Ecosystems (One Credit), Adopted 2015.

§130.19. Range Ecology and Management (One Credit), Adopted 2015.

§130.20. Floral Design (One Credit), Adopted 2015.

§130.21. Landscape Design and Management (One-Half Credit), Adopted 2015.

§130.22. Turf Grass Management (One-Half Credit), Adopted 2015.

§130.23. Horticultural Science (One Credit), Adopted 2015.

§130.24. Greenhouse Operation and Production (One Credit), Adopted 2015.

§130.25. Advanced Plant and Soil Science (One Credit), Adopted 2015.

§130.26. Agricultural Mechanics and Metal Technologies (One Credit), Adopted 2015.

§130.27. Agricultural Structures Design and Fabrication (One Credit), Adopted 2015.

§130.28. Agricultural Equipment Design and Fabrication (One Credit), Adopted 2015.

§130.29. Agricultural Power Systems (Two Credits), Adopted 2015.

§130.30. Agricultural Laboratory and Field Experience (One Credit), Adopted 2015.

§130.31. Practicum in Agriculture, Food, and Natural Resources (Two Credits), Adopted 2015.

§130.32. Extended Practicum in Agriculture, Food, and Natural Resources (One Credit), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Cristina De La Fuente-Valadez
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Texas Education Agency
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For further information, please call: (512) 475-1497

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SUBCHAPTER B. ARCHITECTURE AND CONSTRUCTION

19 TAC §§130.41 - 130.72

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.41. Implementation of Texas Essential Knowledge and Skills for Architecture and Construction, Adopted 2015.

§130.42. Principles of Architecture (One Credit), Adopted 2015.

§130.43. Principles of Construction (One Credit), Adopted 2015.

§130.44. Building Maintenance Technology I (Two Credits), Adopted 2015.

§130.45. Building Maintenance Technology II (Two Credits), Adopted 2015.

§130.46. Construction Management I (Two Credits), Adopted 2015.

§130.47. Construction Management II (Two Credits), Adopted 2015.

§130.48. Construction Technology I (Two Credits), Adopted 2015.

§130.49. Construction Technology II (Two Credits), Adopted 2015.

§130.50. Mill and Cabinetmaking Technology (Two Credits), Adopted 2015.

§130.51. Masonry Technology I (Two Credits), Adopted 2015.

§130.52. Masonry Technology II (Two Credits), Adopted 2015.

§130.53. Architectural Design I (One Credit), Adopted 2015.

§130.54. Architectural Design II (Two Credits), Adopted 2015.

§130.55. Interior Design I (One Credit), Adopted 2015.

§130.56. Interior Design II (Two Credits), Adopted 2015.

§130.57. Electrical Technology I (One Credit), Adopted 2015.

§130.58. Electrical Technology II (Two Credits), Adopted 2015.

§130.59. Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology I (One Credit), Adopted 2015.

§130.60. Heating, Ventilation, and Air Conditioning (HVAC) and Refrigeration Technology II (Two Credits), Adopted 2015.

§130.61. Plumbing Technology I (One Credit), Adopted 2015.

§130.62. Plumbing Technology II (Two Credits), Adopted 2015.

§130.63. Practicum in Construction Management (Two Credits), Adopted 2015.

§130.64. Practicum in Construction Technology (Two Credits), Adopted 2015.

§130.65. Practicum in Masonry Technology (Two Credits), Adopted 2015.

§130.66. Practicum in Architectural Design (Two Credits), Adopted 2015.

§130.67. Practicum in Interior Design (Two Credits), Adopted 2015.

§130.68. Extended Practicum in Construction Management (One Credit), Adopted 2015.

§130.69. Extended Practicum in Construction Technology (One Credit), Adopted 2015.

§130.70. Extended Practicum in Masonry Technology (One Credit), Adopted 2015.

§130.71. Extended Practicum in Architectural Design (One Credit), Adopted 2015.

§130.72. Extended Practicum in Interior Design (One Credit), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER C. ARTS, AUDIO/VIDEO TECHNOLOGY, AND COMMUNICATIONS

19 TAC §§130.81 - 130.127

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.81. Implementation of Texas Essential Knowledge and Skills for Arts, Audio/Video Technology, and Communications, Adopted 2015.

§130.82. Principles of Arts, Audio/Video Technology, and Communications (One Credit), Adopted 2015.

§130.83. Animation I (One Credit), Adopted 2015.

§130.84. Animation I Lab (One Credit), Adopted 2015.

§130.85. Animation II (One Credit), Adopted 2015.

§130.86. Animation II Lab (One Credit), Adopted 2015.

§130.87. Audio/Video Production I (One Credit), Adopted 2015.

§130.88. Audio/Video Production I Lab (One Credit), Adopted 2015.

§130.89. Audio/Video Production II (One Credit), Adopted 2015.

§130.90. Audio/Video Production II Lab (One Credit), Adopted 2015.

§130.91. Digital Audio Technology I (One Credit), Adopted 2015.

§130.92. Digital Audio Technology II (One Credit), Adopted 2015.

§130.93. Video Game Design (One Credit), Adopted 2015.

§130.94. Printing and Imaging Technology I (One Credit), Adopted 2015.

§130.95. Printing and Imaging Technology I Lab (One Credit), Adopted 2015.

§130.96. Printing and Imaging Technology II (One Credit), Adopted 2015.

§130.97. Printing and Imaging Technology II Lab (One Credit), Adopted 2015.

§130.98. Commercial Photography I (One Credit), Adopted 2015.

§130.99. Commercial Photography I Lab (One Credit), Adopted 2015.

§130.100. Commercial Photography II (One Credit), Adopted 2015.

§130.101. Commercial Photography II Lab (One Credit), Adopted 2015.

§130.102. Fashion Design I (One Credit), Adopted 2015.

§130.103. Fashion Design I Lab (One Credit), Adopted 2015.

§130.104. Fashion Design II (One Credit), Adopted 2015.

§130.105. Fashion Design II Lab (One Credit), Adopted 2015.

§130.106. Graphic Design and Illustration I (One Credit), Adopted 2015.

§130.107. Graphic Design and Illustration I Lab (One Credit), Adopted 2015.

§130.108. Graphic Design and Illustration II (One Credit), Adopted 2015.

§130.109. Graphic Design and Illustration II Lab (One Credit), Adopted 2015.

§130.110. Professional Communications (One-Half Credit), Adopted 2015.

§130.111. Practicum in Animation (Two Credits), Adopted 2015.

§130.112. Practicum in Audio/Video Production (Two Credits), Adopted 2015.

§130.113. Practicum in Printing and Imaging Technology (Two Credits), Adopted 2015.

§130.114. Practicum in Commercial Photography (Two Credits), Adopted 2015.

§130.115. Practicum in Fashion Design (Two Credits), Adopted 2015.

§130.116. Practicum in Graphic Design and Illustration (Two Credits), Adopted 2015.

§130.117. Extended Practicum in Animation (One Credit), Adopted 2015.

§130.118. Extended Practicum in Audio/Video Production (One Credit), Adopted 2015.

§130.119. Extended Practicum in Printing and Imaging Technology (One Credit), Adopted 2015.

§130.120. Extended Practicum in Commercial Photography (One Credit), Adopted 2015.

§130.121. Extended Practicum in Fashion Design (One Credit), Adopted 2015.

§130.122. Extended Practicum in Graphic Design and Illustration (One Credit), Adopted 2015.

§130.123. Digital Design and Media Production (One Credit).

§130.124. Digital Art and Animation (One Credit).

§130.125. 3-D Modeling and Animation (One Credit)

§130.126. Digital Communications in the 21st Century (One Credit).

§130.127. Web Game Development (One Credit).

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER D. BUSINESS MANAGEMENT AND ADMINISTRATION

19 TAC §§130.131 - 130.144

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.131. Implementation of Texas Essential Knowledge and Skills for Business Management and Administration, Adopted 2015.

§130.132. Principles of Business, Marketing, and Finance (One Credit), Adopted 2015.

§130.133. Touch System Data Entry (One-Half Credit), Adopted 2015.

§130.134. Business Law (One Credit), Adopted 2015.

§130.135. Business English (One Credit), Adopted 2015.

§130.136. Foundations of Business Communication and Technologies (One Credit), Adopted 2015.

§130.137. Business Communication and Technologies (One Credit), Adopted 2015.

§130.138. Business Lab (One Credit), Adopted 2015.

§130.139. Business Management (One Credit), Adopted 2015.

§130.140. Global Business (One-Half Credit), Adopted 2015.

§130.141. Virtual Business (One-Half Credit), Adopted 2015.

§130.142. Human Resources Management (One-Half Credit), Adopted 2015.

§130.143. Practicum in Business Management (Two Credits), Adopted 2015.

§130.144. Extended Practicum in Business Management (One Credit), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER F. FINANCE

19 TAC §§130.180 - 130.182, 130.184 - 130.190

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.180. Financial Mathematics (One Credit), Adopted 2015.

§130.181. Implementation of Texas Essential Knowledge and Skills for Finance, Adopted 2015.

§130.182. Money Matters (One Credit), Adopted 2015.

§130.184. Securities and Investments (One Credit), Adopted 2015.

§130.185. Insurance Operations (One Credit), Adopted 2015.

§130.186. Banking and Financial Services (One-Half Credit), Adopted 2015.

§130.187. Accounting I (One Credit), Adopted 2015.

§130.188. Accounting II (One Credit), Adopted 2015.

§130.189. Financial Analysis (One Credit), Adopted 2015.

§130.190. Statistics and Business Decision Making (One Credit), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER J. HUMAN SERVICES

19 TAC §§130.271 - 130.276, 130.279 - 130.287

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge

and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.271. Implementation of Texas Essential Knowledge and Skills for Human Services, Adopted 2015.

§130.272. Principles of Human Services (One Credit), Adopted 2015.

§130.273. Dollars and Sense (One-Half Credit), Adopted 2015.

§130.274. Lifetime Nutrition and Wellness (One-Half Credit), Adopted 2015.

§130.275. Interpersonal Studies (One-Half Credit), Adopted 2015.

§130.276. Counseling and Mental Health (One Credit), Adopted 2015.

§130.279. Family and Community Services (One Credit), Adopted 2015.

§130.280. Practicum in Human Services (Two Credits), Adopted 2015.

§130.281. Principles of Cosmetology Design and Color Theory (One Credit), Adopted 2015.

§130.282. Introduction to Cosmetology (One Credit), Adopted 2015.

§130.283. Cosmetology I (Two Credits), Adopted 2015.

§130.284. Cosmetology II (Two Credits), Adopted 2015.

§130.285. Extended Practicum in Human Services (One Credit), Adopted 2015.

§130.286. Cosmetology I Lab (One Credit), Adopted 2018.

§130.287. Cosmetology II Lab (One Credit), Adopted 2018.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER K. INFORMATION TECHNOLOGY

19 TAC §§130.301 - 130.307, 130.311 - 130.318

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.301. Implementation of Texas Essential Knowledge and Skills for Information Technology, Adopted 2015.

§130.302. Principles of Information Technology (One Credit), Adopted 2015.§

§130.303. Computer Maintenance (One Credit), Adopted 2015.

§130.304. Computer Maintenance Lab (One Credit), Adopted 2015.

§130.305. Networking (One Credit), Adopted 2015.

§130.306. Networking Lab (One Credit), Adopted 2015.

§130.307. Digital Media (One Credit), Adopted 2015.

§130.311. Computer Technician Practicum (Two Credits), Adopted 2015.

§130.312. Practicum in Information Technology (Two Credits), Adopted 2015.

§130.313. Extended Computer Technician Practicum (One Credit), Adopted 2015.

§130.314. Extended Practicum in Information Technology (One Credit), Adopted 2015.

§130.315. Web Communications (One-Half Credit).

§130.316. Web Design (One Credit).

§130.317. Independent Study in Technology Applications (One Credit), Beginning with School Year 2012-2013.

§130.318. Independent Study in Evolving/Emerging Technologies (One Credit).

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER M. MANUFACTURING

19 TAC §§130.351 - 130.367

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.351. Implementation of Texas Essential Knowledge and Skills for Manufacturing, Adopted 2015.

§130.352. Principles of Manufacturing (One Credit), Adopted 2015.

§130.353. Diversified Manufacturing I (One Credit), Adopted 2015.
§130.354. Diversified Manufacturing II (One Credit), Adopted 2015.
§130.355. Manufacturing Engineering Technology I (One Credit), Adopted 2015.
§130.356. Manufacturing Engineering Technology II (One Credit), Adopted 2015.
§130.357. Metal Fabrication and Machining I (Two Credits), Adopted 2015.
§130.358. Metal Fabrication and Machining II (Two Credits), Adopted 2015.
§130.359. Precision Metal Manufacturing I (Two Credits), Adopted 2015.
§130.360. Precision Metal Manufacturing II (Two Credits), Adopted 2015.
§130.361. Precision Metal Manufacturing II Lab (One Credit), Adopted 2015.
§130.362. Introduction to Welding (One Credit), Adopted 2015.
§130.363. Welding I (Two Credits), Adopted 2015.
§130.364. Welding II (Two Credits), Adopted 2015.
§130.365. Welding II Lab (One Credit), Adopted 2015.
§130.366. Practicum in Manufacturing (Two Credits), Adopted 2015.
§130.367. Extended Practicum in Manufacturing (One Credit), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER N. MARKETING

19 TAC §§130.381 - 130.383, 130.385 - 130.389

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.381. Implementation of Texas Essential Knowledge and Skills for Marketing, Adopted 2015.
§130.382. Advertising (One-Half Credit), Adopted 2015.
§130.383. Fashion Marketing (One-Half Credit), Adopted 2015.
§130.385. Social Media Marketing (One-Half Credit), Adopted 2015.
§130.386. Sports and Entertainment Marketing (One-Half Credit), Adopted 2015.
§130.387. Practicum in Marketing (Two Credits), Adopted 2015.
§130.388. Extended Practicum in Marketing (One Credit), Adopted 2015.
§130.389. Advanced Marketing (Two Credits), Adopted 2015.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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SUBCHAPTER P. TRANSPORTATION, DISTRIBUTION, AND LOGISTICS

19 TAC §§130.441 - 130.447, 130.449 - 130.466

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.441. Implementation of Texas Essential Knowledge and Skills for Transportation, Distribution, and Logistics, Adopted 2015.
§130.442. Principles of Transportation Systems (One Credit), Adopted 2015.
§130.443. Principles of Distribution and Logistics (One Credit), Adopted 2015.
§130.444. Introduction to Transportation Technology (One-Half Credit), Adopted 2015.
§130.445. Introduction to Small Engine Technology (One Credit), Adopted 2015.
§130.446. Small Engine Technology (Two Credits), Adopted 2015.
§130.447. Automotive Basics (One Credit), Adopted 2015.
§130.449. Automotive Technology I: Maintenance and Light Repair (Two Credits), Adopted 2015.
§130.450. Automotive Technology II: Automotive Service (Two Credits), Adopted 2015.
§130.451. Advanced Transportation Systems Laboratory (One Credit), Adopted 2015.
§130.452. Introduction to Aircraft Technology (One Credit), Adopted 2015.
§130.453. Aircraft Airframe Technology (Two Credits), Adopted 2015.
§130.454. Aircraft Powerplant Technology (Two Credits), Adopted 2015.
§130.455. Basic Collision Repair and Refinishing (One Credit), Adopted 2015.
§130.456. Collision Repair (Two Credits), Adopted 2015.

§130.457. Paint and Refinishing (Two Credits), Adopted 2015.
§130.458. Diesel Equipment Technology I (Two Credits), Adopted 2015.
§130.459. Diesel Equipment Technology II (Two Credits), Adopted 2015.
§130.460. Energy and Power of Transportation Systems (One Credit), Adopted 2015.
§130.461. Management of Transportation Systems (One Credit), Adopted 2015.
§130.462. Distribution and Logistics (One Credit), Adopted 2015.
§130.463. Practicum in Transportation Systems (Two Credits), Adopted 2015.
§130.464. Practicum in Distribution and Logistics (Two Credits), Adopted 2015.
§130.465. Extended Practicum in Transportation Systems (One Credit), Adopted 2015.
§130.466. Extended Practicum in Distribution and Logistics (One Credit), Adopted 2015.
The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Cristina De La Fuente-Valadez
Director, Rulemaking
Texas Education Agency
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 475-1497

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SUBCHAPTER Q. ENERGY

19 TAC §§130.485 - 130.491

STATUTORY AUTHORITY. The repeals are proposed under Texas Education Code (TEC), §7.102(c)(4), which requires the State Board of Education (SBOE) to establish curriculum and graduation requirements; TEC, §28.002(a), which identifies the subjects of the required curriculum; and TEC, §28.002(c), which requires the SBOE to identify by rule the essential knowledge and skills of each subject in the required curriculum that all students should be able to demonstrate and that will be used in evaluating instructional materials and addressed on the state assessment instruments.

CROSS REFERENCE TO STATUTE. The repeals implement Texas Education Code, §7.102(c)(4) and §28.002(a) and (c).

§130.485. Oil and Gas Production I (One Credit).
§130.486. Oil and Gas Production II (One Credit).
§130.487. Oil and Gas Production III (One Credit).
§130.488. Oil and Gas Production IV (One Credit).
§130.489. Introduction to Process Technology (One Credit).
§130.490. Foundations of Energy (One Credit).
§130.491. Petrochemical Safety, Health, and Environment (One Credit).
The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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TITLE 30. ENVIRONMENTAL QUALITY

PART 1. TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

CHAPTER 321. CONTROL OF CERTAIN ACTIVITIES BY RULE

The Texas Commission on Environmental Quality (TCEQ, agency, or commission) proposes to add new §§321.48, 321.49, 321.401, 321.403, 321.405, 321.407, 321.409, 321.411, and 321.413.

Background and Summary of the Factual Basis for the Proposed Rules

TCEQ is proposing to amend 30 Texas Administrative Code (TAC) Chapter 321 (Control of Certain Activities by Rule), Subchapter B (Concentrated Animal Feeding Operations) and add new Subchapter Q (Land Application of Dairy Waste Authority) to implement House Bill (HB) 692, 88th Legislative Session, which added §26.0481 to Chapter 26, Subchapter B of the Texas Water Code (TWC) and §361.1215 to Chapter 361, Subchapter C of the Texas Health and Safety Code (THSC). The bill directs TCEQ to: 1) issue an authorization by rule for land application of dairy waste and to adopt rules governing that land application (THSC §361.1215); 2) adopt rules allowing the disposal of dairy waste from dairy operations either permitted as a concentrated animal feeding operation (CAFO) or unpermitted animal feeding operation (AFO) into a control or retention facility, including a lagoon or playa (TWC §26.0481(b)(1)); and, 3) authorize land application by irrigation associated with that disposal (TWC §26.0481(b)(2)).

This rulemaking proposes to add new §321.48 and §321.49 to the CAFO rules in 30 TAC Chapter 321, Subchapter B, to allow dairy operations to land apply dairy waste directly to land application areas, or put dairy waste in a retention control structure (RCS), including a lagoon or playa, and subsequently irrigate land application areas with dairy waste from the RCS. These activities would only be allowed under emergency conditions.

This rulemaking proposes to add new §§321.401, 321.403, 321.405, 321.407, 321.409, 321.411, and 321.413 under new 30 TAC Chapter 321, Subchapter Q, to allow entities, including landowners and any person along the dairy supply chain (milk haulers, milk processing plant, and milk bottling facilities), to directly land apply dairy waste, under emergency conditions, on agricultural land that is not associated with an animal feeding operation or any other TCEQ authorization.

As part of this rulemaking, the commission is also proposing amendments of 30 TAC Chapter 335 (Industrial Solid Waste and Municipal Hazardous Waste) concurrently in this issue of the *Texas Register*.

Section by Section Discussion

Information from the State Technical Standards of the Natural Resource Conservation Service (NRCS) for Nutrient Management Code 590 will be included for guidance. The requirements of the new CAFO Rules will mandate dairy operators to update the site-specific nutrient management plan (NMP) if commencing land application of dairy waste and to irrigate land application areas based on the application rates that are determined in accordance with the narrative rate approach from both Title 40 Code of Federal Regulations (CFR) §122.42(e)(5)(ii), and the rules found at 30 TAC §321.36(c) or §321.47(f)(3) of this title. This approach allows changes to the NMP to occur at the facility at any time, and adjustments can be made in the implementation of the plan.

The proposed rules would include water quality-based limitations to control all pollutants that could be discharged at a level that will cause, or have the reasonable potential to cause, or contribute to an excursion above any state water quality standard. This would include water quality-based effluent limitations for the production area and land application area of dairy operations. All recordkeeping and annual reporting requirements would be under proposed new §321.48 and §321.49.

Proposed new §321.48, *Land Application of Dairy Waste*, would establish rules to provide authorization to a dairy operation to directly land apply dairy waste, and transfer and receive third-party (i.e., off-site) dairy waste to apply to land that is under the control of a permitted or an unpermitted AFO.

Proposed new §321.48(a), *Definitions*, would establish definitions for dairy operation, dairy waste, and emergency conditions. The definition of dairy waste maintains the statutory definition with additional language added to clarify the regulatory focus on liquid dairy waste and exclusion of solid and semi-solid forms of dairy waste. The definition of "emergency conditions" is consistent with the statutory definition in Texas Government Code §551.045(b)(2), with the addition of ice storm, mechanical failure, and any other situation deemed by the executive director to qualify as an emergency.

Proposed new §321.48(b), *Duration of Authorization*, would limit the duration of the authorization for land application of dairy waste from the first day of the emergency condition(s) to seven (7) calendar days after the emergency condition has ended. Seven calendar days allows sufficient time to manage dairy waste after the emergency condition ends, however in the event that additional time is needed, the executive director can extend the duration of the authorization.

Proposed new §321.48(c), *Purpose*, would establish that new §321.48 provides authorization to a dairy operation to land apply dairy waste, including dairy waste received from a third party, under emergency conditions to land that is under the control of a dairy CAFO or unpermitted AFO.

Proposed new §321.48(d), *Applicability*, would establish a requirement for the owner or operator of a dairy operation that generates dairy waste and the owner or operator of the dairy operation that accepts dairy waste to comply with all the requirements of new §321.48.

Proposed new §321.48(e), *General Requirements*, would establish the requirements for land application of dairy waste by CAFOs and AFOs. The section references §321.40 of this title (relating to Concentrated Animal Feeding Operation (CAFO) Land Application Requirements) and the AFO requirements in §§321.47(f) relating to land application, (h) nutrient utilization plans, and (i) record keeping requirements. The proposed rule would require that dairy waste be evenly applied to fields that are vegetated with actively growing crops, or incorporated into the soils if applied to a fallow field. To protect surface and groundwater, the proposed rule would limit the maximum application rate to 2,000 gallons per acre per year, require setbacks for wells and surface waters, and prohibit land application in the 100-year floodplain. To reduce the occurrence of nuisance odors, land application of dairy waste would be prohibited within 750 feet from an occupied residence or business structure, school (including associated recreational areas), permanent structure containing a place of worship, or public park. Lastly, to prevent over-application of nutrients, land application of dairy waste would be prohibited on land application areas that have elevated nutrient levels or land management units (LMUs) with a nutrient utilization plan.

Proposed new §321.48(f), *Notification Requirements*, would establish requirements for a dairy operator to notify the appropriate TCEQ Regional Office orally within 24 hours or by the next business day, and in writing on paper, electronic mail or other electronic method approved by the executive director within 14 days, of land applying dairy waste. The proposed new section would establish requirements for the written notification to contain the location of the disposal area; a description of the emergency condition; the date that dairy waste was applied; volume applied (gallons, or acre-feet); proof of authorization of the use of the field for dairy waste disposal if third-party (offsite) land was used; the duration of the emergency condition and if additional time will be needed; and a signed certification.

Proposed new §321.48(g), *Recordkeeping Requirements*, would establish requirements for a dairy owner or operator that land applies dairy waste to include certain information in the land application record in the onsite Pollution Prevention Plan (PPP). At a minimum, it must include a log of dairy waste land applied, weather conditions, documentation of any discharge of dairy waste, and a copy of notification(s) to the executive director.

Proposed new §321.48(h), *Discharge Notification*, would establish that requirements in §321.44(a)(1) through (6) apply to the discharge of dairy waste.

Proposed new §321.48(i), *Discharge Monitoring*, would establish a requirement for the dairy operator to sample all discharges of dairy waste to surface water in the state and comply with the discharge monitoring in §321.44(b).

Proposed new §321.48(j), *Annual Reporting*, would establish a requirement for a dairy operator land applying dairy waste to include the information required by §321.48(g) in the annual report required by §321.36(g) that is due to TCEQ on March 31, of each year. The proposed new subsection would also establish a requirement for dairy operators not authorized by permit to submit information regarding the total dairy waste (gallons, or acre-feet) generated and land applied by the same due date.

Proposed new §321.49, *Storage of Dairy Waste in a Retention Control Structure or Playa at an Animal Feeding Operation*, would establish rules to provide authorization to a dairy operation to store dairy waste in an RCS during emergency conditions.

Proposed new §321.49(a), *Purpose*, would establish that §321.49 provides authorization to a dairy operation to store dairy waste in an RCS or playa under emergency conditions and subsequently land apply the dairy waste.

Proposed new §321.49(b), *Applicability*, would establish that the provisions of §321.49 apply to an owner or operator of a dairy operation that stores dairy waste in an RCS, or playa that meets the special requirements for discharges of §321.41.

Proposed new §321.49(c), *Duration of Authorization*, would limit the Authorization to put dairy waste in an RCS from the first day of the emergency condition(s) to seven (7) calendar days after the emergency condition ends. Seven calendar days allows sufficient time to manage dairy waste after the emergency condition ends, however in the event that additional time is needed, the executive director can extend the duration of the authorization.

Proposed new §321.49(d), *Discharge Restrictions*, would establish a prohibition on the discharge or disposal of dairy waste from a dairy operation into or adjacent to water in the state, except in accordance with new §321.49. The proposed section would establish a requirement for dairy waste generated by a dairy operation under this title to be retained and utilized in an appropriate and beneficial manner. The proposed section would also establish a requirement for disposal of dairy waste in an RCS to be subject to the effluent limitations in §321.37 and design requirements in §§321.38 and 321.42(c).

Proposed new §321.49(e), *Recordkeeping Requirements*, would establish the requirements for keeping records of dairy waste placed in an RCS or playa. Records would include a log of monthly dairy waste received and stored at the AFO or CAFO.

Proposed new §321.49(f), *General Requirements*, would establish the requirements for disposal of dairy waste in an RCS or playa. Specifically, the proposed rule would prohibit dairy waste storage in certain playas for compliance with TWC §26.048. The proposed rule would also require a dairy operation using an RCS for storage of dairy waste ensure that storage of dairy waste doesn't cause an unauthorized discharge from the RCS. The proposed rule would also require oral and written notification to the TCEQ Regional Office when dairy waste is stored in an RCS.

Proposed new §321.49(g), *Dairy Waste Transfer*, would establish provisions to allow a dairy operation to transfer dairy waste to another dairy operation site for land application or storage in an RCS to use for irrigation when needed. The proposed rule would require the owner or operator generating the dairy waste to keep a record of all dairy waste (gallons, or acre-feet) transferred to another dairy operation, the date of transfer, as well as the name(s) and address(es) of the recipients of the dairy waste.

Additionally, the proposed rule would establish a requirement for the owner or operator generating the dairy waste to provide the laboratory report for total nitrogen, total phosphorus, and total potassium content of the dairy waste to the receiver of the dairy waste. Book values for dairy waste nutrient contents may be used because under emergency conditions there may not be sufficient time to collect and analyze dairy waste and manage the dairy waste in a timely manner.

Proposed new §321.49(h), *Dairy Waste Received*, would establish requirements for a dairy operator that receives dairy waste to comply with the land application requirements in §321.48 or this section for storage of dairy waste in an RCS.

Proposed new §321.49(i), *Annual Reporting*, would require all information under §321.49(e) in the annual report required by §321.36(g) that is due to the TCEQ by March 31 of each year. The proposed new subsection would also establish a requirement for dairy operators not authorized by permit to submit information regarding the total dairy waste (gallons, or acre-feet) generated and land applied by the same due date.

The proposed rule would create new Chapter 321, Subchapter Q to authorize land application of dairy waste on agriculture land that is not part of an AFO or CAFO.

Proposed new §321.401, *Purpose and Applicability*, would establish that new Subchapter Q provides authorization by rule for direct land application of dairy waste, under emergency conditions, on agricultural land that is not associated with an animal feeding operation or any other TCEQ authorization and that the requirements of new Subchapter Q would apply to the entity or entities land applying the dairy waste and the owners of the land application area.

Proposed new §321.403, *Dairy Waste Management Alternatives*, would list options in addition to the proposed §§321.48, 321.49 and Subchapter Q, that a person or entity may use to manage dairy waste during emergency conditions. The section includes options such as direct land application to lands authorized under a Texas Pollutant Discharge Elimination System (TPDES) permit or Texas Land Application permit (TLAP) amended to include dairy waste management, disposal at a permitted solid waste landfill, disposal via a permitted injection well, hauling or discharging to a permitted domestic wastewater collection system with written consent from the plant operator or owner, or use as animal feed.

Proposed new §321.405, *Definitions*, would establish definitions for agronomic rate, agricultural land, dairy operation, dairy waste, emergency conditions, land application, and water in the state. The definition of dairy waste maintains the statutory definition with additional language added to clarify the regulatory focus on liquid dairy waste and exclusion of solid and semi-solid forms of dairy waste. The definition of "emergency conditions" is consistent with the statutory definition in Texas Government Code (TGC), §551.045(b)(2), with the addition of ice storm, mechanical failure, and any other situation deemed by the executive director to qualify as an emergency.

Proposed new §321.407, *Protection of Surface Water and Groundwater Quality*, would establish that new Subchapter Q does not authorize the discharge of dairy waste into water in the state, including surface water and groundwater, nor does it authorize any contamination of groundwater.

Proposed new §321.409, *General Requirements*, would establish requirements for land application of dairy waste under emergency conditions by owners and operators of agricultural operations that may receive dairy waste for beneficial use, and that the property owner consent would be required for all land application activities. The proposed rule would require that dairy waste be land applied to fields that are vegetated with actively growing crops, or incorporated into the soils if applied to a fallow field. To protect surface and groundwater, the proposed rule would limit the maximum application rate to 2,000 gallons per acre per year, require setbacks for wells and surface waters, prohibit land application in the 100-year floodplain, prohibit land application during rainfall events or to frozen or saturated ground, and prohibit land application to soils with shallow groundwater. To reduce the occurrence of nuisance odors, land application of dairy waste would be prohibited within 750 feet from an occupied residence or business structure, school (including associated recreational areas), permanent structure containing a place of worship, or public park.

Proposed new §321.411, *Notification*, would establish requirements for the person or entity applying dairy waste or the owner of the land application areas to notify the appropriate TCEQ Regional Office upon land application of dairy waste. The proposed rule would require oral notification to occur within 24 hours of application and written notification within 14 days. The proposed rule includes information to assist landowners with identifying the regional office contact information. The proposed rule would require the notification to include the date, time, location, volume, and the applicable emergency condition.

Proposed new §321.413, *Duration of Authorization*, would limit the authorization for land application of dairy waste under new Subchapter Q from the first day of the emergency condition(s) to a time period of seven (7) calendar days beyond the end of the emergency condition. Seven calendar days allows sufficient time to manage dairy waste after the emergency condition ends, however in the event that additional time is needed, the executive director can extend the duration of the authorization.

Fiscal Note: Costs to State and Local Government

Kyle Girten, Analyst in the Budget and Planning Division, has determined that for the first five-year period the proposed rules are in effect, no fiscal implications are anticipated for the agency or for other units of state or local government as a result of administration or enforcement of the proposed rule.

Public Benefits and Costs

Mr. Girten determined that for each year of the first five years the proposed rules are in effect, the public benefit from this rulemaking and concurrent rulemaking proposed in Chapter 335 will be rules that are consistent with state law, specifically HB 692 from the 88th Regular Legislative Session (2023). There may also be environmental benefits for the public because the provisions in Subchapter Q include delineated alternatives for the land application of dairy waste under emergency conditions for unpermitted AFOs. Lastly, the public may benefit from the land application of dairy waste for agricultural lands as described in §321.407(6).

The proposed rulemaking and concurrent rulemaking proposed in Chapter 335 is anticipated to result in fiscal benefit for permitted dairy CAFOs or unpermitted AFOs by providing a more cost-effective means of disposing of dairy waste under emergency conditions defined in §321.48(a) for AFOs / CAFOs and §321.405 for agricultural lands that are not associated with an AFO or any other TCEQ authorization. Currently such dairy waste is required to be disposed off-site by permitted entities at a cost of approximately $3,000 per truckload. This rulemaking would provide a less costly means of disposal within CAFOs' existing operations, though any savings would be offset by costs associated with the alternate forms of disposal, such as costs associated with meeting discharge monitoring requirements (§321.48(i)). TCEQ currently regulates dairy operations at 424 permitted facilities, including 35 facilities authorized under an individual permit and 389 under the Texas CAFO General Permit, TXG920000. Economic benefits may also be realized for these and other entities that provide or receive dairy waste for beneficial uses described or referenced in §§321.49(h), 321.405, 321.407, and 321.411.

Local Employment Impact Statement

The commission reviewed this proposed rulemaking and determined that a Local Employment Impact Statement is not required because the proposed rulemaking does not adversely affect a local economy in a material way for the first five years that the proposed rule is in effect.

Rural Communities Impact Assessment

The commission reviewed this proposed rulemaking and determined that the proposed rulemaking does not adversely affect rural communities in a material way for the first five years that the proposed rules are in effect. The amendments would apply statewide and have the same effect in rural communities as in urban communities.

Small Business and Micro-Business Assessment

No adverse fiscal implications are anticipated for small or micro-businesses due to the implementation or administration of the proposed rule for the first five-year period the proposed rules are in effect.

Small Business Regulatory Flexibility Analysis

The commission reviewed this proposed rulemaking and determined that a Small Business Regulatory Flexibility Analysis is not required because the proposed rule does not adversely affect a small or micro-business in a material way for the first five years the proposed rules are in effect.

Government Growth Impact Statement

The commission prepared a Government Growth Impact Statement assessment for this proposed rulemaking. The proposed rulemaking does not create or eliminate a government program and will not require an increase or decrease in future legislative appropriations to the agency. The proposed rulemaking does not require the creation of new employee positions, eliminate current employee positions, nor require an increase or decrease in fees paid to the agency. The proposed rulemaking amends an existing regulation. The proposed rulemaking does not increase or decrease the number of individuals subject to its applicability. During the first five years, the proposed rule should not impact positively or negatively the state's economy.

Draft Regulatory Impact Analysis Determination [if full RIA not required]

TCEQ reviewed the proposed rulemaking in consideration of the regulatory analysis of major environmental rules required by TGC, §2001.0225 and determined that the rulemaking is not subject to TGC, §2001.0225(a) because it does not meet the definition of a "Major environmental rule" as defined in TGC, §2001.0225(g)(3). The following is a summary of that review.

Section 2001.0225 applies to a "Major environmental rule" adopted by a state agency, the result of which is to exceed standards set by federal law, exceed express requirements of state law, exceed requirements of delegation agreements between the state and the federal government to implement a state and federal program, or adopt a rule solely under the general powers of the agency instead of under a specific state law. A "Major environmental rule" is a rule, the specific intent of which is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector or the state.

The Texas Legislature enacted HB 692, amending TWC, Chapter 26 (Water Quality Control), Subchapter B (General Water Quality Power and Duties), and THSC, Chapter 361 (the Solid Waste Disposal Act), Subchapter C (Permits) by

adding §26.0481 to the TWC and §361.1215 of the THSC, which provides an additional regulatory and legal method for dairy AFOs to dispose of dairy waste, which HB 692 defines as milk, milk by-products, or milk processing waste that is spilled, spoiled, adulterated, unmarketable, stranded, or otherwise unfit for human consumption produced by a dairy operation or at a CAFO, as applicable.

HB 692 required TCEQ to adopt new TCEQ rules to implement HB 692's provisions.

HB 692 grants TCEQ rulemaking authority to create an authorization by rule for land application of dairy waste, and to adopt new Rules allowing the disposal of dairy waste from a CAFO into an RCS, including a lagoon or playa, and authorize land application by irrigation associated with that disposal.

As the Bill Analysis from the Environmental Regulation Committee of the Texas House of Representatives makes clear, the 88th Texas Legislature enacted HB 692 with the aim of providing Texas dairies with another disposal method for unused milk or dairy waste. In Texas, milk or dairy waste is disposed of in a disposal well, of which there are only two locations in Texas for dairy waste. According to the Texas Association of Dairymen, the average cost to dispose a truckload of milk, about 50,000 pounds, is around $3,000, which is a costly burden for dairy operators in Texas. Whereas, land application of dairy waste has proven to be an effective fertilizer, and based on current research, milk itself can improve soil health, if applied properly. This is due to milk's ability to provide nutrients to plants and stimulate the growth of beneficial fungi by supplying sugar. HB 692 addressed these issues by amending TWC and THSC to provide for the authorization for certain land applications and disposal of dairy waste.

HB 692 requires TCEQ to issue both an authorization by rule for land application of dairy waste, that minimizes the risk of water quality impairment caused by the land application, prescribes the conditions under which an authorization is issued, such as the duration of the authorization, the location of the land application area or unit, the maximum quantity or application rate of dairy waste that may be applied or disposed of under the authorization, the suggested agronomic application rate for the dairy waste, and best management practices (BMPs) for the handling and disposal of dairy waste.

HB 692 requires TCEQ, to the extent permitted by federal law, to adopt rules allowing the storage of dairy waste by an AFO into an RCS, including a lagoon or playa, and the land application by irrigation associated with that disposal. The rules must require BMPs and other conditions to ensure that the disposal of dairy waste into the RCS or its associated land application does not impair water quality.

In order to implement the provisions of HB 692, TCEQ proposes to add new §321.48 and §321.49 to the existing 30 TAC Chapter 321, Subchapter B rules allowing dairy operations to land apply dairy waste; and storage of dairy waste in an RCS, including a lagoon or playa, and irrigate dairy waste from the RCS to land application areas. TCEQ also proposes to add new 321.401, §321.403, §321.405, §321.407, §321.409, §321.411, and §321.413 under new 30 TAC Chapter 321, Subchapter Q, to allow entities to directly land apply dairy waste, under emergency conditions, on agricultural land that is not associated with an animal feeding operation or any other TCEQ authorization.

Therefore, the specific intent of the proposed rulemaking is related to expanding the existing CAFO Rules with regulatory options for disposal of dairy waste, as defined in HB 692.

The proposed rules are intended to protect the environment or reduce risks to human health from environmental exposure. However, the proposed rulemaking will not adversely affect in a material way the economy, a sector of the economy, productivity, competition, or jobs; nor would the proposed rulemaking adversely affect in a material way the environment, or the public health and safety of the state or a sector of the state. Therefore, the proposed rulemaking does not fit the TGC, §2001.0225 definition of "Major environmental rule."

Even if this rulemaking was a "Major environmental rule," this rulemaking meets none of the criteria in TGC, §2001.0225 for the requirement to prepare a full Regulatory Impact Analysis. First, this rulemaking is not governed by federal law. Second, it does not exceed state law but rather extends state law and TCEQ rules to adopted and effective state laws. Third, does not come under a delegation agreement or contract with a federal program, and finally, is not being proposed under TCEQ's general rulemaking authority. This rulemaking is being proposed under a specific state statute enacted in HB 692 of the 2023 Texas legislative session and implements existing state law. Because this proposal does not constitute a major environmental rule, a regulatory impact analysis is not required.

Therefore, the commission does not adopt the rule solely under the commission's general powers. The commission invites public comment on the draft regulatory impact analysis determination. Written comments may be submitted to the contact person at the address listed under the Submittal of Comments section of this preamble.

Takings Impact Assessment

TCEQ evaluated the proposed rulemaking and performed an analysis of whether it constitutes a taking under TGC, Chapter 2007. The following is a summary of that analysis.

Under TGC, §2007.002(5), "taking" means a governmental action that affects private real property, in whole or in part or temporarily or permanently, in a manner that requires the governmental entity to compensate the private real property owner as provided by the Fifth and Fourteenth Amendments to the United States Constitution or Section 17 or 19, Article I, Texas Constitution; or a governmental action that affects an owner's private real property that is the subject of the governmental action, in whole or in part or temporarily or permanently, in a manner that restricts or limits the owner's right to the property that would otherwise exist in the absence of the governmental action and is the producing cause of a reduction of at least 25% in the market value of the affected private real property, determined by comparing the market value of the property as if governmental action is not in effect and the market value of the property determined as if the governmental action is in effect.

The specific purpose of the proposed rulemaking is to implement the legislative amendments to the THSC and the TWC in HB 692 by amending TCEQ's CAFO Rules to expand the existing CAFO Rules with regulatory options for disposal of dairy waste, as defined in HB 692. The proposed rulemaking will substantially advance this stated purpose by adopting new rule language that provides for the authorization for certain land applications and disposal of dairy waste.

Promulgation and enforcement of the proposed rules will not be a statutory or constitutional taking of private real property because, as the commission's analysis indicates, TCG, Chapter 2007 does not apply to these proposed rules because these rules do not impact private real property in a manner that would require compensation to private real property owners under the United States Constitution or the Texas Constitution. Specifically, the proposed rulemaking does not apply to or affect any landowner's rights in any private real property because it does not burden (constitutionally), restrict, or limit any landowner's right to real property and reduce any property's value by 25 percent or more beyond that which would otherwise exist in the absence of the regulations. The primary purpose of the proposed rules is to implement HB 692 by providing for the authorization for certain land applications and disposal of dairy waste. The proposed rulemaking is reasonably taken to fulfill requirements of state law. Therefore, the proposed rulemaking would not cause a taking under TGC, Chapter 2007.

Consistency with the Coastal Management Program

The commission reviewed the proposed rulemaking and found that the proposal is subject to the Texas Coastal Management Program (CMP) in accordance with the Coastal Coordination Act, Texas Natural Resources Code, §§33.201 et seq., and therefore must be consistent with all applicable CMP goals and policies. The commission conducted a consistency determination for the proposed rules in accordance with Coastal Coordination Act Implementation Rules, 31 TAC §29.22 and found the proposed rulemaking is consistent with the applicable CMP goals and policies.

CMP goals applicable to the proposed rulemaking includes protecting, preserving, restoring, and enhancing the diversity, quality, quantity, functions, and values of coastal natural resource areas (CNRAs); and ensuring sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone. CMP policies applicable to the proposed rules include that discharges must comply with water quality-based effluent limits; and that discharges which increase pollutant loadings to coastal waters must not impair designated uses of coastal waters and must not significantly degrade coastal water quality, unless necessary for important economic or social development.

The proposed rulemaking is consistent with the above goals and policies by requiring dairy waste disposal activities to be conducted in a manner that is protective of water quality and prohibits the discharge of dairy waste into water in the state.

Promulgation and enforcement of the rules would not violate or exceed any standards identified in the applicable CMP goals and policies because the proposed rules would be consistent with these CMP goals and policies, and the rule would not create or have a direct or significant adverse effect on any CNRAs.

Written comments on the consistency of this rulemaking with CMP goals and policies may be submitted to the contact person at the address listed under the SUBMITTAL OF COMMENTS section of this preamble.

Announcement of Hearing

In addition to comments on any other aspect of the proposed rules, the commission invites public comment on the proposal to authorize the dairy waste management activities only under emergency conditions, without Texas Health and Safety Code, §361.1215 and Texas Water Code, §26.0481 expressly stating that they apply only in such situations.

The commission will hold a hybrid virtual and in-person public hearing on this proposal in Austin, Texas, on Monday, March 31, 2025, at 10:00 a.m. in Building A, Room 173 at the commission's central office located at 12100 Park 35 Circle. The hearing is structured for the receipt of oral or written comments by interested persons. Individuals may present oral statements when called upon in order of registration. Open discussion will not be permitted during the hearing; however, commission staff members will be available to discuss the proposal 30 minutes prior to the hearing at 9:30 a.m.

Individuals who plan to attend the hearing virtually and want to provide oral comments and/or want their attendance on record must register by Thursday, March 27, 2025. To register for the hearing, please email Rules@tceq.texas.gov and provide the following information: your name, your affiliation, your email address, your phone number, and whether or not you plan to provide oral comments during the hearing. Instructions for participating in the hearing will be sent on Friday, March 28, 2025, to those who register for the hearing.

For the public who do not wish to provide oral comments but would like to view the hearing may do so at no cost at: https://events.teams.microsoft.com/event/a31122f6-2c36-4071-8e00-3a262e1c584f@871a83a4-a1ce-4b7a-8156-3bcd93a08fba

Persons who have special communication or other accommodation needs who are planning to attend the hearing should contact Sandy Wong, Office of Legal Services at (512) 239-1802 or (800) RELAY-TX (TDD). Requests should be made as far in advance as possible.

A Spanish translation of this notice is available at: https://www.tceq.texas.gov/rules/hearings.html. If you need additional translation services, please contact TCEQ at (800) 687-4040. Si desea información general en español, puede llamar al (800) 687-4040.

Submittal of Comments

Written comments may be submitted to Gwen Ricco, MC 205, Office of Legal Services, Texas Commission on Environmental Quality, P.O. Box 13087, Austin, Texas 78711-3087, or faxed to *fax4808@tceq.texas.gov*. Electronic comments may be submitted at: *https://tceq.commentinput.com/comment/search*. File size restrictions may apply to comments being submitted via TCEQ Public Comments system. All comments should reference Rule Project Number 2023-139-321-OW. The comment period closes on March 31, 2025. Please choose one of the methods provided to submit your written comments.

Copies of the proposed rulemaking can be obtained from the commission's website at *https://www.tceq.texas.gov/rules/propose_adopt.html*. For further information, please contact Dr. Joy Alabi, Water Quality Division, at (512) 239-1318.

SUBCHAPTER B. CONCENTRATED ANIMAL FEEDING OPERATIONS

30 TAC §321.48, §321.49

Statutory Authority

The new sections are proposed under the Texas Water Code (TWC) and the Texas Health and Safety Code (THSC). TWC, §5.013 establishes the general jurisdiction of the commission,

while TWC, §5.102 provides the commission with the authority to carry out its duties and general powers under its jurisdictional authority as provided by TWC, §5.103. TWC, §5.103 requires the commission to adopt any rule necessary to carry out its powers and duties under the TWC and other laws of the state. TWC, §5.120 requires the commission to administer the law so as to promote judicious use and maximum conservation and protection of the environment and the natural resources of the state. TWC, §26.121, prohibits the unlawful discharge of pollutants into or adjacent to water in the state except as authorized by a rule, permit, or order issued by the commission. TWC, §26.0481 provides the commission with authority to adopt rules to allow the disposal of dairy waste from a CAFO into a control or retention facility, including a lagoon or playa; and the land application by irrigation associated with that disposal.

THSC, §361.1215 provides the commission with authority to issue an authorization by rule for land application of dairy waste and to adopt rules governing that land application.

The proposed new sections implement House Bill 692, 88th Texas Legislature (2023), TWC, §§5.013, 5.102, 5.103, 5.120, 26.121, 26.0481, and THSC, §361.1215.

§321.48. Land Application of Dairy Waste.

(a) Definitions. The following words and terms, when used in this subchapter, shall have the following meanings, unless the context clearly indicates otherwise:

(1) Dairy Operation--An Animal Feeding Operation (AFO) confining cattle that have been or may be used for production of milk, or otherwise associated with a dairy, including cows, calves, and bulls.

(2) Dairy Waste--Milk, milk by-products, or milk processing waste that is spilled, spoiled, adulterated, unmarketable, stranded, or otherwise unfit for human consumption produced by a dairy operation. For the purposes of this rule, dairy waste does not include solid or semi-solid milk products.

(3) Emergency Conditions - Instances where dairy waste is generated at any point along the dairy supply chain due to a reasonably unforeseeable situation, including but not limited to:

(A) fire, flood, earthquake, hurricane, tornado, or wind, rain, ice, or snowstorm;

(B) power failure, transportation failure, mechanical failure, or interruption of communication facilities;

(C) epidemic;

(D) riot, civil disturbance, enemy attack, or other actual or threatened act of lawlessness or violence; or

(E) any other situation deemed by the executive director to qualify as an emergency.

(b) Duration of Authorization. Authorization to land apply dairy waste on LMUs expires seven (7) calendar days after the emergency condition ends, unless an alternative duration for the authorization is granted by the executive director.

(c) Purpose. This section provides authorization to a dairy operation to directly land apply dairy waste, including dairy waste received from a third-party, under emergency conditions to land that is under the control of a permitted CAFO or unpermitted AFO.

(d) Applicability. This section applies to the owner or operator of a dairy operation that generates or accepts third-party dairy waste that is land applied under emergency conditions.

(e) General Requirements. The following requirements apply to land application of dairy waste:

(1) Land application of dairy waste must comply with the requirements of §321.40 of this title (relating to Concentrated Animal Feeding Operation (CAFO) Land Application Requirements) for a CAFO or §§321.47(f), (h), and (i) of this title (relating to Land Application, Nutrient Utilization Plans, and Recordkeeping Requirements, respectively) for an AFO.

(2) Discharge of dairy waste into water in the state from a land management unit (LMU) is prohibited.

(3) Land application practices shall be maintained to minimize ponding or puddling of the dairy waste on the site and prevent the occurrence of nuisance conditions.

(4) Land application of dairy waste shall not occur when the ground is frozen or saturated or during rainfall events.

(5) Dairy waste shall not be land applied within the well buffers identified in §321.38(b) of this title (relating to Control Facility Design Requirements Applicable to Concentrated Animal Feeding Operations (CAFOs)).

(6) Land application of dairy waste shall not occur within 100 feet of any surface water in the state.

(7) Land application of dairy waste shall not occur within a vegetative buffer strip required by §321.40(h) of this title.

(8) Dairy waste shall not be land applied within the 100-year floodplain.

(9) Dairy waste shall not be land applied to soils with shallow, perched or seasonal water tables.

(10) Dairy waste may only be applied to fields that are vegetated with actively growing crops, hay or vegetation, or if to a fallow field, the dairy waste shall be incorporated into the soils within 48 hours of land application.

(11) Dairy waste application shall be limited to a maximum of 2,000 gallons per acre per year.

(12) Dairy waste shall be applied evenly to the soils.

(13) Dairy waste shall not be land applied within 750 feet from an occupied residence or business structure, school (including associated recreational areas), permanent structure containing a place of worship, or public park.

(14) There shall be no land application of dairy waste to an LMU if the LMU is required to have a Nutrient Utilization Plan (NUP) per §321.40(k)(3) of this title.

(15) There shall be no land application of dairy waste to an LMU that has or reaches a critical soil test phosphorus (P) level of greater than or equal to 500 ppm, with a P- Index rating of "High" or "Very High".

(f) Notification Requirements. The dairy operator shall notify the appropriate TCEQ Regional Office orally within 24 hours of land application of dairy waste or by the next business day, and in writing within 14 days of the land application of the dairy waste. Written notification may be on paper, electronic mail, or other electronic method as prescribed by the executive director. The notification shall include the following information:

(1) the location of the land where the dairy waste was land applied, including the address of the area, latitude and longitude, or a site map;

(2) the applicable emergency condition;

(3) the date that dairy waste was land applied;

(4) the volume (gallons, or acre-feet) of dairy waste land applied;

(5) proof of authorization of the use of the field for land application of dairy waste if third-party land was used;

(6) the duration of the emergency condition and if additional time will be needed to complete the land application; and

(7) a certification signed by the dairy operator that the requirements of this subchapter were complied with during the land application of dairy waste.

(g) Recordkeeping Requirements. A dairy owner or operator that land applies dairy waste shall include the following information in the Pollution Prevention Plan (PPP) required in §321.46(d) of this title:

(1) a log of all dairy waste land applied at the AFO or CAFO updated at least monthly. Such records must include the following information:

(A) date of dairy waste application to each LMU;

(B) location of the specific LMU and the volume (gallon, or acre-feet) applied during each application event;

(C) acreage of each individual crop on which dairy waste is applied; and

(D) weather conditions (such as the temperature, precipitation, and cloud cover) during the land application and 24 hours before and after the land application;

(2) documentation describing any discharge of dairy waste into water in the state including the date, time, volume of overflow (gallons, or acre-feet), a copy of the notification(s) provided to the regional office, and sample analysis results associated with the discharge; and

(3) copies of all notifications to the executive director, including any made to a Texas Commission on Environmental Quality regional office, as required by this subchapter, a permit, or authorization.

(h) Discharge Notification. Discharge notification requirements in §§321.44(a)(1) through (6) of this title shall apply to the discharge of dairy waste.

(i) Discharge Monitoring. The dairy operator shall sample all discharges of dairy waste to surface water in the state and comply with the discharge monitoring in §321.44(b) of this title.

(j) Annual Reporting. The dairy operator land applying dairy waste shall include the information required by §321.48(g) in the annual report as indicated in §321.36(g) of this title. Dairy operators that are not authorized by permit, and therefore not required to submit an annual report, must mail the following information to the appropriate TCEQ Regional Office that is servicing the area where the dairy operation is located by March 31 of each year:

(1) estimated total volume of dairy waste (in gallons) generated during the reporting period; and

(2) total volume of dairy waste (gallons, or acre-feet) land applied during the reporting period.

§321.49. Storage of Dairy Waste in a Retention Control Structure or Playa at an Animal Feeding Operation.

(a) Purpose. This section provides authorization to a dairy operation to store dairy waste during emergency conditions in a retention control structure (RCS) or playa and subsequently land apply the dairy waste for beneficial use.

(b) Applicability. This section applies to an owner or operator of a dairy operation that stores dairy waste in an RCS or playa that meets the requirements of §321.41 of this title (relating to Special Requirements for Discharges to a Playa).

(c) Duration of Authorization. Authorization to store dairy waste in a retention control structure(s) expires seven (7) calendar days after the emergency condition ends, unless an alternative duration for the authorization is granted by the executive director.

(d) Discharge Restrictions.

(1) There shall be no discharge or disposal of dairy waste from a dairy operation into or adjacent to water in the state, except in accordance with this section. Dairy waste generated by a dairy operation under this subchapter shall be retained and utilized in an appropriate and beneficial manner as provided by this section.

(2) The storage of dairy waste in an RCS is subject to the effluent limitations in 30 TAC §321.37 and the RCS design requirements in 30 TAC §321.38 and 30 TAC §321.42(c) of this title (relating to Effluent Limitations for Concentrated Animal Feeding Operation (CAFO) Production Areas, Control Facility Design Requirements Applicable to Concentrated Animal Feeding Operations, and Requirements Applicable to the Major Sole-Source Impairment Zone to maintain a margin of safety in the RCS).

(e) Recordkeeping Requirements. A dairy owner or operator that stores dairy waste in an RCS under emergency conditions shall include a log of all dairy waste received and stored at the AFO or CAFO, updated at least monthly, in the Pollution Prevention Plan (PPP) required in §321.46(d) of this title.

(f) General Requirements.

(1) Storage of dairy waste in a playa shall comply with §321.41 of this title.

(2) A dairy operation using an RCS for storage of dairy waste shall ensure that the required capacity in the RCS is available to contain rainfall and rainfall runoff from the design rainfall event, and the margin of safety for CAFOs located in a major sole-source impairment zone.

(3) The operator shall not store dairy waste in an RCS that is in danger of imminent overflow from chronic or catastrophic rainfall or catastrophic conditions.

(4) The dairy operator shall notify the appropriate TCEQ Regional Office orally within 24 hours, or by the next business day, of storing dairy waste in an RCS. The following information shall be provided during the oral notification:

(A) the dairy's authorization status: if the dairy is permitted or not permitted and, if permitted, the permit number;

(B) the name and address of the owner and/or operator;

(C) the name and location of the dairy;

(D) the site-specific emergency condition(s); and

(E) the duration of the emergency conditions and if additional time will be needed to manage dairy waste either by land application, placement in an RCS, or transfer to another dairy.

(5) Written notification. The dairy operator shall provide written notification to the appropriate TCEQ Regional Office within 14 days of storing dairy waste in an RCS. Written notification may be on paper, electronic mail, or other electronic method as prescribed by

the executive director. The following information shall be provided, in addition to the information required for oral notification, on a form that is prescribed by the executive director:

(A) location and name of the RCS that was used to store the dairy waste, including the latitude and longitude;

(B) the date(s) that the dairy waste was put into an RCS;

(C) the volume of dairy waste (gallons, or acre-feet) that was stored in an RCS;

(D) if there was any discharge of dairy waste from the RCSs, and the estimated volume of the discharge (gallons, or acre-feet); and

(E) a USGS topographical Map and a Site and Runoff Control Map identifying where the dairy waste was stored.

(g) Dairy Waste Transfer. A dairy operator may transfer dairy waste to another dairy site for land application or storage in an RCS to use for irrigation when needed.

(1) The owner or operator generating the dairy waste shall keep a record of the date and volume of dairy waste (gallons, or acre-feet) that is transferred to another dairy.

(2) The owner or operator generating the dairy waste shall provide the laboratory report for total nitrogen, total phosphorus, and total potassium content of the dairy waste to the receiver of the dairy waste. If the laboratory report is not available, the book value of dairy waste from the Texas A & M AgriLife Extension Services shall be used in lieu of the laboratory report.

(3) The owner or operator generating the dairy waste shall keep records of the name(s) and address(s) of the recipient(s) of the dairy waste.

(h) Dairy Waste Received. A dairy operator that receives dairy waste shall comply with:

(1) §321.48 of this title (relating to Land Application of Dairy Waste) if dairy waste is land applied, or

(2) the requirements of this section if dairy waste is stored in an RCS.

(i) Annual Reporting. The dairy operator that places dairy waste in an RCS under emergency conditions shall include the information required by §321.49(e) in the annual report required by §321.36(g) of this title. Dairy operators that are not authorized by permit, and therefore not required to submit an annual report, must mail the following information to the appropriate TCEQ Regional Office that is servicing the area where the dairy operation is located by March 31 of each year:

(1) estimated total volume of dairy waste (in gallons) stored during the reporting period; and

(2) total volume of dairy waste (gallons, or acre-feet) land applied during the reporting period.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500565

Charmaine Backens
Deputy Director, Environmental Law Division
Texas Commission on Environmental Quality
Earliest possible date of adoption: April 6, 2025
For further information, please call: (512) 239-2678

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SUBCHAPTER Q. LAND APPLICATION OF DAIRY WASTE AUTHORITY

30 TAC §§321.401, 321.403, 321.405, 321.407, 321.409, 321.411, 321.413

Statutory Authority

The new sections are proposed under the Texas Water Code (TWC) and the Texas Health and Safety Code (THSC). TWC, §5.013 establishes the general jurisdiction of the commission, while TWC, §5.102 provides the commission with the authority to carry out its duties and general powers under its jurisdictional authority as provided by TWC, §5.103. TWC, §5.103 requires the commission to adopt any rule necessary to carry out its powers and duties under the TWC and other laws of the state. TWC, §5.120 requires the commission to administer the law so as to promote judicious use and maximum conservation and protection of the environment and the natural resources of the state. TWC, §26.121, prohibits the unlawful discharge of pollutants into or adjacent to water in the state except as authorized by a rule, permit, or order issued by the commission. TWC, §26.0481 provides the commission with authority to adopt rules to allow the disposal of dairy waste from a CAFO into a control or retention facility, including a lagoon or playa; and the land application by irrigation associated with that disposal.

THSC, §361.1215 provides the commission with authority to issue an authorization by rule for land application of dairy waste and to adopt rules governing that land application.

The proposed new sections implement House Bill 692, 88th Texas Legislature (2023), TWC, §§5.013, 5.102, 5.103, 5.120, 26.121, 26.0481, and THSC, §361.1215.

§321.401. Purpose and Applicability.

This subchapter authorizes by rule direct land application of dairy waste, under emergency conditions, on agricultural land that is not associated with an animal feeding operation or any other TCEQ authorization. The requirements of this subchapter apply to the entity or entities land applying the dairy waste and the owners of the land application area.

§321.403. Dairy Waste Management Alternatives.

A person or entity that needs to manage dairy waste under emergency conditions may use the options below:

(1) land application of dairy waste on agricultural land in accordance with this subchapter;

(2) retention and land application of dairy waste at an animal feeding operation in accordance with 30 TAC §321.48 (relating to Land Application of Dairy Waste) and §321.49 (relating to Storage of Dairy Waste in a Retention Control Structure or Playa at an Animal Feeding Operation) of this title;

(3) direct land application to agricultural lands authorized under a Texas Pollutant Discharge Elimination System permit or Texas Land Application permit amended to include dairy waste management in their permit;

(4) disposal at a permitted solid waste landfill;

(5) disposal via a permitted injection well;

(6) hauling or discharging to a permitted domestic wastewater collection system with written consent from the plant operator or owner;

(7) use as animal feed in accordance with Texas Agriculture Code, Chapter 141 (relating to Commercial Feed); or

(8) other beneficial uses approved by the executive director.

§321.405. Definitions.

The following words and terms, when used in this subchapter, have the following meanings.

(1) Agronomic rate - The dairy waste application rate designed:

(A) to provide the amount of nitrogen needed by the crop or vegetation grown on the land; and

(B) to minimize the amount of nitrogen in the dairy waste that passes below the root zone of the crop or vegetation grown on the land.

(2) Agricultural land - Cropland, grassland, rangeland, pasture, or other specific land areas that are solely devoted to being used for growing crops, hay, or forage.

(3) Dairy Operation - Any entity involved in milk production, collection, transportation, receiving, transfer, or processing.

(4) Dairy Waste - Milk, milk by-products, or milk processing waste that is spilled, spoiled, adulterated, unmarketable, stranded, or otherwise unfit for human consumption produced by a dairy operation. For the purposes of this rule, dairy waste does not include solid or semi-solid milk products.

(5) Emergency Conditions - Instances where dairy waste is generated at any point along the dairy supply chain due to a reasonably unforeseeable situation, including but not limited to:

(A) fire, flood, earthquake, hurricane, tornado, or wind, rain, ice, or snowstorm;

(B) power failure, transportation failure, mechanical failure, or interruption of communication facilities;

(C) epidemic;

(D) riot, civil disturbance, enemy attack, or other actual or threatened act of lawlessness or violence; or

(E) any other situation deemed by the executive director to qualify as an emergency.

(6) Land application--The act of applying dairy waste to agricultural land for beneficial use by crops, hay, or forage. Beneficial use includes the addition of nutrients from dairy waste, such as nitrogen and phosphorous, and the water content of dairy waste used to enhance moisture content of the soil.

(7) Water in the state--Groundwater, percolating or otherwise, lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, wetlands, marshes, inlets, canals, the Gulf of Mexico, inside the territorial limits of the state, and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or nonnavigable, and including the beds and banks of all watercourses and bodies of surface water, that are wholly or partially inside or bordering the state or inside the jurisdiction of the state.

§321.407. Protection of Surface Water and Groundwater Quality.

(a) The discharge of dairy waste into water in the state, including surface waters and groundwater, is prohibited.

(b) Land application of dairy waste shall not contaminate groundwater.

§321.409. General Requirements.

The following requirements apply to land application of dairy waste on agricultural land during emergency conditions. Property owner consent is required for all land application activities.

(1) Dairy waste shall not be land applied within 100-feet of any surface water in the state.

(2) Dairy waste shall not be land applied within 500 feet of a public drinking water well or within 150 feet of any other water well.

(3) Dairy waste shall not be land applied within 750 feet of an occupied residence or business structure, school (including associated recreational areas), permanent structure containing a place of worship, or public park.

(4) Dairy waste shall not be land applied within the 100-year floodplain.

(5) Dairy waste shall not be land applied when the ground is frozen or saturated or during rainfall events.

(6) Dairy waste may only be applied to fields that are vegetated with actively growing crops, hay, or forage, or if to a fallow field, the dairy waste shall be incorporated into the soils within 48 hours of land application.

(7) Dairy waste application shall be limited to a maximum of 2,000 gallons per acre per year. For a full tanker truck load of 6,000 to 8,000 gallons, the contents must be applied over a minimum of three to four acres of land to comply with this requirement.

(8) Land application practices shall be maintained to minimize ponding or puddling of the dairy waste on the site and prevent the occurrence of nuisance conditions.

(9) Dairy waste must be conducive to land application (i.e., in a form that is spreadable and can be incorporated into the soil to avoid piling).

(10) Dairy waste shall not be land applied to soils with shallow, perched, or seasonal water tables.

§321.411. Notification.

(a) The person or entity applying dairy waste, or the owner of the land application areas, shall notify the appropriate TCEQ Regional Office upon land application of dairy waste. Oral notification must occur within 24 hours of land application and written notification within 14 days. Contact information for TCEQ Regional Offices is available in the TCEQ publication number M-070 titled "Area, Region, and Watermaster Offices" available on the TCEQ website at: www.tceq.texas.gov/publications.

(b) The notification must include the following information:

(1) the location where the dairy waste was land applied including the address, latitude and longitude, or a map;

(2) the applicable emergency condition;

(3) the date and time that dairy waste was land applied;

(4) the volume (gallons) of dairy waste that was land applied; and

(5) the duration of the emergency conditions and if additional time will be needed to complete the land application on agricultural land.

§321.413. Duration of Authorization.

Authorization to land apply dairy waste on agricultural land expires seven (7) calendar days after the emergency condition ends, unless an alternative duration for the authorization is granted by the executive director.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

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Charmaine Backens
Deputy Director, Environmental Law Division
Texas Commission on Environmental Quality
Earliest possible date of adoption: April 6, 2025
For further information, please call: (512) 239-2678

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CHAPTER 335. INDUSTRIAL SOLID WASTE AND MUNICIPAL HAZARDOUS WASTE

SUBCHAPTER A. INDUSTRIAL SOLID WASTE AND MUNICIPAL HAZARDOUS WASTE IN GENERAL

30 TAC §335.2, §335.6

The Texas Commission on Environmental Quality (TCEQ, agency, or commission) proposes the amendment to §335.2 and §335.6.

Background and Summary of the Factual Basis for the Proposed Rules

TCEQ is proposing to amend 30 Texas Administrative Code (TAC) Chapter 335 (Industrial Solid Waste and Municipal Hazardous Waste) to implement House Bill (HB) 692, 88th Texas Legislature, which added §26.0481 to Chapter 26, Subchapter B of the Texas Water Code (TWC) and §361.1215 to Chapter 361, Subchapter C of the Texas Health and Safety Code (THSC). The bill directs TCEQ to: 1) issue an authorization by rule for land application of dairy waste and to adopt rules governing that land application (THSC §361.1215); 2) adopt rules allowing the disposal of dairy waste from dairy operations either permitted as a concentrated animal feeding operation (CAFO) or unpermitted animal feeding operation (AFO) into a retention control structure (RCS), including a lagoon or playa (TWC §26.0481(b)(1)); and, 3) authorize land application by irrigation associated with that disposal (TWC §26.0481(b)(2)). Proposed amendments in 30 TAC Chapter 321 (Control of Certain Activities by Rule) prescribe the standards for land application of dairy waste under emergency conditions as further described in the preamble *Background and Summary of the Factual Basis for the Proposed Rules* for Chapter 321 amendments.

Dairy waste from CAFOs and AFOs is considered industrial waste in Texas, and land application or disposal of dairy waste would be subject to a permit under §335.2 or notification under §335.6. The proposed amendment of §335.2 would exempt land application or disposal of dairy waste under emergency conditions in compliance with Chapter 321 from the permitting requirements of Chapter 335. The proposed amendment of §335.6 would exempt land application activities conducted during emergency conditions and in compliance with Chapter 321 from Chapter 335 notification requirements. Although the land application or disposal of dairy waste in compliance with Chapter 321 would not be subject to permitting or notification requirements under Chapter 335, land used for disposing of solid waste, including dairy waste, would be a solid waste facility under THSC §361.003(36).

As part of this rulemaking, the commission is also proposing amendments of 30 TAC Chapter 321 (Control of Certain Activities by Rule) concurrently in this issue of the *Texas Register*.

Section by Section Discussion

Proposed amended §335.2, *Permit Required*, would add paragraph (d)(10) to exempt from permitting under Chapter 335 the land application or disposal of dairy waste under emergency conditions in compliance with Chapter 321.

Proposed amended §335.6, *Notification Requirements*, would add subsection (n) to exempt land application or disposal of dairy waste under emergency conditions in compliance with Chapter 321 from the notification requirements of §335.6.

Fiscal Note: Costs to State and Local Government

Kyle Girten, Analyst in the Budget and Planning Division, has determined that for the first five-year period the proposed rules are in effect, no fiscal implications are anticipated for the agency or for other units of state or local government as a result of administration or enforcement of the proposed rule.

Public Benefits and Costs

Mr. Girten determined that for each year of the first five years the proposed rules are in effect, the public benefit from this rulemaking and concurrent rulemaking proposed in Chapter 321 will be rules that are consistent with state law, specifically HB 692 from the 88th Regular Legislative Session (2023). The proposed rulemaking would benefit entities disposing of or land applying dairy waste during emergency conditions by exempting such entities under these circumstances from permitting or notification requirements in §§335.2 or 335.6 if they are compliant with the rulemaking proposed in Chapter 321. Specifically, changes to §335.2 could benefit entities that are or otherwise would be permitted to dispose of or land apply dairy waste and changes to §335.6 could benefit persons disposing of or land applying dairy waste that are not required to be permitted.

Local Employment Impact Statement

The commission reviewed this proposed rulemaking and determined that a Local Employment Impact Statement is not required because the proposed rulemaking does not adversely affect a local economy in a material way for the first five years that the proposed rule is in effect.

Rural Communities Impact Assessment

The commission reviewed this proposed rulemaking and determined that the proposed rulemaking does not adversely affect rural communities in a material way for the first five years that the proposed rules are in effect. The amendments would apply statewide and have the same effect in rural communities as in urban communities.

Small Business and Micro-Business Assessment

No adverse fiscal implications are anticipated for small or micro-businesses due to the implementation or administration of the proposed rule for the first five-year period the proposed rules are in effect.

Small Business Regulatory Flexibility Analysis

The commission reviewed this proposed rulemaking and determined that a Small Business Regulatory Flexibility Analysis is not required because the proposed rule does not adversely affect a small or micro-business in a material way for the first five years the proposed rules are in effect.

Government Growth Impact Statement

The commission prepared a Government Growth Impact Statement assessment for this proposed rulemaking. The proposed rulemaking does not create or eliminate a government program and will not require an increase or decrease in future legislative appropriations to the agency. The proposed rulemaking does not require the creation of new employee positions, eliminate current employee positions, nor require an increase or decrease in fees paid to the agency. The proposed rulemaking amends an existing regulation. The proposed rulemaking does not increase or decrease the number of individuals subject to its applicability. During the first five years, the proposed rule should not impact positively or negatively the state's economy.

Draft Regulatory Impact Analysis Determination

TCEQ reviewed the proposed rulemaking in consideration of the regulatory analysis of major environmental rules required by Texas Government Code (TGC) §2001.0225 and determined that the rulemaking is not subject to §2001.0225(a) because it does not meet the definition of a "Major environmental rule" as defined in §2001.0225(g)(3). The following is a summary of that review.

Section 2001.0225 applies to a "Major environmental rule" adopted by a state agency, the result of which is to exceed standards set by federal law, exceed express requirements of state law, exceed requirements of delegation agreements between the state and the federal government to implement a state and federal program, or adopt a rule solely under the general powers of the agency instead of under a specific state law. A "Major environmental rule" is a rule, the specific intent of which is to protect the environment or reduce risks to human health from environmental exposure and that may adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, or the public health and safety of the state or a sector or the state.

The 88th Texas Legislature enacted HB 692, amending TWC, Chapter 26 (Water Quality Control), Subchapter B (General Water Quality Power and Duties), and THSC, Chapter 361 (the Solid Waste Disposal Act), Subchapter C (Permits) by adding §26.0481 to the TWC and §361.1215 of the THSC, which provides an additional regulatory and legal method for dairy AFOs to dispose of dairy waste, which HB 692 defines as milk, milk by-products, or milk processing waste that is spilled, spoiled, adulterated, unmarketable, stranded, or otherwise unfit for human consumption produced by a dairy operation or at a CAFO, as applicable.

HB 692 required TCEQ to adopt new rules to implement HB 692's provisions.

HB 692 grants TCEQ rulemaking authority to create an authorization by rule for land application of dairy waste, and to adopt new rules allowing the disposal of dairy waste from a CAFO into an RCS, including a lagoon or playa, and authorize land application by irrigation associated with that disposal. The TCEQ has proposed revisions to 30 TAC Chapter 321 to implement the new requirements for land application or disposal of dairy waste.

The proposed amendments in Chapter 335 implement HB 692 by subjecting the requirements for land application or disposal of dairy waste to the requirements of Chapter 321 and not the permitting or notification requirements of Chapter 335. Dairy waste is considered industrial waste in Texas, and land application or disposal of dairy waste would be subject to a permit under §335.2 or notification under §335.6. The proposed amendment of §335.2 would exempt land application or disposal of dairy waste under emergency conditions in compliance with Chapter 321 from the permitting requirements of Chapter 335. The proposed amendment of §335.6 would exempt land application activities conducted during emergency conditions and in compliance with Chapter 321 from Chapter 335 notification requirements. Although the land application or disposal of dairy waste in compliance with Chapter 321 would not be subject to permitting or notification requirements under Chapter 335, land used for disposing of solid waste, including dairy waste, would be a solid waste facility under THSC §361.003(36).

Therefore, the specific intent of the proposed rulemaking is related to expanding the regulatory options for land application or disposal of dairy waste, as defined in HB 692.

The proposed rules are intended to protect the environment or reduce risks to human health from environmental exposure. However, the proposed rulemaking will not adversely affect in a material way the economy, a sector of the economy, productivity, competition, or jobs; nor would the proposed rulemaking adversely affect in a material way the environment, or the public health and safety of the state or a sector of the state. Therefore, the proposed rulemaking does not fit the TGC, §2001.0225 definition of "Major environmental rule."

Even if this rulemaking was a "Major environmental rule," this rulemaking meets none of the criteria in §2001.0225 for the requirement to prepare a full Regulatory Impact Analysis. First, this rulemaking is not governed by federal law. Second, it does not exceed state law but rather extends state law and TCEQ rules to adopted and effective state laws. Third, does not come under a delegation agreement or contract with a federal program, and finally, is not being proposed under the TCEQ's general rulemaking authority. This rulemaking is being proposed under a specific state statute enacted in HB 692 of the 2023 Texas legislative session and implements existing state law. Because this proposal does not constitute a major environmental rule, a regulatory impact analysis is not required.

Therefore, the commission does not adopt the rule solely under the commission's general powers. The commission invites public comment on the draft regulatory impact analysis determination. Written comments may be submitted to the contact person at the address listed under the Submittal of Comments section of this preamble.

Takings Impact Assessment

TCEQ evaluated the proposed rulemaking and performed an analysis of whether it constitutes a taking under TGC, Chapter 2007. The following is a summary of that analysis.

Under TGC, §2007.002(5), "taking" means a governmental action that affects private real property, in whole or in part or tem-

porarily or permanently, in a manner that requires the governmental entity to compensate the private real property owner as provided by the Fifth and Fourteenth Amendments to the United States Constitution or Section 17 or 19, Article I, Texas Constitution; or a governmental action that affects an owner's private real property that is the subject of the governmental action, in whole or in part or temporarily or permanently, in a manner that restricts or limits the owner's right to the property that would otherwise exist in the absence of the governmental action and is the producing cause of a reduction of at least 25% in the market value of the affected private real property, determined by comparing the market value of the property as if governmental action is not in effect and the market value of the property determined as if the governmental action is in effect.

The specific purpose of the proposed rulemaking is to implement the legislative amendments to the THSC and the TWC in HB 692 by revising TCEQ's rules in Chapter 321 to establish requirements for land application or disposal of dairy waste. The proposed rulemaking will substantially advance this stated purpose by adopting new rule language in Chapter 335 that exempts from permitting or notification under Chapter 335 for certain land applications and disposal of dairy waste in compliance with Chapter 321.

Promulgation and enforcement of the proposed rules will not be a statutory or constitutional taking of private real property because, as the commission's analysis indicates, TGC, Chapter 2007 does not apply to these proposed rules because these rules do not impact private real property in a manner that would require compensation to private real property owners under the United States Constitution or the Texas Constitution. Specifically, the proposed rulemaking does not apply to or affect any landowner's rights in any private real property because it does not burden (constitutionally), restrict, or limit any landowner's right to real property and reduce any property's value by 25 percent or more beyond that which would otherwise exist in the absence of the regulations. The primary purpose of the proposed rules is to implement HB 692 by providing for the authorization for certain land applications and disposal of dairy waste. The proposed rulemaking is reasonably taken to fulfill requirements of state law. Therefore, the proposed rulemaking will not cause a taking TGC, Chapter 2007.

Consistency with the Coastal Management Program

The commission reviewed the proposed rulemaking and found that the proposal is subject to the Texas Coastal Management Program (CMP) in accordance with the Coastal Coordination Act, Texas Natural Resources Code, §§33.201 et seq., and therefore must be consistent with all applicable CMP goals and policies. The commission conducted a consistency determination for the proposed rules in accordance with Coastal Coordination Act Implementation Rules, 31 TAC §29.22 and found the proposed rulemaking is consistent with the applicable CMP goals and policies.

CMP goals applicable to the proposed rulemaking includes protecting, preserving, restoring, and enhancing the diversity, quality, quantity, functions, and values of coastal natural resource areas (CNRAs); and ensuring sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone. CMP policies applicable to the proposed rules include that discharges must comply with water quality-based effluent limits; and that discharges which increase pollutant loadings to coastal waters must not impair designated uses of coastal waters and must not significantly degrade coastal water quality, unless necessary for important economic or social development.

The proposed rulemaking is consistent with the above goals and policies by requiring dairy waste disposal activities to be conducted in a manner that is protective of water quality and prohibits the discharge of dairy waste into water in the state.

Promulgation and enforcement of the rules would not violate or exceed any standards identified in the applicable CMP goals and policies because the proposed rules would be consistent with these CMP goals and policies, and the rule would not create or have a direct or significant adverse effect on any CNRAs.

Written comments on the consistency of this rulemaking with CMP goals and policies may be submitted to the contact person at the address listed under the SUBMITTAL OF COMMENTS section of this preamble.

Announcement of Hearing

In addition to comments on any other aspect of the proposed rules, the commission invites public comment on the proposal to authorize the dairy waste management activities only under emergency conditions, without Texas Health and Safety Code, §361.1215 and Texas Water Code, §26.0481 expressly stating that they apply only in such situations.

The commission will hold a hybrid virtual and in-person public hearing on this proposal in Austin on Monday, March 31, 2025, at 10:00 a.m. in Building A, Room 173 at the commission's central office located at 12100 Park 35 Circle. The hearing is structured for the receipt of oral or written comments by interested persons. Individuals may present oral statements when called upon in order of registration. Open discussion will not be permitted during the hearing; however, commission staff members will be available to discuss the proposal 30 minutes prior to the hearing.

Individuals who plan to attend the hearing virtually and want to provide oral comments and/or want their attendance on record must register by Thursday, March 27, 2025. To register for the hearing, please email *Rules@tceq.texas.gov* and provide the following information: your name, your affiliation, your email address, your phone number, and whether or not you plan to provide oral comments during the hearing. Instructions for participating in the hearing will be sent on Friday, March 28, 2025, to those who register for the hearing.

For the public who do not wish to provide oral comments but would like to view the hearing may do so at no cost at:

https://events.teams.microsoft.com/event/a31122f6-2c36-4071-8e00-3a262e1c584f@871a83a4-a1ce-4b7a-8156-3bcd93a08fba

Persons who have special communication or other accommodation needs who are planning to attend the hearing should contact Sandy Wong, Office of Legal Services at (512) 239-1802 or (800) RELAY-TX (TDD). Requests should be made as far in advance as possible.

A Spanish translation of this notice is available at: *https://www.tceq.texas.gov/rules/hearings.html*. If you need additional translation services, please contact TCEQ at (800) 687-4040. Si desea información general en español, puede llamar al (800) 687-4040.

Submittal of Comments

Written comments may be submitted to Gwen Ricco, MC 205, Office of Legal Services, Texas Commission on Environmental

Quality, P.O. Box 13087, Austin, Texas 78711-3087, or faxed to *fax4808@tceq.texas.gov*. Electronic comments may be submitted at: *https://tceq.commentinput.com/comment/search*. File size restrictions may apply to comments being submitted via TCEQ Public Comments system. All comments should reference Rule Project Number 2023-139-321-OW. The comment period closes on March 31, 2025. Please choose one of the methods provided to submit your written comments.

Copies of the proposed rulemaking can be obtained from the commission's website at *https://www.tceq.texas.gov/rules/propose_adopt.html*. For further information, please contact Dr. Joy Alabi, Water Quality Division, at (512) 239-1318.

Statutory Authority

The amended sections are proposed under the Texas Water Code (TWC) and the Texas Health and Safety Code (THSC). TWC, §5.013 establishes the general jurisdiction of the commission, while TWC, §5.102 provides the commission with the authority to carry out its duties and general powers under its jurisdictional authority as provided by TWC, §5.103. TWC, §5.103 requires the commission to adopt any rule necessary to carry out its powers and duties under the TWC and other laws of the state. TWC, §5.120 requires the commission to administer the law so as to promote judicious use and maximum conservation and protection of the environment and the natural resources of the state. TWC, §26.121, prohibits the unlawful discharge of pollutants into or adjacent to water in the state except as authorized by a rule, permit, or order issued by the commission. TWC, §26.0481 provides the commission with authority to adopt rules to allow the disposal of dairy waste from a CAFO into a control or retention facility, including a lagoon or playa; and the land application by irrigation associated with that disposal.

The commission proposes these amendments under THSC, §361.011, which grants the commission authority over municipal solid waste; THSC, §361.017, which grants the commission jurisdiction over industrial solid waste and hazardous municipal waste; THSC, §361.024, which authorizes the commission to adopt rules consistent with the general purposes of the Solid Waste Disposal Act; and THSC, §361.078 which identifies that THSC Chapter 361, Subchapter B, does not abridge, modify, or restrict the commission's authority to adopt rules issue permits and enforce the terms of permits as necessary to maintain state authorization of Texas' hazardous waste program; and THSC, §361.119, which requires the commission to adopt rules and to adopt rules consistent with THSC, and THSC, §361.1215 provides the commission with authority to issue an authorization by rule for land application of dairy waste and to adopt rules governing that land application.

The proposed amended sections implement House Bill 692, 88th Texas Legislature (2023), TWC, §§5.013, 5.102, 5.103, 5.120, 26.121, 26.0481, and THSC, §361.1215.

§335.2. Permit Required.

(a) Except with regard to storage, processing, or disposal to which subsections (c) - (h) of this section apply, and as provided in §335.45(b) of this title (relating to Effect on Existing Facilities), and in accordance with the requirements of §335.24 of this title (relating to Requirements for Recyclable Materials and Nonhazardous Recyclable Materials) and §335.25 of this title (relating to Handling, Storing, Processing, Transporting, and Disposing of Poultry Carcasses), and as provided in §332.4 of this title (relating to General Requirements), no person may cause, suffer, allow, or permit any activity of storage, processing, or disposal of any industrial solid waste or municipal hazardous waste unless such activity is authorized by a permit, amended permit, or other authorization from the Texas Commission on Environmental Quality (commission) or its predecessor agencies, the Texas Department of State Health Services (DSHS), or other valid authorization from a Texas state agency. No person may commence physical construction of a new hazardous waste management facility without first having submitted Part A and Part B of the permit application and received a finally effective permit.

(b) In accordance with the requirements of subsection (a) of this section, no generator, transporter, owner or operator of a facility, or any other person may cause, suffer, allow, or permit its wastes to be stored, processed, or disposed of at an unauthorized facility or in violation of a permit. In the event this requirement is violated, the executive director will seek recourse against not only the person who stored, processed, or disposed of the waste, but also against the generator, transporter, owner or operator, or other person who caused, suffered, allowed, or permitted its waste to be stored, processed, or disposed.

(c) Any owner or operator of a solid waste management facility that is in existence on the effective date of a statutory or regulatory change that subjects the owner or operator to a requirement to obtain a hazardous waste permit who has filed a hazardous waste permit application with the commission in accordance with the rules and regulations of the commission, may continue the storage, processing, or disposal of hazardous waste until such time as the commission approves or denies the application, or, if the owner or operator becomes subject to a requirement to obtain a hazardous waste permit after November 8, 1984, except as provided by the United States Environmental Protection Agency (EPA) or commission rules relative to termination of interim status. If a solid waste facility which has become a commercial hazardous waste management facility as a result of the federal toxicity characteristic rule effective September 25, 1990, and is required to obtain a hazardous waste permit, such facility that qualifies for interim status is limited to those activities that qualify it for interim status until the facility obtains the hazardous waste permit. Owners or operators of municipal hazardous waste facilities that satisfied this requirement by filing an application on or before November 19, 1980, with the EPA are not required to submit a separate application with the DSHS. Applications filed under this section shall meet the requirements of §335.44 of this title (relating to Application for Existing On-Site Facilities). Owners and operators of solid waste management facilities that are in existence on the effective date of statutory or regulatory amendments under the Texas Solid Waste Disposal Act (Vernon's Supplement 1991), Texas Civil Statutes, Article 4477-7, or the Resource Conservation and Recovery Act (RCRA), 42 United States Code, §§6901 *et seq.,* that render the facilities subject to the requirement to obtain a hazardous waste permit, may continue to operate if Part A of their permit application is submitted no later than six months after the date of publication of regulations by the EPA under RCRA, which first require them to comply with the standards in Subchapter E of this chapter (relating to Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, or Disposal Facilities), or Subchapter H of this chapter (relating to Standards for the Management of Specific Wastes and Specific Types of Facilities); or 30 days after the date they first become subject to the standards in these subchapters, whichever first occur; or for generators who generate greater than 100 kilograms but less than 1,000 kilograms of hazardous waste in a calendar month and who process, store, or dispose of these wastes on-site, a Part A permit application shall be submitted to the EPA by March 24, 1987, as required by 40 Code of Federal Regulations (CFR) §270.10(e)(1)(iii). This subsection shall not apply to a facility if it has been previously denied a hazardous waste permit or if authority to operate the facility has been previously terminated. Applications filed under this section shall meet the requirements of §335.44 of this title. For purposes of this subsection,

a solid waste management facility is in existence if the owner or operator has obtained all necessary federal, state, and local preconstruction approvals or permits, as required by applicable federal, state, and local hazardous waste control statutes, regulations, or ordinances; and either:

(1) a continuous physical, on-site construction program has begun; or

(2) the owner or operator has entered into contractual obligations, which cannot be cancelled or modified without substantial loss, for construction of the facility to be completed within a reasonable time.

(d) No permit shall be required for:

(1) the processing or disposal of nonhazardous industrial solid waste, if the waste is processed or disposed on property owned or otherwise effectively controlled by the owner or operator of the industrial plant, manufacturing plant, mining operation, or agricultural operation from which the waste results or is produced; the property is within 50 miles of the plant or operation; and the waste is not commingled with waste from any other source or sources (An industrial plant, manufacturing plant, mining operation, or agricultural operation owned by one person shall not be considered an "other source" with respect to other plants and operations owned by the same person.);

(2) the storage of nonhazardous industrial solid waste, if the waste is stored on property owned or otherwise effectively controlled by the owner or operator of the industrial plant, manufacturing plant, mining operation, or agricultural operation from which the waste results or is produced, and the waste is not commingled with waste from any other source or sources (An industrial plant, manufacturing plant, mining operation, or agricultural operation owned by one person shall not be considered an "other source" with respect to other plants and operations owned by the same person.);

(3) the storage or processing of nonhazardous industrial solid waste, if the waste is processed in an elementary neutralization unit;

(4) the collection, storage, or processing of nonhazardous industrial solid waste, if the waste is collected, stored, or processed as part of a treatability study;

(5) the storage of nonhazardous industrial solid waste, if the waste is stored in a transfer facility in containers for a period of ten days or less, unless the executive director determines that a permit should be required in order to protect human health and the environment;

(6) the storage or processing of nonhazardous industrial solid waste, if the waste is processed in a publicly owned treatment works with discharges subject to regulation under the federal Clean Waste Act, §402, as amended through October 4, 1996, if the owner or operator has a National Pollutant Discharge Elimination System permit and complies with the conditions of the permit;

(7) the storage or processing of nonhazardous industrial solid waste, if the waste is stored or processed in a wastewater unit and is discharged in accordance with a Texas Pollutant Discharge Elimination System authorization issued under Texas Water Code, Chapter 26;

(8) the storage or processing of nonhazardous industrial solid waste, if the waste is stored or processed in a wastewater treatment unit that discharges to a publicly owned treatment works and the units are located at a noncommercial solid waste management facility; [~~or~~]

(9) the storage or processing of nonhazardous industrial solid waste, if the waste is processed in a wastewater treatment unit that discharges to a publicly owned treatment works liquid wastes that are incidental to the handling, processing, storage, or disposal of solid wastes at municipal solid waste facilities or commercial industrial solid waste landfill facilities; or [~~.~~]

(10) the land application, as defined in §321.405 of this title (relating to Definitions), or the disposal of dairy waste, as defined in §321.48 of this title (relating to Land Application of Dairy Waste), under emergency conditions, as defined in §321.48 of this title, in compliance with Chapter 321 of this title (relating to Control of Certain Activities by Rule).

(e) No permit shall be required for the on-site storage of hazardous waste by a person who meets the conditions for exemption for a very small quantity generator in 40 CFR §262.14 as adopted under §335.53 of this title (relating to General Standards Applicable to Generators of Hazardous Waste).

(f) No permit under this chapter shall be required for the storage, processing, or disposal of hazardous waste by a person described in §335.41(b) - (d) of this title (relating to Purpose, Scope, and Applicability) or for the storage of hazardous waste under the provisions of 40 CFR §261.4(c) and (d) as adopted under §335.504 of this title (relating to Hazardous Waste Determination).

(g) No permit under this chapter shall be required for the storage, processing, or disposal of hazardous industrial waste or municipal hazardous waste that is generated or collected for the purpose of conducting treatability studies. Such samples are subject to the requirements in 40 CFR §261.4(e) and (f) as adopted under §335.504 of this title.

(h) A person may obtain authorization from the executive director for the storage, processing, or disposal of nonhazardous industrial solid waste in an interim status landfill that has qualified for interim status in accordance with 40 CFR Part 270, Subpart G, and that has complied with the standards in Subchapter E of this chapter, by complying with the notification and information requirements in §335.6 of this title (relating to Notification Requirements). The executive director may approve or deny the request for authorization or grant the request for authorization subject to conditions, which may include, without limitation, public notice and technical requirements. A request for authorization for the disposal of nonhazardous industrial solid waste under this subsection shall not be approved unless the executive director determines that the subject facility is suitable for disposal of such waste at the facility as requested. At a minimum, a determination of suitability by the executive director must include approval by the executive director of construction of a hazardous waste landfill meeting the design requirements of 40 CFR §265.301(a). In accordance with §335.6 of this title, such person shall not engage in the requested activities if denied by the executive director or unless 90 days' notice has been provided and the executive director approves the request except where express executive director approval has been obtained prior to the expiration of the 90 days. Authorization may not be obtained under this subsection for:

(1) nonhazardous industrial solid waste, the storage, processing, or disposal of which is expressly prohibited under an existing permit or site development plan applicable to the facility or a portion of the facility;

(2) polychlorinated biphenyl compounds wastes subject to regulation by 40 CFR Part 761;

(3) explosives and shock-sensitive materials;

(4) pyrophorics;

(5) infectious materials;

(6) liquid organic peroxides;

(7) radioactive or nuclear waste materials, receipt of which will require a license from the DSHS or the commission or any other successor agency; and

(8) friable asbestos waste unless authorization is obtained in compliance with the procedures established under §330.171(c)(3)(B) - (E) of this title (relating to Disposal of Special Wastes). Authorizations obtained under this subsection shall be effective during the pendency of the interim status and shall cease upon the termination of interim status, final administrative disposition of the subject permit application, failure of the facility to operate the facility in compliance with the standards set forth in Subchapter E of this chapter, or as otherwise provided by law.

(i) Owners or operators of hazardous waste management units must have permits during the active life (including the closure period) of the unit. Owners or operators of surface impoundments, landfills, land treatment units, and waste pile units that received wastes after July 26, 1982, or that certified closure (according to 40 CFR §265.115) after January 26, 1983, must have post-closure permits, unless they demonstrate closure by removal or decontamination as provided under 40 CFR §270.1(c)(5) and (6), or obtain an order in lieu of a post-closure permit, as provided in subsection (m) of this section. If a post-closure permit is required, the permit must address applicable provisions of 40 CFR Part 264, and Subchapter F of this chapter (relating to Permitting Standards for Owners and Operators of Hazardous Waste Treatment, Storage, or Disposal Facilities) provisions concerning groundwater monitoring, unsaturated zone monitoring, corrective action, and post-closure care requirements. The denial of a permit for the active life of a hazardous waste management facility or unit does not affect the requirement to obtain a post-closure permit under this section.

(j) Upon receipt of the federal Hazardous and Solid Waste Act (HSWA) authorization for the commission's Hazardous Waste Program, the commission shall be authorized to enforce the provisions that the EPA imposed in hazardous waste permits that were issued before the HSWA authorization was granted.

(k) Any person who intends to conduct an activity under subsection (d) of this section shall comply with the notification requirements of §335.6 of this title.

(l) No permit shall be required for the management of universal wastes by universal waste handlers or universal waste transporters, in accordance with the definitions and requirements of Subchapter H, Division 5 of this chapter (relating to Universal Waste Rule).

(m) At the discretion of the commission, an owner or operator may obtain a post-closure order in lieu of a post-closure permit for interim status units, a corrective action management unit unless authorized by a permit, or alternative corrective action requirements for contamination commingled from RCRA and solid waste management units. The post-closure order must address the facility-wide corrective action requirements of §335.167 of this title (relating to Corrective Action for Solid Waste Management Units) and groundwater monitoring requirements of §335.156 of this title (relating to Applicability of Groundwater Monitoring and Response).

(n) Except as provided in subsection (d)(9) of this section, owners or operators of commercial industrial solid waste facilities that receive industrial solid waste for discharge to a publicly owned treatment works are required to obtain a permit under this subchapter. By June 1, 2006, owners or operators of existing commercial industrial solid waste facilities that receive industrial solid waste for discharge to a publicly owned treatment works must have a permit issued under this subchapter or obtain a general permit issued under Chapter 205 of this title (relating to General Permits for Waste Discharges) to continue operating. A general permit issued under Chapter 205 of this title will authorize operations until a final decision is made on the application for an individual permit or 15 months, whichever is earlier. The general permit shall authorize operations for a maximum period of 15 months except that authorization may be extended on an individual basis in one-year increments at the discretion of the executive director. Should an application for a general permit issued under Chapter 205 of this title be submitted, the applicant shall also submit to the commission, by June 1, 2006, the appropriate information to demonstrate compliance with financial assurance requirements for closure of industrial solid waste facilities in accordance with Chapter 37, Subchapter P of this title (relating to Financial Assurance for Hazardous and Nonhazardous Industrial Solid Waste Facilities). Owners or operators of commercial industrial solid waste facilities that receive industrial solid waste for discharge to a publicly owned treatment works operating under a general permit issued under Chapter 205 of this title shall submit an application for a permit issued under this subchapter prior to September 1, 2006.

(o) Treatment, storage, and disposal facilities that are otherwise subject to permitting under RCRA and that meet the criteria in paragraphs (1) or paragraph (2) of this subsection, may be eligible for a standard permit under Subchapter U of this chapter (relating to Standards for Owners and Operators of Hazardous Waste Facilities Operating Under a Standard Permit) if they satisfy one of the two following criteria:

(1) facility generates hazardous waste and then non-thermally treats and/or stores hazardous waste on-site; or

(2) facility receives hazardous waste generated off-site by a generator under the same ownership as the receiving facility.

(p) No permit under this chapter shall be required for a reverse distributor accumulating potentially creditable hazardous waste pharmaceuticals and evaluated hazardous waste pharmaceuticals, as defined in §335.751 of this title (relating to Definitions) in compliance with Subchapter W of this chapter (relating to Management Standards for Hazardous Waste Pharmaceuticals). Reverse distributors accumulating potentially creditable hazardous waste pharmaceuticals and evaluated hazardous waste pharmaceuticals in compliance with Subchapter W of this chapter shall notify the executive director in accordance with §335.6 of this title.

§335.6. Notification Requirements.

(a) Notification of industrial solid waste and municipal hazardous waste activities not authorized by a permit. Any person who intends to store, process, recycle, or dispose of industrial solid waste without a permit, as authorized by §335.2(d), (f), or (h) of this title (relating to Permit Required) or §335.24 of this title (relating to Requirements for Recyclable Materials and Nonhazardous Recyclable Materials), shall notify the executive director using a method approved by the executive director, that storage, processing, recycling, or disposal activities are planned.

(1) A person required to notify of activities under this subsection shall notify at least 90 days before conducting an activity under this subsection.

(2) A person required to notify under this section shall submit additional information, upon request, to the executive director to demonstrate that storage, processing, recycling, or disposal is compliant with the terms of this chapter, including but not limited to information listed under subsection (b)(3) of this section.

(b) Duty to notify of changed and new information. Any person who stores, processes, or disposes of municipal hazardous waste or industrial solid waste shall promptly notify the executive director using a method approved by the executive director of:

(1) any new information concerning storage, processing, and disposal described in paragraph (3) of this subsection; and

(2) any changes to information previously submitted or reported under subsection (a) of this section:

(A) authorized in any permit issued by the commission; or

(B) submitted or reported to the commission in any application filed with the commission.

(3) Information concerning storage, processing, and disposal required to be submitted under this subsection includes and is not limited to:

(A) waste composition;

(B) waste management methods;

(C) facility engineering plans and specifications; and

(D) the geology where the facility is located.

(4) A person who notifies the executive director under this section shall immediately document and notify the executive director within 90 days of changes in information previously provided and additional information that was not provided.

(c) Generator registration.

(1) Any person, by site, that generates in any calendar month more than 100 kilograms of non-acute hazardous waste, more than 1 kilogram of acute hazardous waste, or more than 100 kilograms of industrial Class 1 waste shall register in a method approved by the executive director.

(2) Large quantity generators must meet the requirements of this subsection using the electronic interface provided by the executive director unless:

(A) the executive director has granted a written request to use paper forms or an alternative notification method; or

(B) the software does not have features capable of meeting the requirements.

(3) Notifications submitted pursuant to this section shall be in addition to information provided in any permit applications required by §335.2 of this title, or any reports required by §335.9 of this title (relating to Recordkeeping and Annual Reporting Procedures Applicable to Generators), §335.10 of this title (relating to Shipping and Reporting Procedures Applicable to Generators of Hazardous Waste or Class 1 Waste), and §335.13 of this title (relating to Recordkeeping and Reporting Procedures Applicable to Generators of Hazardous Waste or Class 1 Waste).

(4) If waste is recycled on-site or managed pursuant to §335.2(d)(1) - (4) or (6) - (9) of this title, the generator must also comply with the notification requirements specified in subsection (h) of this section.

(5) The information submitted pursuant to the notification requirements of this subchapter and to the additional requirements of §335.503 of this title (relating to Waste Classification and Waste Coding Required) shall include, but is not limited to:

(A) a description of the waste including:

(i) a description of the process generating the waste; and

(ii) the composition of the waste;

(B) a hazardous waste determination in accordance with §335.504 of this title (relating to Hazardous Waste Determination), which includes the appropriate United States Environmental Protection Agency (EPA) hazardous waste number(s) described in 40 Code of Federal Regulations (CFR) Part 261;

(C) the disposition of each solid waste generated, if subject to the notification requirement of this subsection, including:

(i) whether the waste is managed on-site and/or off-site;

(ii) a description of the type and use of each on-site waste management facility unit;

(iii) a listing of the wastes managed in each unit; and

(iv) whether each unit is permitted, or qualifies for an exemption, under §335.2 of this title.

(d) Transporter registration. Any person who transports hazardous waste or industrial Class 1 waste shall notify the executive director of such activity by registering using a method approved by the executive director. A person, by site, that generates in any calendar month less than 100 kilograms of non-acute hazardous waste, less than 1 kilogram of acute hazardous waste, and less than 100 kilograms of industrial Class 1 waste and only transports their own waste is not required to comply with this subsection.

(e) Transfer facility registration. A person that intends to operate a transfer facility in accordance with §335.94 of this title (relating to Transfer Facility Requirements) shall notify the executive director of such activity by registering using a method approved by the executive director.

(f) Waste analysis. Any person who ships, stores, processes, or disposes of industrial solid waste or hazardous waste shall provide the chemical analysis of the solid waste performed in accordance with Subchapter R of this chapter (relating to Waste Classification) to the executive director upon written request.

(g) Notification prior to facility expansion. Any person who stores, processes, or disposes of industrial solid waste or municipal hazardous waste shall notify the executive director in writing of any activity or facility expansion not authorized by permit, at least 90 days prior to conducting such activity. Such person shall submit to the executive director upon request such information as may reasonably be required to enable the executive director to determine whether such activity is compliant with this chapter.

(h) Notification of recycling activities. Any person who intends to ship off-site or transfer to another person for recycling, or who conducts or intends to conduct the recycling of, industrial solid waste, municipal hazardous waste, recyclable materials, or nonhazardous recyclable materials as defined in §335.24 of this title or Subchapter H of this chapter (relating to Standards for the Management of Specific Wastes and Specific Types of Facilities) and who is required to notify under §335.24 of this title or Subchapter H of this chapter shall notify the executive director using a method approved by the executive director.

(1) A person that is required to notify under this subsection shall include, at a minimum, the following information:

(A) the type(s), classification(s), Texas waste code(s) and EPA hazardous waste number(s) described in 40 CFR Part 261, if any, of each industrial solid waste and municipal hazardous waste intended to be recycled;

(B) the method of storage prior to recycling; and

(C) the nature of the recycling activity.

(2) A person required to notify the executive director of the intent to recycle under this subsection may begin recycling activities 90 days after submitting notification of intent to recycle under this subsection if the executive director has not requested additional information in response to the notification or upon receipt of an acknowledgment from the executive director.

(i) Notification of operating under the small quantity burner exemption. The owner or operator of a facility qualifying for the small quantity burner exemption under 40 CFR §266.108 must provide a one-time signed, written notification to the EPA and to the executive director indicating the following:

(1) the combustion unit is operating as a small quantity burner of hazardous waste;

(2) the owner and operator are in compliance with the requirements of 40 CFR §266.108, §335.221(a)(19) of this title (relating to Applicability and Standards) and this subsection; and

(3) the maximum quantity of hazardous waste that the facility may burn as provided by 40 CFR §266.108(a)(1).

(j) Notification of used oil activities. Notification and regulation requirements on nonhazardous used oil, oil made characteristically hazardous by use (instead of mixing), used oil generated by a very small quantity generator, and household used oil after collection that will be recycled shall notify in accordance with Chapter 324 of this title (relating to Used Oil).

(k) Notification exemption for the disposal of animal carcasses. A landowner who disposes of domestic or exotic animal carcasses and who complies with a certified water quality management plan developed for their site under Texas Agriculture Code, §201.026(f) as added by Acts 2001, 77th Legislature, Chapter 1189, §1 (relating to Nonpoint Source Pollution) is exempt from the notification requirements of subsections (a) and (b) of this section.

(l) Healthcare facilities notification. A person required to notify the executive director under §335.755 of this title (relating to Standards for Healthcare Facilities Managing Non-Creditable Hazardous Waste Pharmaceuticals) shall notify using a method approved by the executive director.

(m) Reverse distributor registration. A person required to notify the executive director under §335.771 of this title (relating to Standards for the Management of Potentially Creditable Hazardous Waste Pharmaceuticals and Evaluated Hazardous Waste Pharmaceuticals by Reverse Distributors) shall register using a method approved by the executive director.

(n) Notification exemption for land application or disposal of dairy waste under emergency conditions. A person land applying, as the term land application is defined in §321.405 of this title (relating to Definitions), or disposing of dairy waste, as defined in §321.48 of this title (relating to Land Application of Dairy Waste), under emergency conditions, as defined in §321.48 of this title, in compliance with Chapter 321, of this title (relating to Control of Certain Activities by Rule) is exempt from the notification requirements of this section.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 14, 2025.

TRD-202500562

Charmaine Backens
Deputy Director, Environmental Law Division
Texas Commission on Environmental Quality
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 239-2678

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TITLE 34. PUBLIC FINANCE

PART 11. TEXAS EMERGENCY SERVICES RETIREMENT SYSTEM

CHAPTER 302. GENERAL PROVISIONS RELATING TO THE TEXAS EMERGENCY SERVICES RETIREMENT SYSTEM

34 TAC §302.1

The Board of Trustees (the "Board") of the Texas Emergency Services Retirement System (the "System") proposes an amendment to Chapter 302, General Provisions Relating to the Texas Emergency Services Retirement System, 34 Texas Administrative Code (TAC) §302.1 to add a definition for the term "spouse" as used for purposes of the System, including eligibility for spousal death benefits, and to set forth the requirements for proving the existence of an informal marriage. The purpose of this amendment is to ensure the efficient administration of the System by establishing clear requirements for proving a legally recognized spousal relationship exists and eliminating any ambiguity or uncertainty for the member, beneficiary or the System.

FISCAL NOTE ON STATE AND LOCAL GOVERNMENTS. Jessica Almaguer, Executive Director of the Texas Emergency Services Retirement System, has determined that for the first five-year period the proposed amendments are in effect, there will be no fiscal impact to state or local governments as a result of enforcing or administering these amendments as proposed under Texas Government Code §2001.024(a)(4) because the amendments do not impose a cost on state or local governments.

LOCAL EMPLOYMENT IMPACT. Ms. Almaguer has determined that the proposed amendments would not impact a local economy. Therefore, a local employment impact statement is not required under Texas Government Code §2001.022 and §2001.024(a)(6).

PUBLIC BENEFIT AND COST NOTE. Ms. Almaguer has determined under Texas Government Code §2001.024(a)(5) that for each of the first five years the proposed amendments would be in effect, the public benefit will be the cleanup, clarification, and refinement of continuing education requirements and the enhanced alignment of continuing education activities with content that directly concerns occupational therapy and ensures the health, safety, and welfare of the public. There would not be an additional anticipated economic cost to persons required to comply with the proposed amendments.

ECONOMIC IMPACT ON SMALL BUSINESSES, MICRO-BUSINESSES, AND RURAL COMMUNITIES. Ms. Almaguer has determined there would be no costs or adverse economic effects on small businesses, micro-businesses, or rural communities. Therefore, no economic impact statement or regulatory flexibility analysis is required under Texas Government Code §2006.002.

TAKINGS IMPACT ASSESSMENT. Ms. Almaguer has determined that no private real property interests are affected by these proposed amendments and that these amendments do not restrict, limit, or impose a burden on an owner's rights to his or her private real property that would otherwise exist in the absence of government action. As a result, these amendments do not constitute a taking under Texas Government Code §2007.043.

GOVERNMENT GROWTH IMPACT STATEMENT. Ms. Almaguer has determined under Texas Government Code §2001.0221 that during the first five years the rules would be in effect:

(1) the rule will not create or eliminate a government program;

(2) the rule will not require the creation of new employee positions or the elimination of existing employee positions;

(3) the rule will not require an increase or decrease in future legislative appropriations to the agency;

(4) the rule will not require an increase or decrease in fees paid to the agency;

(5) the rule will not create a new regulation or repeal a regulation;

(6) the rule will expand certain existing regulations and limit certain existing regulations;

(7) the rule will not increase or decrease the number of individuals subject to the rule's applicability; and

(8) the rule will neither positively nor adversely affect this state's economy.

COSTS TO REGULATED PERSONS. Ms. Almaguer has determined that the rules are not subject to Texas Government Code §2001.0045 as the rules do not impose a cost on regulated persons. In addition, the rules do not impose a cost on another state agency, a special district, or a local government.

ENVIRONMENTAL IMPACT STATEMENT. Ms. Almaguer has determined that the proposed amendments do not require an environmental impact analysis because the amendments are not major environmental rules under Texas Government Code §2001.0225.

PUBLIC COMMENT. Comments on the proposed amendments may be submitted in writing to Jessica Almaguer, Executive Director, 208 E. 10th Street, Suite 309, Austin, Texas 78701 or within 30 days following the publication of this notice in the *Texas Register.* It is requested when sending a comment that individuals include the rule section to which the comment refers and that comments sent by email include "Public Comment" in the email's subject line.

STATUTORY AUTHORITY. The amended rule is proposed pursuant to Texas Government Code §865.006(b), which authorizes the Board to adopt rules necessary for the administration of the System.

CROSS REFERENCE TO STATUTE. No other statutes, articles, or codes are affected by these amendments.

§302.1. Definitions.

(a) Unless otherwise specifically provided in this part, the terms and phrases used in Chapters 302, 304, 306, 308 and 310 have the meanings assigned by Government Code, Chapters 861 - 865.

(b) In Chapters 302, 304, 306, 308 and 310, "Texas Local Fire Fighters Retirement Act" means the Texas Local Fire Fighters Retirement Act (Article 6243e, Vernon's Texas Civil Statutes).

(c) For purposes of this part and Government Code, Chapters 861-865, the term "spouse" means an individual to whom a member is legally married under Subtitle A, Title 1, Family Code or a comparable law of another jurisdiction (including a ceremonial marriage or an informal marriage), provided that in the case of an informal marriage in this state, the marriage must be evidenced by a declaration of informal marriage recorded in accordance with Subchapter E, Chapter 2, Family Code prior to the death of a member. With respect to an informal marriage established in this state, a spouse is considered married to a member as of the date a declaration of informal marriage was recorded in accordance with Subchapter E, Chapter 2, Family Code.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 12, 2025.

TRD-202500487
Jessica Almaguer
Executive Director
Texas Emergency Services Retirement System
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 936-3422

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34 TAC §302.7

The Board of Trustees (the "Board") of the Texas Emergency Services Retirement System (the "System") proposes the repeal of 34 Texas Administrative Code (TAC) §302.7, Employees of Participating Departments. The purpose of the proposed repeal is to eliminate §302.7, which was an interim rule that has since been replaced by 34 TAC §304.4 Employees of Participating Departments. The proposed repeal will remove out of date language that is no longer necessary.

FISCAL NOTE ON STATE AND LOCAL GOVERNMENTS. Jessica Almaguer, Executive Director of the Texas Emergency Services Retirement System, has determined that for the first five-year period the proposed amendments are in effect, there will be no fiscal impact to state or local governments as a result of enforcing or administering these amendments as proposed under Texas Government Code §2001.024(a)(4) because the amendments do not impose a cost on state or local governments.

LOCAL EMPLOYMENT IMPACT. Ms. Almaguer has determined that the proposed amendments would not impact a local economy. Therefore, a local employment impact statement is not required under Texas Government Code §2001.022 and §2001.024(a)(6).

PUBLIC BENEFIT AND COST NOTE. Ms. Almaguer has determined under Texas Government Code §2001.024(a)(5) that for each of the first five years the proposed amendments would be in effect, the public benefit will be the cleanup, clarification, and refinement of continuing education requirements and the enhanced alignment of continuing education activities with content that directly concerns occupational therapy and ensures the health, safety, and welfare of the public. There would not be an additional anticipated economic cost to persons required to comply with the proposed amendments.

ECONOMIC IMPACT ON SMALL BUSINESSES, MICRO-BUSINESSES, AND RURAL COMMUNITIES. Ms. Almaguer has determined there would be no costs or adverse economic effects

on small businesses, micro-businesses, or rural communities. Therefore, no economic impact statement or regulatory flexibility analysis is required under Texas Government Code §2006.002.

TAKINGS IMPACT ASSESSMENT. Ms. Almaguer has determined that no private real property interests are affected by these proposed amendments and that these amendments do not restrict, limit, or impose a burden on an owner's rights to his or her private real property that would otherwise exist in the absence of government action. As a result, these amendments do not constitute a taking under Texas Government Code §2007.043.

GOVERNMENT GROWTH IMPACT STATEMENT. Ms. Almaguer has determined under Texas Government Code §2001.0221 that during the first five years the rules would be in effect:

(1) the rule will not create or eliminate a government program;

(2) the rule will not require the creation of new employee positions or the elimination of existing employee positions;

(3) the rule will not require an increase or decrease in future legislative appropriations to the agency;

(4) the rule will not require an increase or decrease in fees paid to the agency;

(5) the rule will not create a new regulation or repeal a regulation;

(6) the rule will expand certain existing regulations and limit certain existing regulations;

(7) the rule will not increase or decrease the number of individuals subject to the rule's applicability; and

(8) the rule will neither positively nor adversely affect this state's economy.

COSTS TO REGULATED PERSONS. Ms. Almaguer has determined that the rules are not subject to Texas Government Code §2001.0045 as the rules do not impose a cost on regulated persons. In addition, the rules do not impose a cost on another state agency, a special district, or a local government.

ENVIRONMENTAL IMPACT STATEMENT. Ms. Almaguer has determined that the proposed amendments do not require an environmental impact analysis because the amendments are not major environmental rules under Texas Government Code §2001.0225.

PUBLIC COMMENT. Comments on the proposed amendments may be submitted in writing to Jessica Almaguer, Executive Director, 208 E. 10th Street, Suite 309, Austin, Texas 78701 or within 30 days following the publication of this notice in the *Texas Register*. It is requested when sending a comment that individuals include the rule section to which the comment refers and that comments sent by email include "Public Comment" in the email's subject line.

STATUTORY AUTHORITY. The repeal is proposed pursuant to Texas Government Code §865.006(b), which authorizes the Board to adopt rules necessary for the administration of the System.

CROSS REFERENCE TO STATUTE. No other statutes, articles, or codes are affected by these amendments.

§302.7. Employees of Participating Departments.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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Jessica Almaguer
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Texas Emergency Services Retirement System
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For further information, please call: (512) 936-3422

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TITLE 37. PUBLIC SAFETY AND CORRECTIONS

PART 15. TEXAS FORENSIC SCIENCE COMMISSION

CHAPTER 651. DNA, CODIS, FORENSIC ANALYSIS, AND CRIME LABORATORIES
SUBCHAPTER C. FORENSIC ANALYST LICENSING PROGRAM

37 TAC §651.222

The Texas Forensic Science Commission (Commission) proposes amendments to 37 Texas Administrative Code Chapter §651.222, Voluntary Licensure Forensic Analyst and Technician Licensing Requirements to qualify all versions of the Texas Commission on Law Enforcement (TCOLE) Course Number 2106 Intermediate Crime Scene revised or established prior to or after 2019, as long as the course is taught by a TCOLE-certified instructor or subject matter expert approved by the Commission. The rule changes also correct the title of the section to Voluntary Forensic Analyst and Technician Licensing Requirements.

Background and Justification. The proposed amendments qualify crime scene applicants who took the TCOLE 2106 course before 2019 for voluntary licensure by the Commission. Under the current rules, only the 2019 or later courses fulfill this requirement.

Fiscal Impact on State and Local Government. Leigh M. Tomlin, Associate General Counsel of the Commission, has determined that for each year of the first five years the new rule is in effect, there will be no fiscal impact to state or local governments as a result of the enforcement or administration of the proposal. There is no estimated loss or increase in revenue to the state or to local governments as a result of enforcing or administering the proposed rule amendments.

Local Employment Impact Statement. The proposal has no effect on local economy; therefore, no local employment impact statement is required under Texas Government Code §2001.022.

Probable Economic Costs to Persons Required to Comply with Proposal. The proposal does not impose a cost on regulated persons, another state agency, a special district, or a local government and, therefore, is not subject to Texas Government Code §2001.0045.

Public Benefit. Ms. Tomlin has also determined that for each year of the first five years the new rule is in effect, the anticipated public benefit is expanded eligibility for voluntary forensic analyst and technician licenses in crime scene disciplines offered by the

Commission. Under the current rules, candidates are required to successfully complete a TCOLE Crime Scene Search course (version 2019 or later). However, the Commission has determined that many current practitioners who successfully completed earlier versions of the course should be eligible for the license, as long as the course was taught by a TCOLE-certified instructor or a qualified subject matter expert. The incorporated changes to the rules include any version of the course taught by a TCOLE-certified instructor or subject matter expert approved by the Commission, qualifying all candidates who successfully completed the course provided they satisfy the other components of licensure set forth in the Commission's administrative rules.

Fiscal Impact on Small and Micro-businesses and Rural Communities. There is no adverse economic effect anticipated for small businesses, micro-businesses, or rural communities as a result of implementing the proposed rule. Accordingly, no economic impact statement or regulatory flexibility analysis is required under Texas Government Code §2006.002(c).

Takings Impact Assessment. Ms. Tomlin has determined that no private real property interests are affected by this proposal and that this proposal does not restrict or limit an owner's right to property that would otherwise exist in the absence of government action and, therefore, does not constitute a taking or require a takings impact assessment under the Government Code §2007.043.

Government Growth Impact Statement. Ms. Tomlin has determined that for the first five-year period, implementation of the proposed amendments will have no government growth impact. Pursuant to the analysis required by Government Code 2001.221(b): (1) the proposed rule does not create or eliminate a government program; (2) implementation of the proposed rule does not require the creation of new employee positions or the elimination of existing employee positions; (3) implementation of the proposed rule does not increase or decrease future legislative appropriations to the agency; (4) the proposed rule changes do not require any fees; (5) the proposed rule does not create a new regulation; (6) the proposed rule does not expand, limit, or repeal an existing regulation; (7) the proposed rule does not increase or decrease the number of individuals subject to the rule's applicability; and (8) the proposed rule has no effect on the state's economy.

Environmental Rule Analysis. The Commission has determined that the proposed rules are not brought with specific intent to protect the environment or reduce risks to human health from environmental exposure; thus, the Commission asserts that the proposed rules are not a "major environmental rule," as defined in Government Code §2001.0225. As a result, the Commission asserts the preparation of an environmental impact analysis, as provided by §2001.0225, is not required.

Request for Public Comment. The Commission invites comments on the proposal from any member of the public. Please submit comments to Leigh M. Tomlin, 1700 North Congress Avenue, Suite 445, Austin, Texas 78701 or leigh@fsc.texas.gov. Comments must be received by April 1, 2025, to be considered by the Commission.

Statutory Authority. The rule amendments are proposed under the general rulemaking authority provided in Code of Criminal Procedure, Article 38.01 §3-a and its authority to license forensic analysts under §4-a(b).

Cross reference to statute. The proposal affects Tex. Code Crim. Proc. art. 38.01.

§651.222. Voluntary [~~Licensure~~] Forensic Analyst and Technician Licensing Requirements.

(a) Issuance. The Commission may issue an individual's forensic analyst or technician license for forensic examinations or tests not subject to accreditation under this section.

(b) Voluntary. Licensure under this section is voluntary and is not a prerequisite for practice in any of the forensic disciplines listed in this section.

(c) The following forensic disciplines are eligible for a forensic analyst or forensic technician license under this section:

(1) forensic anthropology;

(2) document examination, including document authentication, physical comparison, qualitative determination, and recovery;

(3) latent print examination, including the forensic examination of friction ridge detail from the hands and feet;

(4) latent print processing, including identifying and preserving latent prints from items obtained at a crime scene, by utilizing appropriate visual, physical, and/or chemical techniques with sequential processing to develop latent, patent, and/or plastic prints from a substrate;

(5) digital/multimedia evidence (limited to computer, mobile, vehicle, call detail records (*i.e.,* phone carrier record comparisons to mobile device), and location detail records); and

(6) crime scene, with the following sub-disciplines:

(A) crime scene processing technician, including crime scene documentation (scene notes, photography, sketching, laser scanning), and evidence identification, collection, preservation, and submission;

(B) crime scene investigation analyst, including crime scene processing activities as well as the application of analytical techniques used for evidence triage, such as chemical and presumptive testing. It may also include the issuance of a report on crime scene documentation and/or crime scene processing;

(C) crime scene reconstruction analyst, including crime scene processing activities, crime scene investigation activities, and any forensic activities requiring the application of the scientific method to evaluate information regarding a crime scene from all reasonably available sources such as scene documentation, investigative reports, physical evidence, laboratory reports, autopsy documentation, photographs, video, and witness statements;

(D) crime scene reconstruction analyst, with specific recognition in bloodstain pattern analysis, including all crime scene reconstruction activities described in subparagraph (C) of this paragraph; and

(E) crime scene reconstruction analyst, with specific recognition in shooting incident reconstruction, including crime scene reconstruction activities described in subparagraph (C) of this paragraph.

(d) Application. Before being issued a forensic analyst license, an applicant shall complete and submit to the Commission a current forensic analyst license application and provide documentation that he or she has satisfied all applicable requirements set forth under this section.

(e) Minimum Education Requirements.

(1) Document Examination Analyst. An applicant for a forensic analyst license in document examination must have a baccalaureate or advanced degree from an accredited university.

(2) Forensic Anthropologist. An applicant for a forensic analyst license in forensic anthropology must be certified by the American Board of Forensic Anthropology (ABFA), including fulfillment of any minimum education requirements required to comply with and maintain ABFA certification at the time of the candidate's application for a license.

(3) Latent Print Analyst. An applicant for a forensic analyst license in latent print examination must have:

(A) A baccalaureate or advanced degree from an accredited university;

(B) 3 years of experience in latent print examination with an Associates of Arts or Associates of Science; or

(C) 4 years of experience in latent print examination and 176 hours of training that includes 16 hours of testimonial training (with only a maximum of 80 conference hours accepted as training hours).

(4) Latent Print Processing Technician. An applicant for a forensic technician license in latent print processing must have a minimum of a high school diploma or equivalent degree.

(5) Digital/Multimedia Evidence Analyst. An applicant for a forensic analyst license in digital/multimedia evidence must have:

(A) a baccalaureate or advanced degree from an accredited university;

(B) a non-law enforcement or non-military background without a baccalaureate degree, demonstrating equivalent digital skill set through Certified Forensic Computer Examiner (CFCE), Global Information Assurance Certification Certified Forensic Examination (GCFE), or Global Information Assurance Certification Certified Forensic Analyst (GCFA), or equivalent non-vendor certification examination(s) with competency test(s); or

(C) law enforcement or military experience equivalent demonstrated through forensic training through one of the following organizations: SysAdmin, Audit, Network, and Security (SANS), International Association for Computer Investigative Specialists (IACIS), National White Collar Crime Center (NW3C), Law Enforcement & Emergency Services Video Association International, Inc. (LEVA), U.S. Military, Computer Analysis Response Team (CART) (FBI Training), Seized Computer Evidence Recovery Specialist (SCERS), or U.S. Secret Service.

(6) Crime Scene Reconstruction Analyst. An applicant for a forensic analyst license in crime scene reconstruction, crime scene reconstruction with specific recognition in bloodstain pattern analysis, or crime scene reconstruction with specific recognition in shooting incident reconstruction must have a minimum of an associate's degree or equivalent degree.

(7) Crime Scene Investigation Analyst. An applicant for a forensic analyst license limited to the crime scene investigation category of licensure must have a minimum of a high school diploma or equivalent degree.

(8) Crime Scene Processing Technician. An applicant for a forensic technician license limited to the crime scene processing technician category of licensure must have a minimum of a high school diploma or equivalent degree.

(9) Foreign/Non-U.S. degrees. The Commission shall recognize equivalent foreign, non-U.S. baccalaureate or advanced degrees. The Commission reserves the right to charge licensees a reasonable fee for credential evaluation services to assess how a particular foreign degree compares to a similar degree in the United States. The Commission may accept a previously obtained credential evaluation report from an applicant or licensee in fulfillment of the degree comparison assessment.

(f) Specific Coursework Requirements and Certification Requirements.

(1) General Requirement for Statistics. With the exception of the categories of licensure specifically exempt in this subsection, an applicant for any forensic analyst license under this section must have a three-semester credit hour (or equivalent) college-level statistics course from an accredited university or a program approved by the Commission.

(2) Forensic Discipline-Specific Coursework Requirements.

(A) Document Examination Analyst. An applicant for a forensic analyst license in document examination must have a three-semester credit hour (or equivalent) college-level statistics course from an accredited university or a program approved by the Commission. No other specific college-level coursework is required.

(B) Forensic Anthropologist. An applicant for a forensic analyst license in forensic anthropology must be certified by the American Board of Forensic Anthropology (ABFA), including fulfillment of any specific coursework requirements necessary to comply with and maintain ABFA certification at the time of the candidate's application for a license.

(C) Latent Print Analyst.

(i) An applicant for a forensic analyst license in latent print examination who qualifies for a latent print analyst license based on the minimum education requirements set forth in subsection (d)(3)(A) or (B) of this section must have a minimum of 24 semester-credit hours or equivalent in science, technology, engineering, or mathematics (STEM) related coursework.

(ii) All applicants for a forensic analyst license in latent print examination must have a three-semester credit hour (or equivalent) college-level statistics course from an accredited university or a program approved by the Commission.

(iii) IAI Certification Requirement for Unaccredited Laboratory. All licensed latent print examination analysts and applicants who are not employed by a laboratory accredited by the Commission are required to be certified by the International Association for Identification (IAI) under the IAI's Latent Print Certification program and are required to provide proof of certification upon request. Licensees are required to notify the Commission of any change in the status of their IAI certification within ten (10) business days of any changes.

(D) Digital/Multimedia Evidence Analyst. An applicant for a forensic analyst license in digital/multimedia evidence must have a three-semester credit hour (or equivalent) college-level statistics course from an accredited university or a program approved by the Commission. No other specific college-level coursework is required.

(E) Crime Scene Processing Technician. An applicant for a forensic technician license in crime scene processing must successfully complete a [~~the~~] Texas Commission on Law Enforcement Course Number 2106 titled Intermediate Crime Scene Search taught by a Texas Commission on Law Enforcement-certified instructor or

subject matter expert approved by the Commission [(~~Revised 2019 or later~~)].

(F) Crime Scene Investigation Analyst. An applicant for a forensic analyst license in crime scene investigation must successfully complete a [~~the~~] Texas Commission on Law Enforcement Course Number 2106 titled Intermediate Crime Scene Search taught by a Texas Commission on Law Enforcement-certified instructor or subject matter expert approved by the Commission [(~~Revised 2019 or later~~)] and must complete a minimum of 240 hours of forensic-related training courses which may include in-house mentorship training.

(G) Crime Scene Reconstruction Analyst. An applicant for a forensic analyst license in crime scene reconstruction must have twelve-semester credit hours of college-level courses or equivalent coursework approved by the Commission that includes fluid dynamics, math, and physics; a 40 [~~forty~~]-hour crime scene reconstruction course approved by the Commission; 440 additional hours of forensic-related courses approved by the Commission which may include documented in-house mentorship programs; and have successfully completed a [~~the~~] Texas Commission on Law Enforcement Course Number 2106 titled Intermediate Crime Scene Search taught by a Texas Commission on Law Enforcement-certified instructor or subject matter expert approved by the Commission [(~~Revised 2019 or later~~)].

(H) Crime Scene Reconstruction Analyst, with specific recognition in bloodstain pattern analysis. An applicant for a forensic analyst license in crime scene reconstruction, with specific recognition in bloodstain pattern analysis, must have a 40 [~~forty~~]-hour crime scene reconstruction course approved by the commission, two 40 [~~forty~~]-hour advanced courses taught by two different instructors in blood pattern analysis with syllabi accepted by the International Association of Bloodstain Pattern Analysts (IABPA) or the International Association for Identification (IAI) for certification, a 40 [~~forty~~]-hour fluid dynamics course approved by the Commission, a 40 [~~forty~~]-hour math and physics course approved by the Commission, twenty-four hours of instruction involving presentation and preparation of demonstrative evidence such as 3D modeling, courtroom demonstratives, 440 additional hours of forensic-related courses approved by the Commission which may include documented in-house mentorship programs, and have successfully completed a [~~the~~] Texas Commission on Law Enforcement Course Number 2106 titled Intermediate Crime Scene Search taught by a Texas Commission on Law Enforcement-certified instructor or subject matter expert approved by the Commission [(~~Revised 2019 or later~~)].

(I) Crime Scene Reconstruction Analyst, with specific recognition in shooting incident reconstruction and crime scene reconstruction. An application for a forensic analyst license in crime scene reconstruction, with specific recognition in shooting incident reconstruction must have a 40 [~~forty~~]-hour crime scene reconstruction course approved by the commission, two 40 [~~forty~~]-hour shooting incident reconstruction courses taught by two different instructors in shooting incident reconstruction with syllabi accepted by the International Association for Identification (IAI), the Association of Firearm and Toolmark Examiners (AFTE), or the Association for Crime Scene Reconstruction (ACSR) for certification and approved by the Commission, twenty-four hours of instruction involving presentation and preparation of demonstrative evidence such as 3D modeling and courtroom demonstratives, 440 additional hours of forensic-related courses approved by the Commission which may include documented in-house mentorship programs, and have successfully completed a [~~the~~] Texas Commission on Law Enforcement Course Number 2106 titled Intermediate Crime Scene Search taught by a Texas Commission on Law Enforcement-certified instructor or subject matter expert approved by the Commission [(~~Revised 2019 or later~~)].

(3) Exemptions from Specific Coursework Requirements.

(A) Previously Licensed Document Examination Analyst Exemption. An applicant for a voluntary forensic analyst license previously licensed by the Commission when licensure was mandatory for the discipline is exempt from any specific coursework requirements in this subsection.

(B) An applicant for the technician license category of any forensic discipline set forth in this subchapter is not required to fulfill any specific college-level coursework requirements, including the three-semester credit hour (or equivalent) college-level statistics course component for licensure.

(C) An applicant for a forensic analyst license limited to the crime scene investigation analyst category of licensure is not required to fulfill the three-semester credit hour (or equivalent) college-level statistics course component for licensure.

(g) Work Experience.

(1) Crime Scene Reconstruction Analyst. An applicant for any forensic analyst license in crime scene reconstruction must have a minimum of five years' experience working in crime scene settings.

(2) Crime Scene Investigation Analyst. An applicant for a forensic analyst license in crime scene investigation must have a minimum of one year of experience working in crime scene settings.

(h) General Forensic Analyst Licensing Exam Requirement.

(1) Exam Requirement. An applicant for a forensic analyst license under this section must pass the General Forensic Analyst Licensing Exam administered by the Commission.

(A) An applicant is required to take and pass the General Forensic Analyst Licensing Exam one time.

(B) An applicant may take the General Forensic Analyst Licensing Exam no more than three times. If an applicant fails the General Forensic Analyst Licensing Exam three times, the applicant has thirty (30) days from the date the applicant receives notice of the failure to request special dispensation from the Commission as described in subparagraph (C) of this paragraph. Where special dispensation is granted, the applicant has 90 days from the date he or she receives notice the request for exam is granted to successfully complete the exam requirement. However, for good cause shown, the Commission or its Designee at its discretion may waive this limitation.

(C) Requests for Exam. If an applicant fails the General Forensic Analyst Licensing Exam three times, the applicant must request in writing special dispensation from the Commission to take the exam more than three times. Applicants may submit a letter of support from their employing agency's director or licensing representative and any other supporting documentation supplemental to the written request.

(D) If an applicant sits for the General Forensic Analyst Licensing Exam more than three times, the applicant must pay a $50 exam fee each additional time the applicant sits for the exam beyond the three initial attempts.

(E) Modified General Forensic Analyst Licensing Exam. Forensic Technicians in any disciplines set forth in this subchapter, including latent print processing technicians, crime scene processing technicians and crime scene investigation analysts, may fulfill the General Forensic Analyst Licensing Exam requirement by taking a modified exam administered by the Commission.

(2) Credit for Pilot Exam. If an individual passes a Pilot General Forensic Analyst Licensing Exam, regardless of his or her el-

igibility status for a voluntary or mandatory Forensic Analyst License at the time the exam is taken, the candidate has fulfilled the General Forensic Analyst Licensing Exam Requirement of this subsection.

(i) Continuing Education Requirements. All continuing education requirements outlined in §651.208 (g)-(i) of this subchapter (relating to Forensic Analyst and Forensic Technician License Renewal) apply to this section.

(j) Proficiency Monitoring Requirement.

(1) Requirement for Applicants Employed by an Accredited Laboratory. An applicant who is employed by an accredited laboratory must demonstrate the applicant participates in the laboratory's process for intra-agency [~~intraagency~~] comparison, interagency comparison, proficiency testing, or observation-based performance monitoring requirements in compliance with and on the timeline set forth by the laboratory's accrediting body's proficiency monitoring requirements as applicable to the Forensic Analyst's or Forensic Technician's specific forensic discipline and job duties.

(2) Requirement for Applicants Not Employed at an Accredited Laboratory or at an Accredited Laboratory in an Unaccredited Forensic Discipline. An applicant who is employed by an entity other than an accredited laboratory or performs a forensic examination or test at an accredited laboratory in a forensic discipline not covered by the scope of the laboratory's accreditation must demonstrate the applicant participates in the laboratory or employing entity's process for intra-agency [~~intraagency~~] comparison, interagency comparison, proficiency testing, or observation-based performance monitoring requirements in compliance with and on the timeline set forth by the laboratory or employing entity's Commission-approved process for proficiency monitoring as applicable to the Forensic Analyst's or Forensic Technician's specific forensic discipline and job duties.

(3) A signed certification by the laboratory or entity's authorized representative that the applicant has satisfied the applicable proficiency monitoring requirements, including any intra-agency [~~intraagency~~] comparison, inter-laboratory comparisons, proficiency testing, or observation-based performance monitoring requirements in paragraph (1) or (2) of this subsection as of the date of the analyst's application must be provided on the Proficiency Monitoring Certification form provided by the Commission. The licensee's authorized representative must designate the specific forensic discipline in which the Forensic Analyst or Forensic Technician actively performs forensic casework or is currently authorized to perform supervised or independent casework.

(4) Applicants employed by an entity other than an accredited laboratory or performing forensic examinations or tests at an accredited laboratory in a discipline not covered by the scope of the laboratory or employing entity's accreditation must include written proof of the Forensic Science Commission's approval described in (5) of this subsection with the Proficiency Monitoring Certification form required in (3) of this subsection. The applicant must include written documentation of performance in conformance with expected consensus results for the laboratory or employing entity's Commission-approved activities or exercise(s) as applicable to the applicant's specific forensic discipline and job duties in compliance with and on the timeline set forth by the laboratory or employing entity's Commission-approved process for proficiency monitoring.

(5) Applicants employed by an entity other than an accredited laboratory or performing forensic examinations or tests at an accredited laboratory in a discipline not covered by the scope of the laboratory or employing entity's accreditation seeking approval of proficiency monitoring activities or exercise(s) must seek prior approval of the activities or exercise(s) from the Commission.

(6) Special Proficiency Testing Requirements for Latent Print Analysts and Latent Print Processing Technicians.

(A) Where available and appropriate for the job function(s) being tested, proficiency tests shall be obtained from an external source through participation in a proficiency testing program offered by a provider accredited to the ISO/IEC 17043 international standard.

(B) Where not available or not appropriate for the job function(s) being tested, proficiency tests may be obtained from an external source through participation in an interagency comparison or developed internally by the employing laboratory or entity through participation in an interagency comparison or intra-agency [~~intraagency~~] comparison.

(C) All latent print examiner and latent print processing technician proficiency tests selected shall be developed and validated in accordance with the requirements set forth in Sections 4.2 and 4.3 of the Organization of Scientific Area Committees for Forensic Science (OSAC) 2022-S-0012 Friction Ridge Subcommittee's Standard for Proficiency Testing in Friction Ridge Examination.

(7) Special Proficiency Testing Requirements for Crime Scene Processing Technicians, Crime Scene Investigation Analysts, and Crime Scene Reconstruction Analysts.

(A) Where available and appropriate for the job function(s) being tested, proficiency tests shall be obtained from an external source through participation in a proficiency testing program offered by a provider accredited to the ISO/IEC 17043 international standard.

(B) Where not available or not appropriate for the job function(s) being tested, proficiency tests may be obtained from an external source through participation in an interagency comparison or developed internally by the employing laboratory or entity through participation in an interagency comparison or intra-agency comparison.

(k) Employing Laboratory or Agency Quality Requirement for Forensic Analysts. Applicants for a forensic analyst license under this section must be employed by a laboratory or agency that can demonstrate, regardless of Commission accreditation status, compliance with specific standards as applicable to the applicant's forensic discipline as published on the Commission's website and updated January 15 of each calendar year.

(l) License Term and Fee.

(1) A Forensic Analyst license issued under this section shall expire two years from the date the applicant is granted a license.

(2) Application Fee. A Forensic Analyst or Forensic Technician license applicant or current licensee under this section shall pay the following fee(s) as applicable:

(A) Initial Application fee of $220 for Analysts and $150 for Technicians;

(B) Biennial renewal fee of $200 for Analysts and $130 for Technicians;

(C) License Reinstatement fee of $220; or

(D) Special Exam Fee of $50 for General Forensic Analyst Licensing Exam, required only if testing beyond the three initial attempts.

(m) Forensic Analyst License Renewal. Applicants for renewal of a Forensic Analyst License must comply with §651.208 of this subchapter (Forensic Analyst and Forensic Technician License Renewal).

(n) Forensic Analyst License Expiration and Reinstatement. A Forensic Analyst must comply with §651.209 of this subchapter (Forensic Analyst and Forensic Technician License Expiration and Reinstatement) of this subchapter.

(o) Procedure for Denial of Initial Application or Renewal Application and Reconsideration.

(1) Application Review. The Commission Director or Designee must review each initial application or renewal application and determine whether the applicant meets the qualifications and requirements set forth in this subchapter. If a person who has applied for a forensic analyst license under this section does not meet the qualifications or requirements set forth in this subchapter and has submitted a complete application, the Director or Designee must consult with members of the Licensing Advisory Committee before denying the application.

(2) Denial of Application. The Commission, through its Director or Designee, may deny an initial or renewal application if the applicant fails to meet any of the qualifications or requirements set forth in this subchapter.

(3) Notice of Denial. The Commission, through its Director or Designee, shall provide the applicant a written statement of the reason(s) for denial of the initial or renewal application.

(4) Request for Reconsideration. Within twenty (20) days of the date of the notice that the Commission has denied the application, the applicant may request that the Commission reconsider the denial. The request must be in writing, identify each point or matter about which reconsideration is requested, and set forth the grounds for the request for reconsideration.

(5) Reconsideration Procedure. The Commission must consider a request for reconsideration at its next meeting where the applicant may appear and present testimony.

(6) Commission Action on Request. After reconsidering its decision, the Commission may either affirm or reverse its original decision.

(7) Final Decision. The Commission, through its Director or Designee, must notify the applicant in writing of its decision on reconsideration within fifteen (15) business days of the date of its meeting where the final decision was rendered.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

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TRD-202500502
Leigh Tomlin
Associate General Counsel
Texas Forensic Science Commission
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For further information, please call: (512) 936-0661

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TITLE 43. TRANSPORTATION

PART 10. TEXAS DEPARTMENT OF MOTOR VEHICLES

CHAPTER 215. MOTOR VEHICLE DISTRIBUTION

SUBCHAPTER D. GENERAL DISTINGUISHING NUMBERS AND IN-TRANSIT LICENSES

43 TAC §215.163

INTRODUCTION. The Texas Department of Motor Vehicles (department) proposes a new section to 43 Texas Administrative Code (TAC) Subchapter D, General Distinguishing Numbers and In-Transit Licenses, §215.163, concerning the disposition of license plates for motor vehicles sold at auction or on consignment. This proposed new section is necessary to implement the requirements of House Bill (HB) 718, enacted during the 88th Legislature, Regular Session (2023). HB 718 amended Transportation Code, Chapter 503 to eliminate the use of paper temporary tags when purchasing a motor vehicle and replaced these tags with categories of metal license plates, effective July 1, 2025. HB 718 requires the department to determine proposed new distribution methods, systems, and procedures, and safeguards to protect Texas citizens from license plate fraud. Section 34 of HB 718 grants the department authority to adopt rules necessary to implement or administer these changes in law, and the department published proposed rules in the July 12, 2024, issue of the *Texas Register,* and published adopted rules in the November 8, 2024, issue of the *Texas Register* (49 TexReg 8953). During the rulemaking process, license holders raised questions about disposition of license plates when motor vehicles are sold at auctions or on consignment based on concerns that the department may require operational changes that would increase business costs. In November 2024, the department provided an early draft of this proposed new rule to the Motor Vehicle Industry Regulation Advisory Committee (MVIRAC). Committee members voted on formal motions and provided informal comments. The department incorporated input from this committee into this rule proposal, as well as comments from license holders that regularly hold or participate in motor vehicle auctions. In proposing this rule, the department seeks to minimize opportunities for license plate fraud related to auction and other consignment sales and to eliminate any unnecessary operational or cost impacts to license holders. The effective date for this proposed rule would be July 1, 2025.

EXPLANATION.

Proposed new §215.163 would address how a license holder must handle a license plate or set of license plates for motor vehicles sold at auction or on consignment. Proposed new §215.163 is necessary to clarify license plate disposition and the reporting responsibilities of a dealer and a wholesale motor vehicle auction general distinguishing number (GDN) holder when offering a motor vehicle for sale at a wholesale auction, and to clarify a dealer's responsibilities when offering a motor vehicle with an assigned license plate or set of license plates for sale at auction or on consignment at the dealer's licensed location consistent with the requirements of Transportation Code, §503.063 and §504.901 effective July 1, 2025. This proposed rule will also align license plate transfer requirements in the auction and consignment contexts with the amended rules regarding license plate transfers that the department adopted in October 2024 to implement HB 718; those amended rules will become effective July 1, 2025.

Proposed new §215.163(a) would address license plate disposition requirements for motor vehicles offered for sale at a wholesale motor vehicle auction, in which only dealers are

allowed to purchase a motor vehicle under Transportation Code, §503.037. The only exception allowed under Transportation Code, §503.037(d) is for the sale of a vehicle owned by a state or federal government entity, and such a motor vehicle typically has an exempt license plate which does not transfer with the motor vehicle. Proposed new §215.163(a)(1) would require a wholesale motor vehicle auction GDN holder that receives a motor vehicle on consignment from a person who is not a GDN holder to remove and mark any license plate with the vehicle as void; destroy, recycle, or return any license plate as required under adopted amended 43 TAC §215.158 (relating to General Requirements for Buyer's License Plates); and update the license plate database to notify the department of the auction sale. Proposed new §215.163(a)(2) would require a GDN dealer that consigns or delivers a motor vehicle from the GDN dealer's inventory for sale at a wholesale auction to remove and mark the vehicle's license plate or set of license plates as void; destroy, recycle, or return any license plate as required under adopted amended 43 TAC §215.158 (relating to General Requirements for Buyer's License Plates); and update the license plate database. Proposed new §215.163(a) is necessary to prevent Texas license plates from being distributed out-of-state or exported and used fraudulently. These proposed provisions are also consistent with Transportation Code, §503.063 and §504.901 as amended by HB 718, because a retail buyer may not purchase a motor vehicle at a wholesale motor vehicle auction with an assigned general issue license plate, so the cost and delay associated with securely maintaining and transferring an assigned license plate with the vehicle are unnecessary.

Proposed new §215.163(b) would define a dealer's license plate disposition responsibilities if a motor vehicle is sold at a public auction, at which members of the public can bid on and purchase a motor vehicle. Proposed new §215.163(b) closely aligns with the more general rules the department has already adopted for license plate disposition in sales by a dealer to a member of the public, requiring general issue license plates to be removed, securely stored, and reassigned to the buyer except in certain circumstances where destruction of the plates is necessary to reduce the opportunity for fraud. If a dealer offers a motor vehicle from the dealer's inventory or a vehicle consigned to the dealer for sale at a public auction, the dealer is required to maintain any license plate assigned to the vehicle in a secure storage area as required in adopted amended 43 TAC §215.150(f) (relating to Dealer Authorization to Issue License Plates) until the motor vehicle is sold. If the purchaser is a Texas retail buyer, the dealer must securely transfer the license plates to the purchaser and update the license plate database unless the buyer has a specialty personalized or other qualifying license plate to transfer, consistent with adopted amended 43 TAC §215.151 (relating to License Plate General Use Requirements). If the purchaser at the public auction is a dealer, export buyer, or out-of-state buyer, the selling dealer must mark any license plate previously assigned to the vehicle as void; destroy, recycle, or return the license plate as required in adopted amended 43 TAC §215.158 (relating to General Requirements for Buyer's License Plates); and update the license plate database. Additionally, if the purchaser at an auction is an out-of-state buyer, the dealer may only issue a buyer's temporary license plate if the buyer requires this license plate to transport the vehicle to another state in accordance with Transportation Code, §503.063, as amended by HB 718, and with adopted amended 43 TAC §215.150(c) (relating to Dealer Authorization to Issue License Plates). Proposed new §215.163(b) is necessary to clarify license plate disposition for different types of sales that can occur at a public auction and to minimize potential fraud or misuse of license plates that may occur, consistent with the requirements of Transportation Code, §503.063 and §504.901, as amended by HB 718, and of adopted amended 43 TAC §§215.150, 215.151, and 215.158.

Proposed new §215.163(c) would implement dealer requirements for other types of consignment sales which occur at a dealer's licensed location and not at auction. Proposed new §215.163(c) is necessary to address license plate disposition for other types of consignment sales and to minimize potential fraud or misuse of license plates, consistent with the requirements of Transportation Code, §503.063 and §504.901, as amended by HB 718, and the requirements of the department's adopted amended rules implementing HB 718. Proposed new §215.163(c)(1) would require a dealer to remove and securely store any license plate during the period of consignment at the licensed location, to align with adopted amended 43 TAC §215.150(f) (relating to Dealer Authorization to Issue License Plates). Proposed new §215.163(c)(1) would further clarify that a dealer may use its dealer's temporary license plate to demonstrate the consigned vehicle to a potential purchaser, in accordance with adopted amended 43 TAC §215.138 (relating to Use of Dealer's License Plates). Proposed new §215.163(c)(2) would align the requirements for dealer consignment sales with the general license plate disposition requirements in the department's adopted amended rules implementing HB 718. Proposed new §215.163(c)(2) would require a dealer, upon the sale of a consigned motor vehicle, to provide any assigned license plate to a Texas retail buyer that purchases the vehicle unless the buyer has a specialty personalized or other qualifying license plate to transfer and to update the license plate database, consistent with adopted amended 43 TAC §215.151 (relating to License Plate General Use Requirements). If the vehicle is sold to an out-of-state buyer, for export, or to a Texas dealer, a dealer must mark any license plate as void; destroy, recycle, or return the license plate, as required in adopted amended 43 TAC §215.158 (relating to General Requirements for Buyer's License Plates); and update the license plate database, as required by adopted amended 43 TAC §215.151 (relating to License Plate General Use Requirements). Proposed new §215.163(c)(3) is necessary to clarify license plate disposition requirements for independent motor vehicle dealers whose business includes the sale of salvage vehicles or total loss vehicles as defined by the applicable insurance contract, and who may receive consignments from non-GDN holders such as insurance or finance companies. In these situations, an independent motor vehicle dealer must remove and mark any license plate as void; destroy, recycle, or return the license plate as required in adopted amended §215.158 (relating to General Requirements for Buyer's License Plates); and update the license plate database, as required by adopted amended 43 TAC §215.151 (relating to License Plate General Use Requirements). Under Occupations Code, §2302.009, an independent motor vehicle dealer that acts as a salvage vehicle dealer or displays a motor vehicle as an agent of an insurance company must comply with Occupations Code, Chapter 2302, including the requirement to immediately remove any unexpired license plate. Requiring an independent motor vehicle dealer to void, destroy, recycle, or return the license plate as required in adopted amended §215.158 (relating to General Requirements for Buyer's License Plates) is necessary to reduce the risk of fraud or misuse of the plates, since salvage or total loss vehicles may not be driven on Texas roads. Proposed new §215.163(c) is necessary to minimize potential fraud or misuse of these license plates and is

consistent with the requirements of Occupations Code, Chapter 2302, and Transportation Code, §503.063 and §504.901.

FISCAL NOTE AND LOCAL EMPLOYMENT IMPACT STATEMENT. Glenna Bowman, Chief Financial Officer, has determined that for each year of the first five years the proposed new section will be in effect, there will be no fiscal impact on state or local governments as a result of the enforcement or administration of the proposal. Annette Quintero, Director of the Vehicle Titles and Registration (VTR) Division has determined that there will be no measurable effect on local employment or the local economy as a result of the proposal.

PUBLIC BENEFIT AND COST NOTE. Ms. Quintero has also determined that, for each year of the first five years the proposed new section is in effect, the public will benefit because of the reduction of Texas license plates leaving Texas, which will reduce the opportunity for bad actors to use these license plates to commit license plate fraud and related crimes. The department prioritized the public benefits associated with reducing fraud and related crime and improving public health and safety, while carefully considering potential costs to license holders consistent with board and department responsibilities.

Anticipated Public Benefits. The public benefits anticipated as a result of the proposal include limiting the criminal activity of bad actors who may obtain Texas license plates and sell or provide these license plates to persons seeking to engage in violent criminal activity, including armed robbery, human trafficking, and assaults on law enforcement, or to criminally operate uninsured and uninspected vehicles which are hazardous to Texas motorists and the environment.

Anticipated Costs To Comply With The Proposal. Ms. Quintero anticipates that while dealer GDN holders will not incur additional costs to comply with the proposed rule, wholesale motor vehicle auction GDN holders may incur costs to comply with the proposed rule. For dealers, proposed new §215.163 has the same requirements that are already in place under other previously adopted rules or existing statutes and will not impose any new cost requirements.

However, this proposal may require wholesale motor vehicle auction GDN holders to make an operational change or incur a cost. The department can estimate certain associated costs. Proposed new §215.163 would require a wholesale motor vehicle auction GDN holder to permanently mark the front of a buyer's license plate with the word "void" or a large "X." Department research suggests that the cost of a permanent marker is $1.35 per marker. Proposed new §215.163 would also require a wholesale motor vehicle auction GDN holder to destroy a void buyer's license plate, recycle a void plate with a registered metal recycler, or return the void plate to the department, or to a county tax assessor-collector. Aviation tin snips may be used to destroy a void license plate. Department research suggests that the cost of tin snips, which can cut metal, is approximately $18.50. A motor vehicle auction GDN holder may choose to recycle void license plates. Department research suggests that the cost of doing so through a metal recycler will vary by locality and the availability of local recycling facilities, with some regions benefitting from free curbside-pickup recycling programs and others requiring license holders to expend transportation costs to take the plates to a recycling facility. Department research also suggests that scrap aluminum, such as voided license plates, is currently worth about $.72 per pound when sold to a metal recycler. Lastly, a motor vehicle auction GDN holder may return a void buyer's license plate to the department, including one of the regional service centers, or a county tax assessor-collector office, or mail a void plate to the department. Department research suggests that a typical average cost to mail a plate is $9.75. The proposed rule provides a motor vehicle auction GDN holder with multiple options for responsible disposal of void license plates and each license holder may choose which option is least expensive or most convenient based on the license holder's operation. Ms. Quintero has reviewed the department research regarding the cost of marking and the options for destroying, recycling, or returning void license plates and has determined that these costs are reasonable and necessary to reduce the potential for fraudulent plate use and to protect the public, including law enforcement personnel. Indeed, it is possible that many wholesale motor vehicle auction GDN holders will incur no costs as a result of the proposed rule: the wholesale motor vehicle auction GDN holders who commented or provided informal feedback on the draft rule stated that they already have existing systems in place to collect and dispose of license plates and to report vehicle transfers using the currently available web-based tools.

ECONOMIC IMPACT STATEMENT AND REGULATORY FLEXIBILITY ANALYSIS. As required by Government Code, §2006.002, the department has determined that this proposal may have an adverse economic effect or disproportionate economic impact on small or micro-businesses. The department has determined that the proposed rule will not have an adverse economic effect on rural communities because rural communities are exempt from the requirement to hold a GDN under Transportation Code, §503.024.

The cost analysis in the Public Benefit and Cost Note section of this proposal determined that the proposed new rule may result in additional costs for existing license holders. Based on data from the Comptroller and the Texas Workforce Commission, the department estimates that most license holders are small or micro-businesses. The department has tried to minimize costs to both wholesale motor vehicle auction and dealer GDN holders. The proposed new requirements are designed to set minimum standards that will prevent license plate fraud, protect public health and safety, and allow these license holders to operate without incurring significant ongoing or unreasonable costs. These requirements do not include requirements that will cause a license holder to incur unnecessary or burdensome costs, such as employing additional persons.

Under Government Code, §2006.002, the department must perform a regulatory flexibility analysis. The department considered the alternatives of not adopting a rule, exempting small and micro-business license holders from the rule, and adopting a limited version of this rule for small and micro-business applicants and license holders. The department rejected all three options. The department reviewed licensing records, including records for license holders who have been denied access to the temporary tag system, and determined that small and micro-business license holders are largely the bad actors who have historically perpetrated fraud. The department, after considering the purpose of the authorizing statutes, does not believe it is feasible to waive or limit the requirements of the proposed rule for small or micro-business GDN dealers. Also, Government Code, §2006.002(c-1) does not require the department to consider alternatives that might minimize possible adverse impacts on small businesses and micro-businesses if the alternatives would not be protective of the health and safety of the state.

TAKINGS IMPACT ASSESSMENT. The department has determined that no private real property interests are affected by this proposal and that this proposal does not restrict or limit an owner's right to property that would otherwise exist in the absence of government action and, therefore, does not constitute a taking or require a takings impact assessment under Government Code, §2007.043.

GOVERNMENT GROWTH IMPACT STATEMENT. The department has determined that each year of the first five years the proposed new section is in effect, no government program would be created or eliminated. Implementation of the proposed new section would not require the creation of new employee positions or the elimination of existing employee positions. Implementation would not require an increase or decrease in future legislative appropriations to the department or an increase or decrease of fees paid to the department. The proposed new section would create a new regulation by creating new §215.163 to set out the requirements for plate disposition in the context of motor vehicle sales through auctions and consignments, and would limit an existing regulation by allowing dealers selling vehicles from their inventory at wholesale auction to void and destroy license plates rather than removing, securely storing, and transferring a previously assigned license plate when a motor vehicle is sold to an in-state buyer. The proposed new section would not expand or repeal an existing regulation. Lastly, the proposed new section does not affect the number of individuals subject to the rule's applicability and will not negatively affect this state's economy.

REQUEST FOR PUBLIC COMMENT.

If you want to comment on the proposal, submit your written comments by 5:00 p.m. (CDT or CST, as applicable) on March 31, 2025. A request for a public hearing must be sent separately from your written comments. Send written comments or hearing requests by email to *rules@txdmv.gov* or by mail to Office of General Counsel, Texas Department of Motor Vehicles, 4000 Jackson Avenue, Austin, Texas 78731. If a hearing is held, the department will consider written comments and public testimony presented at the hearing.

STATUTORY AUTHORITY. In addition to the rulemaking authority provided in Section 34 of HB 718, the department proposes new §215.163 under Occupations Code, §2301.151, which gives the board authority to regulate the distribution, sale, and lease of motor vehicles and the authority to take any action that is necessary or convenient to exercise that authority; Occupations Code, §2301.152, which authorizes the board to establish the qualifications of license holders, to ensure that the distribution, sale, and lease of motor vehicles is conducted as required by statute and board rules, to prevent fraud, unfair practices, discrimination, impositions, and other abuses in connection with the distribution and sale of motor vehicles, and to enforce and administer Occupations Code, Chapter 2301 and Transportation Code, Chapter 503; Occupations Code, §2301.155, which authorizes the board to adopt rules as necessary or convenient to administer Occupations Code, Chapter 2301 and to govern practice and procedure before the board; Occupations Code, §2301.651, which gives the board authority to deny an application for a license, revoke or suspend a license, place on probation a person whose license has been suspended, or reprimand a licensee if the applicant or license holder is unfit, makes a material misrepresentation, violates any law relating to the sale, distribution, financing, or insuring of motor vehicles, willfully defrauds a purchaser, or fails to fulfill a written agreement with a retail purchaser of a motor vehicle; Occupations Code, §2302.051, which gives the board authority to adopt rules as necessary to administer and enforce Chapter 2302; Transportation Code, §503.0631 which requires the department to adopt rules to implement and manage the department's database of dealer-issued buyer's license plates; Transportation Code, §503.002, which authorizes the board to adopt rules for the administration of Transportation Code, Chapter 503; Transportation Code, §504.0011 which allows the board to adopt rules to implement and administer Transportation Code, Chapter 504; Transportation Code, §1002.001, which authorizes the board to adopt rules that are necessary and appropriate to implement the powers and the duties of the department; and Government Code, §2001.004, which requires state agencies to adopt rules of practice stating the nature and requirements of all available formal and informal procedures, as well as the statutes referenced throughout this preamble.

CROSS REFERENCE TO STATUTE. The proposed new section would implement Government Code, Chapter 2001; Occupations Code, Chapters 2301 and 2302; and Transportation Code, Chapters 503, 504, and 1002.

§215.163. License Plate Disposition for Motor Vehicles Sold at Auction or on Consignment.

(a) Wholesale Motor Vehicle Auctions.

(1) A wholesale motor vehicle auction GDN holder that receives a consignment and delivery of a motor vehicle from a person who is not a GDN holder for the purpose of sale at auction shall:

(A) remove and mark any license plate as void;

(B) destroy, recycle, or return any license plate as required in §215.158 of this title (relating to General Requirements for Buyer's License Plates); and

(C) update the license plate database.

(2) A GDN dealer that consigns or delivers a motor vehicle from the GDN dealer's inventory for sale at a wholesale motor vehicle auction shall:

(A) remove and mark any license plate as void;

(B) destroy, recycle, or return any license plate as required in §215.158 of this title; and

(C) update the license plate database.

(b) Public Auctions.

(1) A dealer shall remove and securely store any assigned license plate, as required under §215.150(f) of this title (relating to Dealer Authorization to Issue License Plates), before offering a consigned motor vehicle for sale at a public auction.

(2) If the purchaser at a public auction is a Texas retail buyer, the dealer shall securely transfer the license plates to the purchaser and update the license plate database unless the buyer has a specialty, personalized, or other qualifying license plate to transfer consistent with §215.151 of this title (relating to License Plate General Use Requirements).

(3) If the purchaser at the public auction is a dealer, export buyer, or out-of-state buyer, the selling dealer shall:

(A) mark any license plate previously issued to the vehicle as void;

(B) destroy, recycle, or return the license plate as required in §215.158 of this title; and

(C) update the license plate database.

(4) Notwithstanding §215.150(c) of this title, if the purchaser at a public auction is an out-of-state buyer, the dealer shall issue a buyer's temporary license plate only if the buyer requires this license plate to transport the vehicle to another state in which the vehicle will be titled and registered in accordance with the laws of that state.

(c) Other Consignment Sales.

(1) A dealer shall remove and securely store any license plates during the period of consignment at the dealer's licensed location, as required under §215.150(f) of this title, when offering for sale a consigned motor vehicle owned by a person who is not a GDN holder. The dealer to which the vehicle is consigned may use its dealer's temporary license plate to demonstrate the consigned motor vehicle to a potential purchaser.

(2) Upon the sale of a consigned motor vehicle owned by a person who is not a GDN holder, the dealer shall:

(A) provide any issued license plate to a Texas retail buyer that purchases the vehicle unless the buyer has a specialty, personalized, or other qualifying license plate to transfer consistent with §215.151 of this title and update the license plate database; or

(B) if the vehicle is sold to an out-of-state buyer, for export, or to a Texas dealer:

(i) mark any license plate previously issued to the vehicle as void;

(ii) destroy, recycle, or return the license plate as required in §215.158 of this title; and

(iii) update the license plate database.

(3) An independent motor vehicle dealer who receives consignment and delivery of a salvage vehicle or total loss vehicle (as defined by the applicable insurance contract) for sale from a person who is not a GDN holder shall:

(A) remove and mark any license plate previously issued to the vehicle as void;

(B) destroy, recycle, or return the license plate as required in §215.158 of this title; and

(C) update the license plate database.

The agency certifies that legal counsel has reviewed the proposal and found it to be within the state agency's legal authority to adopt.

Filed with the Office of the Secretary of State on February 13, 2025.

TRD-202500506
Laura Moriaty
General Counsel
Texas Department of Motor Vehicles
Earliest possible date of adoption: March 30, 2025
For further information, please call: (512) 465-4160

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