Minutes

State Board of Education

April 17, 2020

STATE BOARD OF EDUCATION
(State Board for Career and Technology Education)

KEVEN ELLIS, Lufkin
Chair of the State Board of Education
District 9

MARTY ROWLEY, Amarillo
Vice Chair of the State Board of Education
District 15

GEORGINA PÉREZ, El Paso
Secretary of the State Board of Education
District 1

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LAWRENCE ALLEN, JR., Houston
District 4

DONNA BAHORICH, Houston
District 6

BARBARA CARGILL, Conroe
District 8

RUBEN CORTEZ, JR., Brownsville
District 2

AICHA DAVIS, Dallas
District 13

PATRICIA HARDY, Fort Worth
District 11

PAM LITTLE, Fairview
District 12

TOM MAYNARD, Florence
District 10

SUE MELTON-MALONE, Robinson
District 14

KEN MERCER, San Antonio
District 5

MARISA PEREZ-DIAZ, Converse
District 3

MATT ROBINSON, Friendswood
District 7

Committees of the State Board of Education

INSTRUCTION

Sue Melton-Malone, chair
Pam Little, vice chair
Aicha Davis
Georgina C. Pérez
Marty Rowley

SCHOOL FINANCE/PERMANENT SCHOOL FUND

Tom Maynard, chair
Lawrence A. Allen, Jr., vice chair
Donna Bahorich
Patricia Hardy
Ken Mercer

SCHOOL INITIATIVES

Barbara Cargill, chair
Marisa B. Perez-Diaz, vice chair
Ruben Cortez, Jr.
Keven Ellis
Matt Robinson

Minutes
State Board of Education
April 17, 2020

The State Board of Education Committee of the Full Board conducted a virtual meeting at 9:02 a.m. on Friday, April 17, 2020. Attendance was noted as follows:

Present: Keven Ellis, chair; Lawrence A. Allen, Jr.; Donna Bahorich; Barbara Cargill; Ruben Cortez, Jr.; Aicha Davis; Pat Hardy; Pam Little; Tom Maynard; Sue Melton-Malone; Ken Mercer; Georgina C. Pérez, secretary; Marisa B. Perez-Diaz; Matt Robinson; Marty Rowley, vice chair

Student performance

The student performance was provided by Lufkin High School Marching Band in the Lufkin Independent School District (ISD).

Invocation

Pledge of Allegiance

Roll Call

Approval of Minutes

State Board of Education, November 15, 2019

State Board of Education, January 31, 2020

Public Testimony

The State Board of Education received no presentations of public testimony.

1. Approval of Consent Agenda

Any agenda item may be placed on the consent agenda by any State Board of Education committee.

The State Board of Education may elect to take separate action on any item on the consent agenda.

By unanimous consent, the State Board of Education approved the following items on the consent agenda.

(1) Ratification of the Purchases and Sales of the Investment Portfolio of the Permanent School Fund for the Months of December 2019, January and February 2020
(Board agenda page III-11)
(Committee on School Finance/Permanent School Fund)
The State Board of Education ratified the purchases and sales for the months of December 2019, January 2020 and February 2020, in the amount of $1,167,603,588 and $1,322,360,449 respectively.
(ATTACHMENT 1, page 9).

(2) Recommendation for Appointment to the Fort Sam Houston Independent School District Board of Trustees
(Board agenda page IV-1)
(Committee on School Initiatives)

The State Board of Education approved the appointment of Mr. Richard Kling III to serve a two-year term of office, from April 17, 2020 to April 17, 2022, on the Fort Sam Houston Independent School District Board of Trustees.

(3) Recommendation for Appointments to the Lackland Independent School District Board of Trustees
(Board agenda page IV-22)
(Committee on School Initiatives)

The State Board of Education approved the appointments of Mr. Khalil Gatlin and Ms. Sandra H. Wellman to serve two-year terms of office, from April 17, 2020 to April 17, 2022, on the Lackland Independent School District Board of Trustees.

COMMITTEE OF THE FULL BOARD

2. Proposed Amendments to 19 TAC Chapter 74, Curriculum Requirements, Subchapter B, Graduation Requirements, §74.11, High School Graduation Requirements, §74.12, Foundation High School Program, and §74.13, Endorsements
(Second Reading and Final Adoption)
(Board agenda page I-1)

MOTION AND VOTE: *It was moved by Mr. Rowley and carried unanimously that the State Board of Education approve for second reading and final adoption the proposed amendments to 19 TAC Chapter 74, Curriculum Requirements, Subchapter B, Graduation Requirements, §74.11, High School Graduation Requirements; §74.12, Foundation High School Program; and §74.13, Endorsements; and*

Make an affirmative finding that immediate adoption of the proposed amendments to 19 TAC Chapter 74, Curriculum Requirements, Subchapter B, Graduation Requirements, §74.11, High School Graduation Requirements; §74.12, Foundation High School Program; and §74.13, Endorsements, is necessary and shall have an effective date of August 1, 2020, as recommended by the Committee of the Full Board (ATTACHMENT 2, page 11).

3. Proposed Revisions to 19 TAC Chapter 126, Texas Essential Knowledge and Skills for Technology Applications, and Chapter 130, Texas Essential Knowledge and Skills for Career and Technical Education
(Second Reading and Final Adoption)
(Board agenda page I-12)

MOTION AND VOTE: *It was moved by Mr. Rowley and carried unanimously that the State Board of Education approve for second reading and final adoption proposed revisions to 19 TAC Chapter 126, Texas Essential Knowledge and Skills for Technology Applications, Subchapter C, High School, and Subchapter D, Other Technology Applications Courses, and Chapter 130, Texas Essential Knowledge and Skills for Career and Technical Education, Subchapter A, Agriculture, Food, and Natural Resources; Subchapter C, Arts, Audio/Video Technology, and Communications; Subchapter K, Information Technology; Subchapter O, Science, Technology, Engineering, and Mathematics; and Subchapter Q, Energy; and*

Make an affirmative finding that immediate adoption of the proposed revisions to 19 TAC Chapter 126, Texas Essential Knowledge and Skills for Technology Applications, Subchapter C, High School, and Subchapter D, Other Technology Applications Courses, and Chapter 130, Texas Essential Knowledge and Skills for Career and Technical Education, Subchapter A, Agriculture, Food, and Natural Resources; Subchapter C, Arts, Audio/Video Technology, and Communications; Subchapter K, Information Technology; Subchapter O, Science, Technology, Engineering, and Mathematics; and Subchapter Q, Energy, is necessary and shall have an effective date of August 1, 2020, as recommended by the Committee of the Full Board (ATTACHMENT 3, page 19).

4. Proposed Revisions to 19 TAC Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, and Subchapter D, Other Social Studies Courses (Second Reading and Final Adoption)
(Board agenda page I-103)

MOTION AND VOTE: *It was moved by Mr. Rowley and carried unanimously that the State Board of Education ratify suspension of board operating procedures §5.7 to allow board members to provide proposed amendments to the TEKS to staff by 3:00 p.m., April 16, 2020.*

MOTION: *It was moved by Mr. Rowley that the State Board of Education approve for second reading and final adoption the proposed revisions to 19 TAC Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, and Subchapter D, Other Social Studies Courses, as amended; and*

Make an affirmative finding that immediate adoption of the proposed revisions to 19 TAC Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, and Subchapter D, Other Social Studies Courses, is necessary and shall have an effective date of August 1, 2020, as amended and recommended by the Committee of the Full Board.

MOTION AND VOTE: *It was moved by Mrs. Bahorich, seconded by Dr. Robinson, and carried unanimously that the State Board of Education amend §113.51(c)(9)(A) to read as follows:*

> "~~explain~~ compare and contrast how the unalienable rights expressed in the Declaration of Independence and civil rights in the Bill-of-Rights, influenced the political perspectives of enslaved and free African Americans in the late 1700s and early 1800s"

MOTION AND VOTE: *It was moved by Ms. Pérez, seconded by Mrs. Bahorich, and carried, that the State Board of Education suspend board operating procedures §5.7 to allow board members to consider a proposed amendment.*

MOTION AND VOTE: *It was moved by Ms. Pérez, and carried unanimously that the State Board of Education amend § 113.5(c)(4)(G) to read as follows:*

> "~~discuss~~ describe the impact of the U.S. Supreme Court decision Plessy v. Ferguson (1896);"

MOTION AND VOTE: *It was moved by Mr. Mercer, seconded by Mrs. Bahorich, and carried that the State Board of Education suspend board operating procedures §5.7 to allow board members to consider a proposed amendment.*

MOTION AND VOTE: *It was moved by Ms. Perez, seconded by Mr. Maynard, and carried unanimously that the State Board of Education amend § 113.51(c)(5)(B) to read as follows:*

"~~discuss~~ describe the impact of U.S. Supreme Court decisions Sweatt v. Painter (1950) and Brown v. Board of Education (1954);

VOTE: *A vote was taken on the original motion to recommend that the State Board of Education approve for second reading and final adoption the proposed revisions to 19 TAC Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, and Subchapter D, Other Social Studies Courses, as amended; and*

Make an affirmative finding that immediate adoption of the proposed revisions to 19 TAC Chapter 113, Texas Essential Knowledge and Skills for Social Studies, Subchapter C, High School, and Subchapter D, Other Social Studies Courses, is necessary and shall have an effective date of August 1, 2020, as amended and recommended by the Committee of the Full Board, as amended (ATTACHMENT 4, page 195).

The motion carried with 15 members voting Aye, and 0 members voting No, as follows:

Aye:	*Mr. Allen*	*Mr. Maynard*
	Mrs. Bahorich	*Mrs. Melton-Malone*
	Mrs. Cargill	*Mr. Mercer*
	Mr. Cortez	*Ms. Pérez*
	Ms. Davis	*Ms. Perez-Diaz*
	Dr. Ellis	*Dr. Robinson*
	Ms. Hardy	*Mr. Rowley*
	Mrs. Little	

5. *Proclamation 2022* of the State Board of Education Advertising for Bids on Instructional Materials
(Board agenda page I-128)

MOTION AND VOTE: *It was moved by Mr. Rowley and carried unanimously the State Board of Education approve* Proclamation 2022 *of the State Board of Education Advertising for Bids for Instructional Materials, as amended and recommended by the Committee of the Full Board.*

(Dr. Robinson was absent for the vote.)

6. Perkins Reauthorization and Approval of State Plan
(Board agenda page I-163)

MOTION AND VOTE: *It was moved by Mr. Rowley and carried unanimously that the State Board of Education approve the* Texas State Plan for Strengthening Career and Technical Education for the 21st Century Act (Perkins V)*, as recommended by the Committee of the Full Board.*

(Dr. Robinson was absent for the vote.)

7. Update on Texas Essential Knowledge and Skills (TEKS) Review
(Board agenda page I-458)

The committee took no action; therefore, this item was removed from the agenda.

COMMITTEE ON INSTRUCTION

8. Proposed Repeal of 19 TAC Chapter 110, Texas Essential Knowledge and Skills for English Language Arts and Reading, Subchapter C, High School, §§110.30-110.34, and Subchapter D, Other High School English Language Arts and Reading Courses, §110.85, and Chapter 128, Texas Essential Knowledge and Skills for Spanish Language Arts and Reading and English as a Second Language, Subchapter C, High School, §§128.30-128.32
(Second Reading and Final Adoption)
(Board agenda page II-1)

MOTION AND VOTE: *It was moved by Mrs. Melton-Malone and carried unanimously that the State Board of Education approve for second reading and final adoption the proposed repeal of 19 TAC Chapter 110, Texas Essential Knowledge and Skills for English Language Arts and Reading, Subchapter C, High School, §§110.30-110.34, and Subchapter D, Other High School English Language Arts and Reading Courses, §110.85, and Chapter 128, Texas Essential Knowledge and Skills for Spanish Language Arts and Reading and English as a Second Language, Subchapter C, High School, §§128.30-128.32; and*

Make an affirmative finding that immediate adoption of the proposed repeal of 19 TAC Chapter 110, Texas Essential Knowledge and Skills for English Language Arts and Reading, Subchapter C, High School, §§110.30-110.34, and Subchapter D, Other High School English Language Arts and Reading Courses, §110.85, and Chapter 128, Texas Essential Knowledge and Skills for Spanish Language Arts and Reading and English as a Second Language, Subchapter C, High School, §§128.30-128.32, is necessary and shall have an effective date of August 1, 2020, as recommended by the Committee on Instruction (ATTACHMENT 5, page 217).

9. Action Regarding Origo Education
(Board agenda page II-5)

MOTION AND VOTE: *It was moved by Mrs. Melton-Malone and carried unanimously that the State Board of Education approve the changes that have been submitted by ORIGO Education, as recommended by the Committee on Instruction.*

MOTION AND VOTE: *It was moved by Mrs. Melton-Malone and carried unanimously that the State Board of Education assess liquidated damages in the amount of $113,494.*

MOTION: *It was moved by Mrs. Melton-Malone that the State Board of Education approve final adoption to establish a due date of June 1, 2020 for payment of the liquidated damages, as recommended by the Committee on Instruction.*

MOTION AND VOTE: *It was moved by Mr. Maynard, seconded by Mr. Cortez, and carried to amend the motion to read:*

"Establish a due date of TEA's close of business June 1, 2020, for receipt of payment of the liquidated damages."

VOTE: *A vote was taken on the motion to establish a due date of TEA's close of business on June 1, 2020, for receipt of payment of the liquidated damages, as amended. The motion carried unanimously.*

COMMITTEE ON SCHOOL FINANCE/PERMANENT SCHOOL FUND

10. Proposed Repeal of 19 TAC Chapter 105, Foundation School Program, Subchapter B, Use of State Funds
(Second Reading and Final Adoption)
(Board agenda page III-1)

MOTION AND VOTE: *It was moved by Mr. Maynard and carried unanimously that the State Board of Education approve for second reading and final adoption the proposed repeal of 19 TAC Chapter 105, Foundation School Program, Subchapter B, Use of State Funds; and*
Make an affirmative finding that immediate adoption of the proposed repeal of 19 TAC Chapter 105, Foundation School Program, Subchapter B, Use of State Funds, is necessary and shall have an effective date of 20 days after filing as adopted with the Texas Register, as recommended by the Committee on School Finance/Permanent School Fund, (ATTACHMENT 6, page 267).

10. Proposed Amendment to 19 TAC Chapter 109, Budgeting, Accounting, and Auditing, Subchapter B, Texas Education Agency Audit Functions, §109.23, School District Independent Audits and Agreed-Upon Procedures
(First Reading and Filing Authorization)
(Board agenda page III-5)

MOTION AND VOTE: *It was moved by Mr. Maynard and carried unanimously that the State Board of Education approve for first reading and filing authorization the proposed amendment to 19 TAC Chapter 109, Budgeting, Accounting, and Auditing, Subchapter B, Texas Education Agency Audit Functions, §109.23, School District Independent Audits and Agreed-Upon Procedures, as recommended by the Committee on School Finance/Permanent School Fund*
(ATTACHMENT 7, page 270).

COMMITTEE ON SCHOOL INITIATIVES

12. Adoption of Review of 19 TAC Chapter 100, Charters, Subchapter A, Open-Enrollment Charter Schools, and Subchapter B, Home-Rule School District Charters
(Adoption of Review)
(Board agenda page IV-34)

MOTION AND VOTE: *It was moved by Mrs. Cargill and carried unanimously that the State Board of Education adopt the review of 19 TAC Chapter 100, Charters, Subchapter A, Open-Enrollment Charter Schools, and Subchapter B, Home-Rule School District Charters, as recommended by the Committee on School Initiatives.*

13. Review of Proposed Amendments to 19 TAC Chapter 230, Professional Educator Preparation and Certification, Subchapter C, Assessment of Educators, Subchapter D, Types and Classes of Certificates Issued, Subchapter E, Educational Aide Certificate, and Subchapter G, Certificate Issuance Procedures
(Board agenda page IV-38)

MOTION AND VOTE: *It was moved by Mrs. Cargill and carried unanimously that the State Board of Education take no action on the proposed amendments to 19 TAC Chapter 230, Professional Educator Preparation and Certification, Subchapter C, Assessment of Educators, Subchapter D, Types and Classes of Certificates Issued, Subchapter E, Educational Aide Certificate, and Subchapter G, Certificate Issuance Procedures, as recommended by the Committee on School Initiatives.*

REGARDING AGENDA ITEMS POSTED FOR DISCUSSION ON COMMITTEE AGENDAS

Committee on Instruction

Mrs. Melton-Malone did not report on the Committee on Instruction.

Committee on School Finance/Permanent School Fund

Mr. Maynard did not report on the Committee on Finance/Permanent School Fund.

Committee on School Initiatives

Mrs. Cargill announced that 16 charter school applications were being reviewed and interviews are still scheduled for July 27.

REPORTS OF OTHER STATE BOARD OF EDUCATION MEMBERS REGARDING AGENDA ITEMS AND EDUCATIONAL ACTIVITIES AND CONCERNS IN INDIVIDUAL DISTRICTS

Dr. Ellis gave board members an opportunity to provide information regarding agenda items or other relevant information about public education. Brief reports were made.

The meeting adjourned at 1:06 p.m.

Georgina C. Pérez

Georgina C. Pérez, Secretary

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TEXAS PERMANENT SCHOOL FUND
SUMMARY OF TRANSACTIONS FOR APPROVAL
(Including External Manager's Trades)
For December 1, 2019 through February 29, 2020

Purchases/Capital Calls:		
	Long Term Fixed Income	$ 360,405,911
	Public Market Equities	219,125,208
	Alternative Investments	588,072,469
	TOTAL	$ 1,167,603,588
Sales/Distributions:		
	Long Term Fixed Income	$ 353,588,859
	Public Market Equities	362,103,516
	Alternative Investments	606,668,074
	TOTAL	$ 1,322,360,449

General Land Office Contributions:

FY 2019 Cumulative February 2019	FY 2020 Cumulative February 2020
$127,500,000	$5,000,000

Based on the above information provided by staff including a report that deposits to the Permanent School Fund from the General Land Office were $127,500,000 through February 2019 for fiscal year 2019 versus $5,000,000 through February 2020 for fiscal year 2020, and the recommendation of the Executive Administrator and Chief Investment Officer and the Commissioner of Education; it is moved by unanimous consent that the Committee on School Finance/Permanent School Fund ratify for the months of December 2019, January 2020 and February 2020 Permanent School Fund portfolio purchases of $1,167,603,588 and sales of $1,322,360,449.

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ATTACHMENT
Text of Proposed Amendments to 19 TAC

Chapter 74. Curriculum Requirements

Subchapter B. Graduation Requirements

§74.11. High School Graduation Requirements.

(a)-(f) (No change.)

(g) Elective credits may be selected from the following:

(1) high school courses not required for graduation that are listed in the following chapters of this title:

(A) Chapter 110 of this title (relating to Texas Essential Knowledge and Skills for English Language Arts and Reading);

(B) Chapter 111 of this title (relating to Texas Essential Knowledge and Skills for Mathematics);

(C) Chapter 112 of this title (relating to Texas Essential Knowledge and Skills for Science);

(D) Chapter 113 of this title (relating to Texas Essential Knowledge and Skills for Social Studies);

(E) Chapter 114 of this title (relating to Texas Essential Knowledge and Skills for Languages Other Than English);

(F) Chapter 115 of this title (relating to Texas Essential Knowledge and Skills for Health Education);

(G) Chapter 116 of this title (relating to Texas Essential Knowledge and Skills for Physical Education);

(H) Chapter 117 of this title (relating to Texas Essential Knowledge and Skills for Fine Arts);

[~~(I) Chapter 126 of this title (relating to Texas Essential Knowledge and Skills for Technology Applications);~~]

(I) [~~(J)~~] Chapter 127 of this title (relating to Texas Essential Knowledge and Skills for Career Development); and

(J) [~~(K)~~] Chapter 130 of this title (relating to Texas Essential Knowledge and Skills for Career and Technical Education);

(2) state-approved innovative courses as specified in §74.27 of this title (relating to Innovative Courses and Programs);

(3) Junior Reserve Officer Training Corps (JROTC)--one to four credits; and

(4) Driver Education--one-half credit.

(h)-(n) (No change.)

§74.12. Foundation High School Program.

(a) (No change.)

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

(1)-(4) (No change.)

(5) Languages other than English (LOTE)--two credits.

(A) The credits may be selected from the following:

(i) any two levels in the same language, including comparable AP or IB language courses that do not count toward another credit required for graduation; or

(ii) two credits in computer programming languages, including computer coding, to be selected from Computer Science I, II, and III, AP Computer Science Principles, AP Computer Science A, IB Computer Science Standard Level, and IB Computer Science Higher Level.

(B) A single two-credit IB LOTE course may only satisfy one LOTE requirement.

(C) If a student, in completing the first credit of LOTE, demonstrates that the student is unlikely to be able to complete the second credit, the student may substitute another appropriate course as follows:

(i) Special Topics in Language and Culture;

(ii) World History Studies or World Geography Studies for a student who is not required to complete both by the local district;

(iii) another credit selected from Chapter 114 of this title (relating to Texas Essential Knowledge and Skills for Languages Other Than English); or

(iv) computer programming languages, including computer coding.

(D) The determination regarding a student's ability to complete the second credit of LOTE must be agreed to by:

(i) the teacher of the first LOTE credit course or another LOTE teacher designated by the school district, the principal or designee, and the student's parent or person standing in parental relation;

(ii) the student's admission, review, and dismissal (ARD) committee if the student receives special education services under the TEC, Chapter 29, Subchapter A; or

(iii) the committee established for the student under Section 504, Rehabilitation Act of 1973 (29 United States Code, Section 794) if the student does not receive special education services under the TEC, Chapter 29, Subchapter A, but is covered by the Rehabilitation Act of 1973.

(E) A student, who due to a disability, is unable to complete two credits in the same language in a language other than English, may substitute a combination of two credits that are not being used to satisfy another specific graduation requirement selected from English language arts, mathematics, science, or social studies or two credits in career and technical education or technology applications for the LOTE credit requirements. The determination regarding a student's ability to complete the LOTE credit requirements will be made by:

(i) the student's ARD committee if the student receives special education services under the TEC, Chapter 29, Subchapter A; or

(ii) the committee established for the student under Section 504, Rehabilitation Act of 1973 (29 United States Code, Section 794) if the student does not receive special education services under the TEC, Chapter 29, Subchapter A, but is covered by the Rehabilitation Act of 1973.

(F) A student who successfully completes a dual language immersion/two-way or dual language immersion/one-way program in accordance with §89.1210(d)(3) and (4) of this title (relating to Program Content and Design), §89.1227 of this title (relating to Minimum Requirements for Dual Language Immersion Program Model), and §89.1228 of this title (relating to Two-Way Dual Language Immersion Program Model Implementation) at an elementary school may satisfy one credit of the two credits required in a language other than English.

(i) To successfully complete a dual language immersion program, a student must:

(I) have participated in a dual language immersion program for at least five consecutive school years;

(II) achieve high levels of academic competence as demonstrated by performance of meets or masters grade level on both the mathematics and reading State of Texas Assessments of Academic Readiness (STAAR®) in English or Spanish, as applicable , in at least one grade level ; and

(III) achieve proficiency in both English and a language other than English as demonstrated by scores of proficient or higher in the reading and speaking domains on language proficiency or achievement tests in both languages.

(ii) The second credit of a language other than English must be in the same language as the successfully completed dual language immersion program.

(G) A student who successfully completes a course in American Sign Language while in elementary school may satisfy one credit of the two credits required in a language other than English.

(6)-(7) (No change.)

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

§74.13. Endorsements.

(a)-(c) (No change.)

(d) A school district may define advanced courses and determine a coherent sequence of courses for an endorsement area, provided that prerequisites in Chapters 110-117, [~~126.~~] 127, and 130 of this title are followed.

(e) (No change.)

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

(1) Science, technology, engineering, and mathematics (STEM). A student may earn a STEM endorsement by completing the requirements specified in subsection (e) of this section, including Algebra II, chemistry, and physics or 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), or CTE innovative courses approved by the commissioner of education. The final course in the sequence must be selected from Chapter 130, Subchapter O, of this title (relating to Science, Technology, Engineering, and Mathematics) or Career Preparation I or II and Project-Based Research in Chapter 127, Subchapter B, of this title (relating to High School), if the course addresses a STEM-related field; or

(B) courses required to complete a TEA-designated program of study related to STEM; or

[~~(B) a coherent sequence of four credits in computer science selected from the following:~~]

[~~(i) Fundamentals of Computer Science; or~~]

[~~(ii) Computer Science I; or~~]

[~~(iii) Computer Science II; or~~]

[~~(iv) Computer Science III; or~~]

[~~(v) Digital Forensics; or~~]

[~~(vi) Discrete Mathematics for Computer Science; or~~]

[~~(vii) Game Programming and Design; or~~]

[~~(viii) Mobile Application Development; or~~]

[~~(ix) Robotics Programming and Design; or~~]

[~~(x) Independent Studies in Technology Applications; or~~]

[~~(xi) AP Computer Science A; or~~]

[~~(xii) AP Computer Science Principles; or~~]

[~~(xiii) IB Computer Science, Standard Level; or~~]

[~~(xiv) IB Computer Science, Higher Level; or~~]

(C) three credits in mathematics by successfully completing Algebra II and two additional mathematics courses for which Algebra II is a prerequisite by selecting courses from subsection (e)(2) of this section; or

(D) four credits in science by successfully completing chemistry, physics, and two additional science courses by selecting courses from subsection (e)(6) of this section; or

[~~(E) a coherent sequence of four courses in cybersecurity to consist of Foundations of Cybersecurity and Cybersecurity Capstone and two additional courses to be selected from the following:~~]

[~~(i) AP Computer Science A; or~~]

[~~(ii) Computer Science I; or~~]

[~~(iii) AP Computer Science Principles; or~~]

[~~(iv) Digital Forensics; or~~]

[~~(v) Computer Maintenance; or~~]

[~~(vi) Internetworking Technologies I; or~~]

[~~(vii) Internetworking Technologies II; or~~]

[~~(viii) Networking; or~~]

(E) [~~(F)~~] in addition to Algebra II, chemistry, and physics, a coherent sequence of three additional credits from no more than two of the categories or disciplines represented by subparagraphs (A), (B), (C), and (D) of this paragraph.

(2) Business and industry. A student 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 approved by the commissioner. The final course in the sequence must be selected from one of the following:

(i) Chapter 130, Subchapter A, of this title (relating to Agriculture, Food, and Natural Resources); or

(ii) Chapter 130, Subchapter B, of this title (relating to Architecture and Construction); or

(iii) Chapter 130, Subchapter C, of this title (relating to Arts, Audio/Video Technology, and Communications); or

(iv) Chapter 130, Subchapter D, of this title (relating to Business Management and Administration); or

(v) Chapter 130, Subchapter F, of this title (relating to Finance); or

(vi) Chapter 130, Subchapter I, of this title (relating to Hospitality and Tourism); or

(vii) Chapter 130, Subchapter K, of this title (relating to Information Technology); or

(viii) Chapter 130, Subchapter M, of this title (relating to Manufacturing); or

(ix) Chapter 130, Subchapter N, of this title (relating to Marketing); or

(x) Chapter 130, Subchapter P, of this title (relating to Transportation, Distribution, and Logistics); or

(xi) Chapter 130, Subchapter Q, of this title (relating to Energy); or

(xii) [~~(xii)~~] Career Preparation I or II and Project-Based Research in Chapter 127, Subchapter B, of this title if the course addresses a career from a field listed in clauses (i)-(xi) [~~(i)-(x)~~] of this subparagraph; or

(B) courses required to complete a TEA-designated program of study related to business and industry; or

(C) [~~(B)~~] four English credits by selecting courses from Chapter 110 of this title to include three levels in one of the following areas:

(i) public speaking; or

(ii) debate; or

(iii) advanced broadcast journalism; or

(iv) advanced journalism: newspaper; or

(v) advanced journalism: yearbook; or

(vi) advanced journalism: literary magazine; or

[~~(C) four technology applications credits by selecting from the following:~~]

[~~(i) Digital Design and Media Production; or~~]

[~~(ii) Digital Art and Animation; or~~]

[~~(iii) 3-D Modeling and Animation; or~~]

[~~(iv) Digital Communications in the 21st Century; or~~]

[~~(v) Digital Video and Audio Design; or~~]

[~~(vi) Web Communications; or~~]

[~~(vii) Web Design; or~~]

[~~(viii) Web Game Development; or~~]

[~~(ix) Independent Study in Evolving/Emerging Technologies; or~~]

(D) a coherent sequence of four credits from subparagraph (A), (B), or (C) of this paragraph.

(3) Public services. A student 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 approved by the commissioner. The final course in the sequence must be selected from one of the following:

(i) Chapter 130, Subchapter E, of this title (relating to Education and Training); or

(ii) Chapter 130, Subchapter G, of this title (relating to Government and Public Administration); or

(iii) Chapter 130, Subchapter H, of this title (relating to Health Science); or

(iv) Chapter 130, Subchapter J, of this title (relating to Human Services); or

(v) Chapter 130, Subchapter L, of this title (relating to Law, Public Safety, Corrections, and Security); or

(vi) Career Preparation I or II and Project-Based Research in Chapter 127, Subchapter B, of this title if the course addresses a field from a cluster listed in clauses (i)-(v) of this subparagraph; or

(B) courses required to complete a TEA-designated program of study related to public services; or

(C) [~~(B)~~]four courses in Junior Reserve Officer Training Corps (JROTC).

(4) Arts and humanities. A student may earn an arts and humanities endorsement by completing the requirements specified in subsection (e) of this section and:

(A) five social studies credits by selecting courses from Chapter 113 of this title; or

(B) four levels of the same language in a language other than English by selecting courses in accordance with Chapter 114 of this title, which may include Advanced Language for Career Applications; or

(C) two levels of the same language in a language other than English and two levels of a different language in a language other than English by selecting courses in accordance with Chapter 114 of this title; or

(D) four levels of American sign language by selecting courses in accordance with Chapter 114 of this title; or

(E) a coherent sequence of four credits by selecting courses from one or two categories or disciplines in fine arts from Chapter 117 of this title or innovative courses approved by the commissioner; or

(F) four English credits by selecting from the following:

(i) English IV; or

(ii) Independent Study in English; or

(iii) Literary Genres; or

(iv) Creative Writing; or

(v) Research and Technical Writing; or

(vi) Humanities; or

(vii) Communication Applications; or

(viii) AP English Literature and Composition; or

(ix) AP English Language and Composition; or

(x) IB Language Studies A: Language and Literature Standard Level; or

(xi) IB Language Studies A: Language and Literature Higher Level; or

(xii) IB Language Studies A: Literature Standard Level; or

(xiii) IB Language Studies A: Literature Higher Level; or

(xiv) IB Literature and Performance Standard Level.

(5) Multidisciplinary studies. A student may earn a multidisciplinary studies endorsement by completing the requirements specified in subsection (e) of this section and:

(A) four advanced courses that prepare a student to enter the workforce successfully or postsecondary education without remediation from within one endorsement area or among endorsement areas that are not in a coherent sequence; or

(B) four credits in each of the four foundation subject areas to include chemistry and/or physics and English IV or a comparable AP or IB English course; or

(C) four credits in Advanced Placement, International Baccalaureate, or dual credit selected from English, mathematics, science, social studies, economics, languages other than English, or fine arts.

(g) (No change.)

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ATTACHMENT
Text of Proposed Revisions to 19 TAC

Chapter 130. Texas Essential Knowledge and Skills for Career and Technical Education

Subchapter A. Agriculture, Food, and Natural Resources

[~~§130.13. Oil and Gas Production I (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 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 leadership or extracurricular organizations.~~

~~(5) Statements 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) 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 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 understands the history 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.

(4) 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.

~~(5) 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.~~]

[~~§130.14. Oil and Gas Production II (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course 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.~~

~~(b) 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 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 leadership or extracurricular organizations.~~

~~(5) Statements 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) 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 agriculture, food, and natural resources;~~

~~(B) identify careers in agriculture, food, and natural resources 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 in agriculture, food, and natural resources;~~

~~(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 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 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 and contrast 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.~~

~~(4) 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.~~

~~(5) 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.~~]

Subchapter C. Arts, Audio/Video Technology, and Communications

§130.123. Digital Design and Media Production (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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 techniques, 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.

§130.124. Digital Art and Animation (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.125. 3-D Modeling and Animation (One Credit)

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.126. Digital Communications in the 21st Century (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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, non-profit 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.

§130.127. Web Game Development (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Web Design. This course is recommended for students in Grades 11 and 12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

Subchapter K. Information Technology

[~~§130.308. Web Technologies (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Information Technology. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 Technologies, students will learn to make informed decisions and apply the decisions to the field of IT. 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 leadership or extracurricular organizations.~~

~~(5) Statements 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) 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) examine the role of certifications, resumes, and portfolios in the web technology profession;~~

~~(D) solve problems and think critically;~~

~~(E) demonstrate leadership skills and function effectively as a team member; and~~

~~(F) 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 interactive 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 portfolio.~~

~~(3) The student demonstrates knowledge and appropriate use of hardware, software, and connectivity technologies. The student is expected to:~~

~~(A) identify networking components and define the impact of networking components on web development;~~

~~(B) evaluate the various input, processing, output, and storage devices and storage services;~~

~~(C) identify current and future Internet protocols such as hypertext transfer protocol, file transfer protocol, telnet, and email; and~~

~~(D) describe new trends in web technology and evaluate their impact on web development.~~

~~(4) The student complies with 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) differentiate between copyright and trademarks;~~

~~(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) adhere to copyright and trademark intellectual property laws and regulations, including demonstrating correct acquisition and citation of sources;~~

~~(F) discuss the process of acquiring rights to use copyrighted and trademarked content in a website;~~

~~(G) demonstrate appropriate behavior and adherence to acceptable use policies when accessing and using online resources;~~

~~(H) explain the importance of information privacy such as securing credit card information, passwords, and personal information;~~

~~(I) describe the function of a non-disclosure agreement; and~~

~~(J) discuss website accessibility concerns.~~

~~(5) The student evaluates electronic information. The student is expected to:~~

~~(A) identify appropriate methods to analyze the design and functionality of web pages;~~

~~(B) demonstrate skill in testing the accuracy and validity of information acquired; and~~

~~(C) synthesize information from data acquired from online resources.~~

~~(6) The student creates and modifies web and digital media designs. The student is expected to:~~

~~(A) implement functional design elements such as proximity, repetition, contrast, alignment, color theory, consistency, image file size, and typography;~~

~~(B) identify, create, modify, and use common file formats such as text, image, video analog and digital, and audio files;~~

~~(C) select, create, modify, and integrate effective digital content such as vector-based and raster graphics, motion graphics, video, and audio;~~

~~(D) create web pages using current web standards and web development skills such as version control, documentation, web application security, validation, accessibility, and compatibility across multiple browsers and devices;~~

~~(E) demonstrate proper use of folder structure hierarchy; and~~

~~(F) use web coding standards to evaluate the design and functionality of web pages such as the World Wide Web Consortium (W3C) guidelines.~~

~~(7) The student demonstrates and employs knowledge of Internet programming strategies to develop and maintain web applications. The student is expected to:~~

~~(A) explain the importance of Internet programming standards;~~

~~(B) differentiate among various web coding standards such as HyperText Markup Language, and cascading style sheets;~~

~~(C) use standard applications to develop web applications such as text-based editing programs, word processors, and web authoring software;~~

~~(D) compare and contrast the impact of different browsers on web development;~~

~~(E) explain client-server applications and describe the process of a client-server transaction;~~

~~(F) identify the advantages and disadvantages of client-side processing;~~

~~(G) identify security issues related to client-side processing;~~

~~(H) use standard scripting languages to produce interactive web applications;~~

~~(I) identify characteristics of various scripting languages; and~~

~~(J) explain the process to construct secure transaction interfaces from the web server to the customer.~~

~~(8) The student employs knowledge of web administration to develop and maintain web applications. The student is expected to:~~

~~(A) compare the advantages and disadvantages of running a personal server versus using a server provider;~~

~~(B) explain the Transmission Control Protocol/Internet Protocol;~~

~~(C) identify hardware and software requirements for web servers;~~

~~(D) evaluate server providers;~~

~~(E) describe the process of establishing a domain name;~~

~~(F) simulate the administration of web servers, including uploading and managing files;~~

~~(G) collect and analyze usage statistics;~~

~~(H) maintain documentation of the server environment such as specifications, passwords, and software versions;~~

~~(I) summarize the process of server backup and restoration of software features;~~

~~(J) propose security measures to protect web servers from electronic threats such as unauthorized access and negative intentions; and~~

~~(K) evaluate security measures such as using a firewall, Secure Socket Layer (SSL) connections, and Hypertext Transfer Protocol Secure (HTTPS) transactions.~~

~~(9) The student evaluates a problem and creates a project management plan for meeting client requirements. The student is expected to:~~

~~(A) communicate with clients to analyze requirements to meet the needs of the client and target audience;~~

~~(B) document design properties, necessary tools, and resources and identify and address risks;~~

~~(C) develop and use a timeline task list such as critical milestones, potential challenges, and interdependencies; and~~

~~(D) use various methods to evaluate the progress of the plan and modify as necessary.~~

~~(10) The student creates and implements a web product using a project management plan. The student is expected to:~~

~~(A) create and simulate the publication of a multipage web product using client required content and web design concepts;~~

~~(B) develop a test plan for a multipage web product for testing usability, effectiveness, reliability, and customer acceptance;~~

~~(C) explain the quality assurance process; and~~

~~(D) develop and implement a quality assurance plan.~~]

[~~§130.309. Computer Programming I (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Information Technology and Algebra I. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 Programming I, students will acquire knowledge of structured programming techniques and concepts appropriate to developing executable programs 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 programming. Students will apply technical skills to address business applications of emerging technologies.~~

~~(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.~~

~~(5) Statements 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) The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected:~~

~~(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) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT;~~

~~(F) demonstrate planning and time management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project; and~~

~~(G) identify job opportunities and accompanying job duties and tasks.~~

~~(2) The student differentiates the concepts of integrity and confidentiality as related to technology in the business environment. The student is expected to:~~

~~(A) define business ethics;~~

~~(B) distinguish between honest and dishonest business practices;~~

~~(C) examine copyright and licensing issues in the software industry; and~~

~~(D) analyze the effects of unethical practices on a business.~~

~~(3) The student identifies and analyzes the client project software needs and requirements. The student is expected to:~~

~~(A) gather data to identify client and project requirements;~~

~~(B) identify input and output requirements;~~

~~(C) identify system processing requirements; and~~

~~(D) develop program requirements and specifications.~~

~~(4) The student develops an IT-based project plan to solve a specific problem. The student is expected to:~~

~~(A) define scope of work to meet client based project needs;~~

~~(B) identify software development processes and issues; and~~

~~(C) explain the software system life cycle approach.~~

~~(5) The student designs a software application plan. The student is expected to:~~

~~(A) articulate the principles of system design such as procedural, object-oriented, and event-driven processes;~~

~~(B) perform a logical design using appropriate software tools;~~

~~(C) apply algorithmic and data structure concepts;~~

~~(D) identify constraints;~~

~~(E) identify modular design concepts; and~~

~~(F) document the design specification using a defined procedure.~~

~~(6) The student solves problems using different types and levels of programming languages and quality assurances. The student is expected to:~~

~~(A) differentiate among the concepts of data such as procedural, object-oriented, and event-driven representation;~~

~~(B) identify current programming languages and the environment in which each is used;~~

~~(C) produce procedural and object-oriented programs using structured coding with appropriate style and clarity of expression;~~

~~(D) demonstrate skill in program testing;~~

~~(E) compare computed results with anticipated results to determine the reasonableness of the solutions;~~

~~(F) troubleshoot technological problems;~~

~~(G) explain the software quality assurance process; and~~

~~(H) follow established quality assurance procedures for testing, identifying problems, and tracking resolutions.~~

~~(7) The student recognizes issues and complies with procedures for maintaining the security of computerized information. The student is expected to:~~

(A) identify risks to information systems facilities, data communications systems, and applications;

(B) comply with federal and state legislation pertaining to computer crime, fraud, and abuse;

(C) identify and select controls for information systems facilities, data communications, and applications appropriate to specific risks; and

(D) apply procedures used to recover from situations such as system failure and computer virus.]

[§130.310. Computer Programming II (One Credit), Adopted 2015.]

[(a) General requirements. This course is recommended for students in Grades 11 and 12. Recommended prerequisites: Principles of Information Technology and Computer Programming I. Students shall be awarded one credit for successful completion of this course.

(b) 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 Programming II, students will expand their knowledge and skills in structured programming techniques and concepts by addressing more complex problems and developing comprehensive programming solutions. Students will analyze the social responsibility of business and industry regarding the significant issues relating to environment, ethics, health, safety, and diversity in society and in the workplace as related to computer programming. Students will apply technical skills to address business applications of emerging technologies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

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

(A) employ effective reading and writing skills;

(B) employ effective verbal and nonverbal communication skills;

(C) illustrate interview skills for successful job placement;

(D) solve problems and think critically;

(E) demonstrate leadership skills and function effectively as a team member;

(F) identify and implement proper safety procedures;

(G) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(H) 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) create a personal career plan along with education, job skills, and experience necessary to achieve career goals; and

(B) develop a resume that includes letters of recommendation appropriate to a chosen career plan.

(3) The student identifies project software needs and requirements. The student is expected to:

(A) identify input and output requirements;

(B) identify system processing requirements;

(C) identify hardware, networking, and software system functional requirements;

(D) conduct a project needs analysis;

(E) define a problem to be solved by a created application;

(F) analyze requirement specifications using current approaches;

(G) identify project constraints; and

(H) use advanced modeling and analysis of functional requirements.

(4) The student produces an IT-based strategy and project plan to solve a provided class problem. The student is expected to:

(A) identify key functions and subsystem capabilities of modern software products;

(B) identify software resources and individual product risks; and

(C) identify software development methodologies.

(5) The student demonstrates knowledge of the software development environment. The student is expected to:

(A) apply prototyping techniques;

(B) use appropriate configuration management tools;

(C) apply language-specific programming techniques;

(D) develop programs using appropriate language;

(E) apply the appropriate development environment for each selected language such as the compiler, debugger, test generator, and analyzer;

(F) use appropriate modeling and analysis tools; and

(G) use appropriate requirement tracking tools.

(6) The student demonstrates knowledge of the software development process. The student is expected to:

(A) articulate the information system life cycle;

(B) identify system analysis issues related to design, testing, implementation, and maintenance;

(C) identify the use of program design tools in a software development process; and

(D) identify current information life cycle models.

(7) The student designs a software application. The student is expected to:

(A) apply principals of system design such as structured, object-oriented, and event-driven processes;

(B) develop a logical design;

(C) document design specifications according to a defined procedure;

(D) design system input, output, processing, and interfaces;

(E) identify the characteristics and uses of data processing such as batch, interactive, event driven, and object oriented;

(F) explain algorithmic and data structure concepts;

(G) identify constraints;

(H) identify modular design concepts;

(I) identify the features, functions, and architectures of client-server computing;

(J) articulate database management concepts;

(K) define the objectives of a client-server application;

(L) design static and dynamic online processing systems; and

(M) employ interface techniques.

(8) The student codes a software application. The student is expected to:

(A) apply programming language concepts;

(B) identify the hardware-software connection;

(C) articulate the concept of data representation;

(D) apply structured, object-oriented, and event-driven programming techniques;

(E) articulate how a programming language can support multitasking and exception handling;

(F) identify how current key programming languages work in different operating system environments;

(G) translate data structures and program design into code in an appropriate language;

(H) demonstrate key constructs and commands specific to a language;

(I) identify current programming languages used in software development;

(J) explain how to resolve program implementation issues such as debugging, documentation, and auditing;

(K) articulate software development issues such as correctness, reliability, and productivity;

(L) explain code analysis issues related to design, testing, implementation, and maintenance;

(M) demonstrate how to design and implement programs in a top-down manner;

(N) demonstrate how to translate algorithmic and modular design into computer code;

(O) explain how programming control structures are used to verify correctness;

(P) compile and debug computer code; and

(Q) prepare appropriate commenting within code.

(9) The student demonstrates knowledge of software testing. The student is expected to:

(A) develop a test plan;

(B) define test procedures;

(C) develop test cases; and

(D) perform software testing.

(10) The student performs quality assurance testing. The student is expected to:

(A) explain the software quality assurance process;

~~(B) apply standard requirements for software quality assurance;~~

~~(C) perform software quality assurance tasks to determine a quality software product; and~~

~~(D) conduct code inspection.~~

~~(11) The student applies procedures for maintaining the security of computerized information. The student is expected to:~~

~~(A) identify risks to information systems facilities, data, communication systems, and applications;~~

~~(B) comply with federal and state legislation pertaining to computer crime, fraud, and abuse;~~

~~(C) identify and select controls for information systems facilities, data communications, and applications appropriate to specific risks; and~~

~~(D) apply procedures used to recover from situations such as system failure and computer virus.~~]

§130.315. Web Communications (One-Half Credit).

(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course is recommended for students in Grade 9.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.316. Web Design (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.317. Independent Study in Technology Applications (One Credit), Beginning with School Year 2012-2013.

(a) 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 may be taken at Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.318. Independent Study in Evolving/Emerging Technologies (One Credit).

(a) 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 may be taken at Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

Subchapter O. Science, Technology, Engineering, and Mathematics

§130.420. Fundamentals of Computer Science (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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) 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 the 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 and regulations 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. 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 leadership or extracurricular organizations.

(5) Statements 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) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. 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 and publish interactive stories, games, and animations;

(C) create and publish interactive animations;

(D) create algorithms for the solution of various problems;

(E) create web pages using a mark-up language;

(F) use the Internet to create and publish solutions; and

(G) design creative and effective user interfaces.

(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) seek and respond to advice from peers and professionals in 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, and video.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) construct appropriate electronic search strategies; and

(B) use a variety of resources, including other subject areas, together with various productivity tools to gather authentic data as a basis for individual and group programming projects.

(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 applets into web pages;

(B) find, download, and insert scripting code into web pages to enhance interactivity;

(C) understand binary representation of data in computer systems, perform conversions between decimal and binary number systems, and count in binary number systems;

(D) read and define a problem's description, purpose, and goals;

(E) demonstrate coding proficiency in a contemporary programming language by developing solutions that create stories, games, and animations;

(F) choose, identify, and use the appropriate data type to properly represent data in a problem solution;

(G) demonstrate an understanding of and use variables within a programmed story, game, or animation;

(H) demonstrate proficiency in the use of arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(I) demonstrate an understanding of and use sequence within a programmed story, game, or animation;

(J) demonstrate an understanding of and use conditional statements within a programmed story, game, or animation;

(K) demonstrate an understanding of and use iteration within a programmed story, game, or animation;

(L) create an interactive story, game, or animation;

(M) use random numbers within a programmed story, game, or animation; and

(N) test program solutions by investigating valid and invalid data.

(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/issues and model ethical acquisition of digital information by citing sources using established methods;

(B) demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and on intranets;

(C) investigate measures such as passwords or virus detection/prevention to protect computer systems and databases from unauthorized use and tampering;

(D) understand the safety risks associated with the use of social networking sites;

(E) discuss the impact of computing and computing related advancements on society; and

(F) determine the reliability of information available through electronic media.

(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 knowledge of the basic computer components, including a central processing unit (CPU), storage, and input/output devices;

(B) use operating system tools, including appropriate file management;

(C) demonstrate knowledge and appropriate use of different operating systems;

(D) demonstrate knowledge and understanding of basic network connectivity;

(E) describe, compare, and contrast the differences between an application and an operating system; and

(F) compare, contrast, and appropriately use various input, processing, output, and primary/secondary storage devices.

§140.421. Computer Science I (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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) 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 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 and regulations 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. 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 leadership or extracurricular organizations.

(5) Statements 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) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) participate with electronic communities as a learner, initiator, contributor, and teacher/mentor;

(B) extend the learning environment beyond the school walls with digital products created to increase teaching and learning in the other subject areas; and

(C) participate in relevant, meaningful activities in the larger community and society to create electronic projects.

(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) create and properly display meaningful output;

(B) create interactive console display interfaces, with appropriate user prompts, to acquire data from a user;

(C) use Graphical User Interfaces (GUIs) to create interactive interfaces to acquire data from a user and display program results;

(D) write programs with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, spacing, indentation, and a standardized program style;

(E) improve numeric display by optimizing data visualization;

(F) display simple vector graphics using lines, circles, and rectangles;

(G) display simple bitmap images; and

(H) seek and respond to advice from peers and professionals in evaluating quality and accuracy.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) use a variety of resources, including foundation and enrichment curricula, to gather authentic data as a basis for individual and group programming projects; and

(B) use various productivity tools to gather authentic data as a basis for individual and group programming projects.

(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 to create program solutions;

(B) define and specify the purpose and goals of solving a problem;

(C) identify the 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 and debug errors;

(I) test program solutions with appropriate valid and invalid test data for correctness;

(J) debug and solve problems using error messages, reference materials, language documentation, and effective strategies;

(K) explore common algorithms, including finding greatest common divisor, finding the biggest number out of three, finding primes, making change, and finding the average;

(L) analyze and modify existing code to improve the underlying algorithm;

(M) create program solutions that exhibit robust behavior by understanding, avoiding, and preventing runtime errors, including division by zero and type mismatch;

(N) select the most appropriate algorithm for a defined problem;

(O) demonstrate proficiency in the use of the arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(P) create program solutions to problems using available mathematics libraries, including absolute value, round, power, square, and square root;

(Q) develop program solutions that use assignment;

(R) develop sequential algorithms to solve non-branching and non-iterative problems;

(S) develop algorithms to decision-making problems using branching control statements;

(T) develop iterative algorithms and code programs to solve practical problems;

(U) demonstrate proficiency in the use of the relational operators;

(V) demonstrate proficiency in the use of the logical operators; and

(W) 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 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, responsible use of software, and knowledge of acceptable use policies;

(D) investigate measures, including passwords and virus detection/prevention, to protect computer systems and databases from unauthorized use and tampering; and

(E) investigate how technology has changed 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) compare and contrast types of operating systems, software applications, and programming languages;

(B) demonstrate knowledge of major hardware components, including primary and secondary memory, a central processing unit (CPU), and peripherals;

(C) differentiate among current programming languages, discuss the use of those languages in other fields of study, and demonstrate knowledge of specific programming terminology and concepts;

(D) differentiate between a high-level compiled language and an interpreted language;

(E) understand concepts of object-oriented design;

(F) use local and global scope access variable declarations;

(G) encapsulate data and associated subroutines into an abstract data type;

(H) create subroutines that do not return values with and without the use of arguments and parameters;

(I) create subroutines that return typed values with and without the use of arguments and parameters;

(J) understand and identify the data-binding process between arguments and parameters;

(K) compare objects using reference values and a comparison routine;

(L) understand the binary representation of numeric and nonnumeric data in computer systems;

(M) understand the finite limits of numeric data;

(N) perform numerical conversions between the decimal and binary number systems and count in the binary number system;

(O) choose, identify, and use the appropriate data types for integer, real, and Boolean data when writing program solutions;

(P) demonstrate an understanding of the concept of a variable;

(Q) demonstrate an understanding of and use reference variables for objects;

(R) demonstrate an understanding of how to represent and manipulate text data, including concatenation and other string functions;

(S) demonstrate an understanding of the concept of scope;

(T) identify and use the structured data type of one-dimensional arrays to traverse, search, and modify data;

(U) choose, identify, and use the appropriate data type and structure to properly represent the data in a program problem solution; and

(V) compare and contrast strongly typed and un-typed programming languages.

§130.422. Computer Science II (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I and either Computer Science I or Fundamentals of Computer Science. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 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 and regulations and by practicing integrity and respect. Students will gain an understanding of computer science through the study of technology operations, systems, and concepts. 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 leadership or extracurricular organizations.

(5) Statements 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) 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) demonstrate the ability to read and modify large programs, including the design description and process development;

(C) follow the systematic problem-solving process of identifying the specifications of purpose and goals, the data types and objects needed, and the subtasks to be performed;

(D) compare and contrast design methodologies and implementation techniques such as top-down, bottom-up, and black box;

(E) analyze, modify, and evaluate existing code by performing a case study on a large program, including inheritance and black box programming;

(F) identify the data types and objects needed to solve a problem;

(G) 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;

(H) use object-oriented programming development methodology, data abstraction, encapsulation with information hiding, and procedural abstraction in program development and testing; and

(I) create, edit, and manipulate bitmap images that are used to enhance user interfaces and program functionality.

(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) use the principles of software engineering to work in software design teams, break a problem statement into specific solution requirements, create a program development plan, code part of a solution from a program development plan while a partner codes the remaining part, team test the solution for correctness, and develop presentations to report the solution findings;

(B) create interactive console display interfaces with appropriate user prompts;

(C) create interactive human interfaces to acquire data from a user and display program results using an advanced Graphical User Interface (GUI);

(D) write programs and communicate with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, indentation, and a standardized program style;

(E) improve data display by optimizing data visualization;

(F) display simple vector graphics to interpret and display program results; and

(G) display simple bitmap images.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) use local area networks (LANs) and wide area networks (WANs), including the Internet and intranets, in research, file management, and collaboration;

(B) understand programming file structure and file access for required resources;

(C) acquire and process information from text files, including files of known and unknown sizes;

(D) manipulate data structures using string processing;

(E) manipulate data values by casting between data types;

(F) identify and use the structured data type of one-dimensional arrays to traverse, search, modify, insert, and delete data;

(G) identify and use the structured data type of two-dimensional arrays to traverse, search, modify, insert, and delete data; and

(H) identify and use a list object data structure to traverse, search, insert, and delete data.

(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) 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 proficiency in the use of short-circuit evaluation;

(D) demonstrate proficiency in the use of Boolean algebra, including De Morgan's Law;

(E) develop iterative algorithms using nested loops;

(F) identify, trace, and appropriately use recursion in programming solutions, including algebraic computations;

(G) design, construct, evaluate, and compare search algorithms, including linear searching and binary searching;

(H) identify, describe, design, create, evaluate, and compare standard sorting algorithms, including selection sort, bubble sort, insertion sort, and merge sort;

(I) measure time/space efficiency of various sorting algorithms;

(J) compare and contrast search and sort algorithms, including linear, quadratic, and recursive strategies, for time/space efficiency;

(K) analyze algorithms using "big-O" notation for best, average, and worst-case data patterns;

(L) develop algorithms to solve various problems, including factoring, summing a series, finding the roots of a quadratic equation, and generating Fibonacci numbers;

(M) test program solutions by investigating boundary conditions; testing classes, methods, and libraries in isolation; and performing stepwise refinement;

(N) identify and debug compile, syntax, runtime, and logic errors;

(O) compare and contrast algorithm efficiency 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;

(P) demonstrate the ability to count, convert, and perform mathematical operations in the binary and hexadecimal number systems;

(Q) demonstrate knowledge of the maximum integer boundary, minimum integer boundary, imprecision of real number representations, and round-off errors;

(R) create program solutions to problems using the mathematics library class;

(S) use random algorithms to create simulations that model the real world;

(T) identify, understand, and create class specifications and relationships among classes, including composition and inheritance relationships;

(U) understand and explain object relationships among defined classes, abstract classes, and interfaces;

(V) create object-oriented definitions using class declarations, variable declarations, constant declarations, method declarations, parameter declarations, and interface declarations;

(W) create robust classes that encapsulate data and the methods that operate on that data and incorporate overloading to enrich the object's behavior;

(X) design and implement a set of interactive classes;

(Y) design, create, and evaluate multiclass programs that use abstract classes and interfaces;

(Z) understand and implement a student-created class hierarchy;

(AA) extend, modify, and improve existing code using inheritance;

(BB) create adaptive behaviors, including overloading, using polymorphism;

(CC) understand and use reference variables for object and string data types;

(DD) understand and implement access scope modifiers;

(EE) understand and demonstrate how to compare objects;

(FF) duplicate objects using the appropriate deep and/or shallow copy;

(GG) define and implement abstract classes and interfaces in program problem solutions;

(HH) apply functional decomposition to a program solution;

(II) create simple and robust objects from class definitions through instantiation;

(JJ) apply class membership of variables, constants, and methods;

(KK) examine and mutate the properties of an object using accessors and modifiers;

(LL) understand and implement a composite class; and

(MM) design and implement an interface.

(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 digital rights management.

(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) compare and contrast types of operating systems, software applications, hardware platforms, and programming languages;

(B) demonstrate knowledge of major hardware components, including primary and secondary memory, a central processing unit (CPU), and peripherals;

(C) demonstrate knowledge of major networking components, including hosts, servers, switches, and routers;

(D) demonstrate knowledge of computer communication systems, including single-user, peer-to-peer, workgroup, client-server, and networked;

(E) demonstrate knowledge of computer addressing systems, including Internet Protocol (IP) address and Media Access Control (MAC) address; and

(F) differentiate among the categories of programming languages, including machine, assembly, high-level compiled, high-level interpreted, and scripted.

§130.423. Computer Science III (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Computer Science II, Advanced Placement (AP) Computer Science A, or International Baccalaureate (IB) Computer Science. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 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 and regulations and by practicing integrity and respect. Students will gain an understanding of advanced computer science data structures through the study of technology operations, systems, and concepts. 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) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) Knowledge and skills.

(1) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) apply data abstraction and encapsulation to manage complexity;

(B) implement a student-created class hierarchy;

(C) read and write class specifications using visual organizers, including Unified Modeling Language;

(D) use black box programming methodology;

(E) design, create, and use interfaces to apply protocols;

(F) identify, describe, design, create, evaluate, and compare standard sorting algorithms that perform sorting operations on data structures, including quick sort and heap sort;

(G) select, 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

(H) manage complexity by using a systems approach.

(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) use local area networks (LANs) and wide area networks (WANs), including the Internet and intranets, in research, file management, and collaboration;

(B) create interactive human interfaces to acquire data from a user and display program results using an advanced Graphical User Interface (GUI);

(C) write programs and communicate with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, indentation, and a standardized program style; and

(D) work in software design teams.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) identify and use the structured data type of arrays of objects to traverse, search, modify, insert, and delete data;

(B) identify and use two-dimensional ragged arrays to traverse, search, modify, insert, and delete data;

(C) identify and use a list object data structure, including vector, to traverse, search, insert, and delete object data;

(D) understand and trace a linked-list data structure;

(E) create program solutions using a linked-list data structure, including unordered single, ordered single, double, and circular linked;

(F) understand composite data structures, including a linked list of linked lists;

(G) understand and create program solutions using stacks, queues, trees, heaps, priority queues, graph theory, and enumerated data types;

(H) understand and create program solutions using sets, including HashSet and TreeSet;

(I) understand and create program solutions using maps, including HashMap and TreeMap; and

(J) write and modify text file data.

(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) develop choice algorithms using selection control statements, including break, label, and continue;

(B) demonstrate proficiency in the use of the bitwise operators;

(C) develop iterative algorithms using do-while loops;

(D) demonstrate proficiency in the use of the ternary operator;

(E) create program solutions that use iterators;

(F) identify, trace, and appropriately use recursion;

(G) understand and create program solutions using hashing;

(H) perform pattern recognition using regular expressions;

(I) explore common algorithms, including matrix addition and multiplication, fractals, Towers of Hanoi, and magic square;

(J) create program solutions that exhibit robust behavior by understanding and avoiding runtime errors and handling anticipated errors;

(K) understand object-oriented design concepts of inner classes, outer classes, and anonymous classes;

(L) use object reference scope identifiers, including null, this, and super;

(M) provide object functionality to primitive data types;

(N) write program assumptions in the form of assertions;

(O) write a Boolean expression to test a program assertion; and

(P) construct assertions to make explicit program invariants.

(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; and

(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies.

(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) compare and contrast high-level programming languages;

(B) create a small workgroup network;

(C) create and apply a basic network addressing scheme; and

(D) create discovery programs in a low-level language, high-level language, and scripting language.

§130.424. Digital Forensics (One Credit), Beginning with School Year 2019-2020.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 forensics is an evolving discipline concerned with analyzing anomalous activity on computers, networks, programs, and data. As a discipline, it has grown with the emergence of a globally-connected digital society. As computing has become more sophisticated, so too have the abilities of malicious agents to access systems and private information. By evaluating prior incidents, digital forensics professionals have the ability to investigate and craft appropriate responses to disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 as well as accompanying duties and tasks;

(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 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 historic cases or events regarding digital forensics or cyber;

(D) examine ethical and legal behavior when presented with confidential or sensitive information in various scenarios related to cyber activities;

(E) analyze case studies of computer incidents;

(F) use the findings of a computer incident investigation to reconstruct the 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) maintain data integrity;

(D) examine metadata of a file; and

(E) examine 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;

(E) describe digital forensics tools;

(F) select the proper software tool based on appropriateness, effectiveness, and efficiency for a given digital forensics scenario; and

(G) describe components of applications such as configurations settings, data, supporting files, and user interface.

(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 MAC, 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; and

(B) identify points of weakness and attack vectors such as online spoofing, phishing, and social engineering.

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

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra II. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

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

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.427. Mobile Application Development (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.428. Foundations of Cybersecurity (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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) Cybersecurity is an evolving discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the emergence of a globally-connected society. As computing has become more sophisticated, so too have the abilities of malicious agents looking to penetrate networks and seize private information. By evaluating prior incidents, cybersecurity professionals have the ability to craft appropriate responses to minimize disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 in relation to the field of cybersecurity.

(2) Employability skills. The student identifies various employment opportunities and requirements in the cybersecurity field. The student is expected to:

(A) identify job and internship opportunities as well as accompanying duties and tasks;

(B) research careers in cybersecurity and information assurance along with the 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) research and develop resumes, digital portfolios, or professional profiles in the cybersecurity field.

(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) research local, state, national, and international cyber law such as the PATRIOT Act of 2001, General Data Protection Regulation, and Digital Millennium Copyright Act;

(C) research historic cases or events regarding cyber;

(D) demonstrate an understanding of ethical and legal behavior when presented with various scenarios related to cyber activities;

(E) define and identify techniques such as hacking, phishing, social engineering, online piracy, spoofing, and data vandalism; and

(F) identify and use appropriate methods for citing sources.

(4) Ethics and laws. The student identifies the consequences of ethical versus malicious hacking. The student is expected to:

(A) identify motivations for hacking;

(B) identify and describe the impact of cyberattacks on the global community, society, and individuals;

(C) distinguish between a cyber attacker and a cyber defender;

(D) differentiate types of hackers such as black hats, white hats, and gray hats;

(E) determine possible outcomes and legal ramifications of ethical versus malicious hacking practices; and

(F) debate the varying perspectives of ethical versus malicious hacking.

(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 and counterterrorism;

(D) identify the role of cyber defenders in protecting national interests and corporations;

(E) identify 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 nuclear plants.

(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 prevent, deter, and report cyberbullying.

(7) Cybersecurity skills. The student understands basic cybersecurity concepts and definitions. The student is expected to:

(A) define information security and cyber defense;

(B) identify basic risk management and risk assessment principles related to cybersecurity threats and vulnerabilities;

(C) explain the fundamental concepts of confidentiality, integrity, availability, authentication, and authorization;

(D) describe the inverse relationship between privacy and security;

(E) identify and analyze cybersecurity breaches and incident responses;

(F) identify and analyze security concerns in areas such as physical, network, cloud, and web;

(G) define and discuss challenges faced by cybersecurity professionals;

(H) identify common risks, alerts, and warning signs of compromised computer and network systems;

(I) understand and explore the vulnerability of network-connected devices; and

(J) use appropriate cybersecurity terminology.

(8) 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 Trojans, worms, and viruses;

(C) discuss the impact malware has had on the cybersecurity landscape;

(D) explain the role of reverse engineering for detecting malware and viruses;

(E) compare free and commercial antivirus software alternatives; and

(F) compare free and commercial anti-malware software alternatives.

(9) 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) demonstrate basic use of 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; and

(G) research and understand standard practices for securing computers, networks, and operating systems.

(10) Cybersecurity skills. The student understands basic network operations. The student is expected to:

(A) identify basic network addressing and devices, including switches and routers;

(B) analyze incoming and outgoing rules for traffic passing through a firewall;

(C) identify well known ports by number and service provided, including port 22 (ssh), port 80 (http), and port 443 (https);

(D) identify commonly exploited ports and services, including ports 20 and 21 (ftp) and port 23 (telnet); and

(E) identify common tools for monitoring ports and network traffic.

(11) 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.

(12) Cybersecurity skills. The student demonstrates necessary steps to maintain user access on the computer system. The student is expected to:

(A) identify the 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 accounting;

(C) compare methods for single- and dual-factor authentication such as passwords, biometrics, personal identification numbers (PINs), and security tokens;

(D) define and explain the purpose of an air-gapped computer; and

(E) explain how hashes and checksums may be used to validate the integrity of transferred data.

(13) Cybersecurity skills. The student explores the field of digital forensics. The student is expected to:

(A) explain the importance of digital forensics to law enforcement, government agencies, and corporations;

(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.

(14) 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; and

(C) review simple cryptography methods such as shift cipher and substitution cipher.

(15) Risk assessment. The student understands information security vulnerabilities, threats, and computer attacks. The student is expected to:

(A) define and describe vulnerability, payload, exploit, port scanning, and packet sniffing as they relate to hacking;

(B) define and describe cyberattacks, including man-in-the-middle, distributed denial of service, and spoofing;

(C) explain how computer vulnerabilities leave systems open to cyberattacks;

(D) identify threats to systems such as back-door attacks and insider threats;

(E) differentiate types of social engineering attacks such as phishing, shoulder surfing, hoaxes, and dumpster diving;

(F) explain how users are the most common vehicle for compromising a system at the application level; and

(G) identify various types of application-specific attacks.

(16) Risk assessment. The student understands, identifies, and explains the strategies and techniques of both ethical and malicious hackers. The student is expected to:

(A) identify internal and external threats to computer systems;

(B) identify the capabilities of vulnerability assessment tools, including open source tools; and

(C) explain the concept of penetration testing, tools, and techniques.

(17) Risk assessment. The student evaluates the risks of wireless networks. The student is expected to:

(A) compare risks associated with connecting devices to public and private wireless networks;

(B) explain device vulnerabilities and security solutions on a wireless network;

(C) compare wireless encryption protocols;

(D) debate the broadcasting or hiding of a wireless service set identifier (SSID); and

(E) research and discuss wireless threats such as MAC spoofing and war driving.

(18) Risk assessment. 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 practices;

(C) discuss methods of online spoofing such as web links in email, instant messaging, social media, and other online communication with malicious links;

(D) explain the purpose and function of vulnerability scanners;

(E) explain how coding errors may create system vulnerabilities; and

(F) analyze the risks of distributing insecure programs.

(19) Risk assessment. The student understands the implications of sharing information and access with others. The student is expected to:

(A) describe the impact of granting applications unnecessary permissions;

(B) describe the risks of granting third parties access to personal and proprietary data on social media and systems; and

(C) 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.

§130.429. Cybersecurity Capstone (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 11 and 12. Recommended prerequisite: Foundations of Cybersecurity.

(b) 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 foundations.

(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) Cybersecurity is an evolving discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the emergence of a globally-connected society. As computing has become more sophisticated, so too have the abilities of malicious agents looking to penetrate networks and seize private information. By evaluating prior incidents, cybersecurity professionals have the ability to craft appropriate responses to minimize disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 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) illustrate 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 cyber law such as David's Law and Digital Millennium Copyright Act;

(B) evaluate historic cases or events regarding cyber; and

(C) explore 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), and Gramm-Leach-Bliley Act (GLBA).

(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) identify ethical or unethical behavior when presented with various scenarios related to cyber activities.

(5) Cybersecurity skills. The student explains the importance and process of penetration testing. The student is expected to:

(A) define the phases of penetration testing, including plan, discover, attack, and report;

(B) develop a plan to gain authorization for penetration testing;

(C) identify 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) explain the purpose of hashing algorithms, including blockchain;

(C) explain the function of password salting;

(D) explain and create a digital signature; and

(E) explain steganography.

(7) Cybersecurity skills. The student understands the concept of cyber 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), and intrusion detection prevention systems (IDPS);

(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 the role of software-managed networks, including virtualization;

(C) discuss 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;

(B) explain proper data acquisition;

(C) examine evidence from devices for suspicious activities; and

(D) research current cybercrime cases involving digital forensics.

(10) Cybersecurity skills. The student explores emerging technology. The student is expected to:

(A) describe the integration of artificial intelligence and machine learning in cybersecurity;

(B) investigate impacts made by predictive analytics on cybersecurity; and

(C) research 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) issue 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 analyzes various types of threats, attacks, and vulnerabilities. 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 risk response techniques, including accept, transfer, avoid, and mitigate;

(D) develop a plan of preventative measures to address cyberattacks;

(E) describe common web vulnerabilities such as cross-site scripting, buffer overflow, injection, spoofing, and denial of service;

(F) describe common data destruction and media sanitation practices such as wiping, shredding, and degaussing; and

(G) develop an incident response plan for a given scenario or recent attack.

(14) Risk assessment. The student understands risk management processes and concepts. The student is expected to:

(A) describe 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 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.

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

(a) General requirements. 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.

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

(a) General requirements. 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.

§130.432. International Baccalaureate (IB) Computer Science 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 Computer Science Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.433. International Baccalaureate (IB) Computer Science 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 Computer Science Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.434. International Baccalaureate (IB) Information Technology in a Global 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 Information Technology in a Global Society Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.435. International Baccalaureate (IB) Information Technology in a Global 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 Information Technology in a Global Society Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

Subchapter Q. Energy

§130.485. Oil and Gas Production I (One Credit).

(a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.486. Oil and Gas Production II (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.487. Oil and Gas Production III (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.488. Oil and Gas Production IV (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.489. Introduction to Process Technology (One Credit).

(a) General requirements. This course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.490. Foundations of Energy (One Credit).

(a) General requirements This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of the course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.491. Petrochemical Safety, Health, and Environment (One Credit).

(a) General requirements. The course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

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ATTACHMENT
Text of Proposed Revisions to 19 TAC

Chapter 130. Texas Essential Knowledge and Skills for Career and Technical Education

Subchapter A. Agriculture, Food, and Natural Resources

[~~§130.13. Oil and Gas Production I (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 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 leadership or extracurricular organizations.~~

~~(5) Statements 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) 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 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 understands the history 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.

(4) 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.

(5) 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.]

[§130.14. Oil and Gas Production II (One Credit), Adopted 2015.]

[(a) General requirements. This course 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.

(b) 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 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 leadership or extracurricular organizations.

(5) Statements 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) 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 agriculture, food, and natural resources;

(B) identify careers in agriculture, food, and natural resources 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 in agriculture, food, and natural resources;

(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 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 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 and contrast 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.

(4) 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.

(5) 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.]

Subchapter C. Arts, Audio/Video Technology, and Communications

§130.123. Digital Design and Media Production (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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 techniques, 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.

§130.124. Digital Art and Animation (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.125. 3-D Modeling and Animation (One Credit)

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Art, Level I. This course is recommended for students in Grades 9-12. This course satisfies the high school fine arts graduation requirement.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.126. Digital Communications in the 21st Century (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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, non-profit 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.

§130.127. Web Game Development (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: Web Design. This course is recommended for students in Grades 11 and 12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

Subchapter K. Information Technology

[~~§130.308. Web Technologies (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Information Technology. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 Technologies, students will learn to make informed decisions and apply the decisions to the field of IT. 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 leadership or extracurricular organizations.~~

~~(5) Statements 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) 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) examine the role of certifications, resumes, and portfolios in the web technology profession;~~

~~(D) solve problems and think critically;~~

~~(E) demonstrate leadership skills and function effectively as a team member; and~~

~~(F) 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 interactive 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 portfolio.~~

(3) The student demonstrates knowledge and appropriate use of hardware, software, and connectivity technologies. The student is expected to:

(A) identify networking components and define the impact of networking components on web development;

(B) evaluate the various input, processing, output, and storage devices and storage services;

(C) identify current and future Internet protocols such as hypertext transfer protocol, file transfer protocol, telnet, and email; and

(D) describe new trends in web technology and evaluate their impact on web development.

(4) The student complies with 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) differentiate between copyright and trademarks;

(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) adhere to copyright and trademark intellectual property laws and regulations, including demonstrating correct acquisition and citation of sources;

(F) discuss the process of acquiring rights to use copyrighted and trademarked content in a website;

(G) demonstrate appropriate behavior and adherence to acceptable use policies when accessing and using online resources;

(H) explain the importance of information privacy such as securing credit card information, passwords, and personal information;

(I) describe the function of a non-disclosure agreement; and

(J) discuss website accessibility concerns.

(5) The student evaluates electronic information. The student is expected to:

(A) identify appropriate methods to analyze the design and functionality of web pages;

(B) demonstrate skill in testing the accuracy and validity of information acquired; and

(C) synthesize information from data acquired from online resources.

(6) The student creates and modifies web and digital media designs. The student is expected to:

(A) implement functional design elements such as proximity, repetition, contrast, alignment, color theory, consistency, image file size, and typography;

(B) identify, create, modify, and use common file formats such as text, image, video analog and digital, and audio files;

(C) select, create, modify, and integrate effective digital content such as vector-based and raster graphics, motion graphics, video, and audio;

(D) create web pages using current web standards and web development skills such as version control, documentation, web application security, validation, accessibility, and compatibility across multiple browsers and devices;

(E) demonstrate proper use of folder structure hierarchy; and

(F) use web coding standards to evaluate the design and functionality of web pages such as the World Wide Web Consortium (W3C) guidelines.

(7) The student demonstrates and employs knowledge of Internet programming strategies to develop and maintain web applications. The student is expected to:

(A) explain the importance of Internet programming standards;

(B) differentiate among various web coding standards such as HyperText Markup Language, and cascading style sheets;

(C) use standard applications to develop web applications such as text-based editing programs, word processors, and web authoring software;

(D) compare and contrast the impact of different browsers on web development;

(E) explain client-server applications and describe the process of a client-server transaction;

(F) identify the advantages and disadvantages of client-side processing;

(G) identify security issues related to client-side processing;

(H) use standard scripting languages to produce interactive web applications;

(I) identify characteristics of various scripting languages; and

(J) explain the process to construct secure transaction interfaces from the web server to the customer.

(8) The student employs knowledge of web administration to develop and maintain web applications. The student is expected to:

(A) compare the advantages and disadvantages of running a personal server versus using a server provider;

(B) explain the Transmission Control Protocol/Internet Protocol;

(C) identify hardware and software requirements for web servers;

(D) evaluate server providers;

(E) describe the process of establishing a domain name;

(F) simulate the administration of web servers, including uploading and managing files;

(G) collect and analyze usage statistics;

(H) maintain documentation of the server environment such as specifications, passwords, and software versions;

(I) summarize the process of server backup and restoration of software features;

(J) propose security measures to protect web servers from electronic threats such as unauthorized access and negative intentions; and

(K) evaluate security measures such as using a firewall, Secure Socket Layer (SSL) connections, and Hypertext Transfer Protocol Secure (HTTPS) transactions.

(9) The student evaluates a problem and creates a project management plan for meeting client requirements. The student is expected to:

(A) communicate with clients to analyze requirements to meet the needs of the client and target audience;

(B) document design properties, necessary tools, and resources and identify and address risks;

(C) develop and use a timeline task list such as critical milestones, potential challenges, and interdependencies; and

(D) use various methods to evaluate the progress of the plan and modify as necessary.

~~(10) The student creates and implements a web product using a project management plan. The student is expected to:~~

~~(A) create and simulate the publication of a multipage web product using client required content and web design concepts;~~

~~(B) develop a test plan for a multipage web product for testing usability, effectiveness, reliability, and customer acceptance;~~

~~(C) explain the quality assurance process; and~~

~~(D) develop and implement a quality assurance plan.~~]

[~~§130.309. Computer Programming I (One Credit), Adopted 2015.~~]

[~~(a) General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisites: Principles of Information Technology and Algebra I. Students shall be awarded one credit for successful completion of this course.~~

~~(b) 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 Programming I, students will acquire knowledge of structured programming techniques and concepts appropriate to developing executable programs 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 programming. Students will apply technical skills to address business applications of emerging technologies.~~

~~(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.~~

~~(5) Statements 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) The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected:~~

~~(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) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT;~~

~~(F) demonstrate planning and time management skills such as project management, including initiating, planning, executing, monitoring and controlling, and closing a project; and~~

~~(G) identify job opportunities and accompanying job duties and tasks.~~

~~(2) The student differentiates the concepts of integrity and confidentiality as related to technology in the business environment. The student is expected to:~~

~~(A) define business ethics;~~

~~(B) distinguish between honest and dishonest business practices;~~

~~(C) examine copyright and licensing issues in the software industry; and~~

~~(D) analyze the effects of unethical practices on a business.~~

~~(3) The student identifies and analyzes the client project software needs and requirements. The student is expected to:~~

~~(A) gather data to identify client and project requirements;~~

~~(B) identify input and output requirements;~~

~~(C) identify system processing requirements; and~~

~~(D) develop program requirements and specifications.~~

~~(4) The student develops an IT-based project plan to solve a specific problem. The student is expected to:~~

~~(A) define scope of work to meet client based project needs;~~

~~(B) identify software development processes and issues; and~~

~~(C) explain the software system life cycle approach.~~

~~(5) The student designs a software application plan. The student is expected to:~~

~~(A) articulate the principles of system design such as procedural, object-oriented, and event-driven processes;~~

~~(B) perform a logical design using appropriate software tools;~~

~~(C) apply algorithmic and data structure concepts;~~

~~(D) identify constraints;~~

~~(E) identify modular design concepts; and~~

~~(F) document the design specification using a defined procedure.~~

~~(6) The student solves problems using different types and levels of programming languages and quality assurances. The student is expected to:~~

~~(A) differentiate among the concepts of data such as procedural, object-oriented, and event-driven representation;~~

~~(B) identify current programming languages and the environment in which each is used;~~

~~(C) produce procedural and object-oriented programs using structured coding with appropriate style and clarity of expression;~~

~~(D) demonstrate skill in program testing;~~

~~(E) compare computed results with anticipated results to determine the reasonableness of the solutions;~~

~~(F) troubleshoot technological problems;~~

~~(G) explain the software quality assurance process; and~~

~~(H) follow established quality assurance procedures for testing, identifying problems, and tracking resolutions.~~

~~(7) The student recognizes issues and complies with procedures for maintaining the security of computerized information. The student is expected to:~~

(A) identify risks to information systems facilities, data communications systems, and applications;

(B) comply with federal and state legislation pertaining to computer crime, fraud, and abuse;

(C) identify and select controls for information systems facilities, data communications, and applications appropriate to specific risks; and

(D) apply procedures used to recover from situations such as system failure and computer virus.]

[§130.310. Computer Programming II (One Credit), Adopted 2015.]

[(a) General requirements. This course is recommended for students in Grades 11 and 12. Recommended prerequisites: Principles of Information Technology and Computer Programming I. Students shall be awarded one credit for successful completion of this course.

(b) 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 Programming II, students will expand their knowledge and skills in structured programming techniques and concepts by addressing more complex problems and developing comprehensive programming solutions. Students will analyze the social responsibility of business and industry regarding the significant issues relating to environment, ethics, health, safety, and diversity in society and in the workplace as related to computer programming. Students will apply technical skills to address business applications of emerging technologies.

(4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

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

(A) employ effective reading and writing skills;

(B) employ effective verbal and nonverbal communication skills;

(C) illustrate interview skills for successful job placement;

(D) solve problems and think critically;

(E) demonstrate leadership skills and function effectively as a team member;

(F) identify and implement proper safety procedures;

(G) demonstrate an understanding of legal and ethical responsibilities in relation to the field of IT; and

(H) 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) create a personal career plan along with education, job skills, and experience necessary to achieve career goals; and

(B) develop a resume that includes letters of recommendation appropriate to a chosen career plan.

(3) The student identifies project software needs and requirements. The student is expected to:

(A) identify input and output requirements;

(B) identify system processing requirements;

(C) identify hardware, networking, and software system functional requirements;

(D) conduct a project needs analysis;

(E) define a problem to be solved by a created application;

(F) analyze requirement specifications using current approaches;

(G) identify project constraints; and

(H) use advanced modeling and analysis of functional requirements.

(4) The student produces an IT-based strategy and project plan to solve a provided class problem. The student is expected to:

(A) identify key functions and subsystem capabilities of modern software products;

(B) identify software resources and individual product risks; and

(C) identify software development methodologies.

(5) The student demonstrates knowledge of the software development environment. The student is expected to:

(A) apply prototyping techniques;

(B) use appropriate configuration management tools;

(C) apply language-specific programming techniques;

(D) develop programs using appropriate language;

(E) apply the appropriate development environment for each selected language such as the compiler, debugger, test generator, and analyzer;

(F) use appropriate modeling and analysis tools; and

(G) use appropriate requirement tracking tools.

(6) The student demonstrates knowledge of the software development process. The student is expected to:

(A) articulate the information system life cycle;

(B) identify system analysis issues related to design, testing, implementation, and maintenance;

(C) identify the use of program design tools in a software development process; and

(D) identify current information life cycle models.

(7) The student designs a software application. The student is expected to:

(A) apply principals of system design such as structured, object-oriented, and event-driven processes;

(B) develop a logical design;

(C) document design specifications according to a defined procedure;

(D) design system input, output, processing, and interfaces;

(E) identify the characteristics and uses of data processing such as batch, interactive, event driven, and object oriented;

(F) explain algorithmic and data structure concepts;

(G) identify constraints;

(H) identify modular design concepts;

(I) identify the features, functions, and architectures of client-server computing;

(J) articulate database management concepts;

(K) define the objectives of a client-server application;

(L) design static and dynamic online processing systems; and

(M) employ interface techniques.

(8) The student codes a software application. The student is expected to:

(A) apply programming language concepts;

(B) identify the hardware-software connection;

(C) articulate the concept of data representation;

(D) apply structured, object-oriented, and event-driven programming techniques;

(E) articulate how a programming language can support multitasking and exception handling;

(F) identify how current key programming languages work in different operating system environments;

(G) translate data structures and program design into code in an appropriate language;

(H) demonstrate key constructs and commands specific to a language;

(I) identify current programming languages used in software development;

(J) explain how to resolve program implementation issues such as debugging, documentation, and auditing;

(K) articulate software development issues such as correctness, reliability, and productivity;

(L) explain code analysis issues related to design, testing, implementation, and maintenance;

(M) demonstrate how to design and implement programs in a top-down manner;

(N) demonstrate how to translate algorithmic and modular design into computer code;

(O) explain how programming control structures are used to verify correctness;

(P) compile and debug computer code; and

(Q) prepare appropriate commenting within code.

(9) The student demonstrates knowledge of software testing. The student is expected to:

(A) develop a test plan;

(B) define test procedures;

(C) develop test cases; and

(D) perform software testing.

(10) The student performs quality assurance testing. The student is expected to:

(A) explain the software quality assurance process;

~~(B) apply standard requirements for software quality assurance;~~

~~(C) perform software quality assurance tasks to determine a quality software product; and~~

~~(D) conduct code inspection.~~

~~(11) The student applies procedures for maintaining the security of computerized information. The student is expected to:~~

~~(A) identify risks to information systems facilities, data, communication systems, and applications;~~

~~(B) comply with federal and state legislation pertaining to computer crime, fraud, and abuse;~~

~~(C) identify and select controls for information systems facilities, data communications, and applications appropriate to specific risks; and~~

~~(D) apply procedures used to recover from situations such as system failure and computer virus.~~]

§130.315. Web Communications (One-Half Credit).

(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course is recommended for students in Grade 9.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.316. Web Design (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.317. Independent Study in Technology Applications (One Credit), Beginning with School Year 2012-2013.

(a) 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 may be taken at Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.318. Independent Study in Evolving/Emerging Technologies (One Credit).

(a) 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 may be taken at Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

Subchapter O. Science, Technology, Engineering, and Mathematics

§130.420. Fundamentals of Computer Science (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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) 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 the 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 and regulations 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. 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 leadership or extracurricular organizations.

(5) Statements 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) Creativity and innovation. The student develops products and generates new understanding by extending existing knowledge. 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 and publish interactive stories, games, and animations;

(C) create and publish interactive animations;

(D) create algorithms for the solution of various problems;

(E) create web pages using a mark-up language;

(F) use the Internet to create and publish solutions; and

(G) design creative and effective user interfaces.

(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) seek and respond to advice from peers and professionals in 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, and video.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) construct appropriate electronic search strategies; and

(B) use a variety of resources, including other subject areas, together with various productivity tools to gather authentic data as a basis for individual and group programming projects.

(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 applets into web pages;

(B) find, download, and insert scripting code into web pages to enhance interactivity;

(C) understand binary representation of data in computer systems, perform conversions between decimal and binary number systems, and count in binary number systems;

(D) read and define a problem's description, purpose, and goals;

(E) demonstrate coding proficiency in a contemporary programming language by developing solutions that create stories, games, and animations;

(F) choose, identify, and use the appropriate data type to properly represent data in a problem solution;

(G) demonstrate an understanding of and use variables within a programmed story, game, or animation;

(H) demonstrate proficiency in the use of arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(I) demonstrate an understanding of and use sequence within a programmed story, game, or animation;

(J) demonstrate an understanding of and use conditional statements within a programmed story, game, or animation;

(K) demonstrate an understanding of and use iteration within a programmed story, game, or animation;

(L) create an interactive story, game, or animation;

(M) use random numbers within a programmed story, game, or animation; and

(N) test program solutions by investigating valid and invalid data.

(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/issues and model ethical acquisition of digital information by citing sources using established methods;

(B) demonstrate proper digital etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and on intranets;

(C) investigate measures such as passwords or virus detection/prevention to protect computer systems and databases from unauthorized use and tampering;

(D) understand the safety risks associated with the use of social networking sites;

(E) discuss the impact of computing and computing related advancements on society; and

(F) determine the reliability of information available through electronic media.

(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 knowledge of the basic computer components, including a central processing unit (CPU), storage, and input/output devices;

(B) use operating system tools, including appropriate file management;

(C) demonstrate knowledge and appropriate use of different operating systems;

(D) demonstrate knowledge and understanding of basic network connectivity;

(E) describe, compare, and contrast the differences between an application and an operating system; and

(F) compare, contrast, and appropriately use various input, processing, output, and primary/secondary storage devices.

§140.421. Computer Science I (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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) 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 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 and regulations 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. 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 leadership or extracurricular organizations.

(5) Statements 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) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) participate with electronic communities as a learner, initiator, contributor, and teacher/mentor;

(B) extend the learning environment beyond the school walls with digital products created to increase teaching and learning in the other subject areas; and

(C) participate in relevant, meaningful activities in the larger community and society to create electronic projects.

(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) create and properly display meaningful output;

(B) create interactive console display interfaces, with appropriate user prompts, to acquire data from a user;

(C) use Graphical User Interfaces (GUIs) to create interactive interfaces to acquire data from a user and display program results;

(D) write programs with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, spacing, indentation, and a standardized program style;

(E) improve numeric display by optimizing data visualization;

(F) display simple vector graphics using lines, circles, and rectangles;

(G) display simple bitmap images; and

(H) seek and respond to advice from peers and professionals in evaluating quality and accuracy.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) use a variety of resources, including foundation and enrichment curricula, to gather authentic data as a basis for individual and group programming projects; and

(B) use various productivity tools to gather authentic data as a basis for individual and group programming projects.

(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 to create program solutions;

(B) define and specify the purpose and goals of solving a problem;

(C) identify the 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 and debug errors;

(I) test program solutions with appropriate valid and invalid test data for correctness;

(J) debug and solve problems using error messages, reference materials, language documentation, and effective strategies;

(K) explore common algorithms, including finding greatest common divisor, finding the biggest number out of three, finding primes, making change, and finding the average;

(L) analyze and modify existing code to improve the underlying algorithm;

(M) create program solutions that exhibit robust behavior by understanding, avoiding, and preventing runtime errors, including division by zero and type mismatch;

(N) select the most appropriate algorithm for a defined problem;

(O) demonstrate proficiency in the use of the arithmetic operators to create mathematical expressions, including addition, subtraction, multiplication, real division, integer division, and modulus division;

(P) create program solutions to problems using available mathematics libraries, including absolute value, round, power, square, and square root;

(Q) develop program solutions that use assignment;

(R) develop sequential algorithms to solve non-branching and non-iterative problems;

(S) develop algorithms to decision-making problems using branching control statements;

(T) develop iterative algorithms and code programs to solve practical problems;

(U) demonstrate proficiency in the use of the relational operators;

(V) demonstrate proficiency in the use of the logical operators; and

(W) 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 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, responsible use of software, and knowledge of acceptable use policies;

(D) investigate measures, including passwords and virus detection/prevention, to protect computer systems and databases from unauthorized use and tampering; and

(E) investigate how technology has changed 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) compare and contrast types of operating systems, software applications, and programming languages;

(B) demonstrate knowledge of major hardware components, including primary and secondary memory, a central processing unit (CPU), and peripherals;

(C) differentiate among current programming languages, discuss the use of those languages in other fields of study, and demonstrate knowledge of specific programming terminology and concepts;

(D) differentiate between a high-level compiled language and an interpreted language;

(E) understand concepts of object-oriented design;

(F) use local and global scope access variable declarations;

(G) encapsulate data and associated subroutines into an abstract data type;

(H) create subroutines that do not return values with and without the use of arguments and parameters;

(I) create subroutines that return typed values with and without the use of arguments and parameters;

(J) understand and identify the data-binding process between arguments and parameters;

(K) compare objects using reference values and a comparison routine;

(L) understand the binary representation of numeric and nonnumeric data in computer systems;

(M) understand the finite limits of numeric data;

(N) perform numerical conversions between the decimal and binary number systems and count in the binary number system;

(O) choose, identify, and use the appropriate data types for integer, real, and Boolean data when writing program solutions;

(P) demonstrate an understanding of the concept of a variable;

(Q) demonstrate an understanding of and use reference variables for objects;

(R) demonstrate an understanding of how to represent and manipulate text data, including concatenation and other string functions;

(S) demonstrate an understanding of the concept of scope;

(T) identify and use the structured data type of one-dimensional arrays to traverse, search, and modify data;

(U) choose, identify, and use the appropriate data type and structure to properly represent the data in a program problem solution; and

(V) compare and contrast strongly typed and un-typed programming languages.

§130.422. Computer Science II (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I and either Computer Science I or Fundamentals of Computer Science. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 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 and regulations and by practicing integrity and respect. Students will gain an understanding of computer science through the study of technology operations, systems, and concepts. 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 leadership or extracurricular organizations.

(5) Statements 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) 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) demonstrate the ability to read and modify large programs, including the design description and process development;

(C) follow the systematic problem-solving process of identifying the specifications of purpose and goals, the data types and objects needed, and the subtasks to be performed;

(D) compare and contrast design methodologies and implementation techniques such as top-down, bottom-up, and black box;

(E) analyze, modify, and evaluate existing code by performing a case study on a large program, including inheritance and black box programming;

(F) identify the data types and objects needed to solve a problem;

(G) 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;

(H) use object-oriented programming development methodology, data abstraction, encapsulation with information hiding, and procedural abstraction in program development and testing; and

(I) create, edit, and manipulate bitmap images that are used to enhance user interfaces and program functionality.

(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) use the principles of software engineering to work in software design teams, break a problem statement into specific solution requirements, create a program development plan, code part of a solution from a program development plan while a partner codes the remaining part, team test the solution for correctness, and develop presentations to report the solution findings;

(B) create interactive console display interfaces with appropriate user prompts;

(C) create interactive human interfaces to acquire data from a user and display program results using an advanced Graphical User Interface (GUI);

(D) write programs and communicate with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, indentation, and a standardized program style;

(E) improve data display by optimizing data visualization;

(F) display simple vector graphics to interpret and display program results; and

(G) display simple bitmap images.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) use local area networks (LANs) and wide area networks (WANs), including the Internet and intranets, in research, file management, and collaboration;

(B) understand programming file structure and file access for required resources;

(C) acquire and process information from text files, including files of known and unknown sizes;

(D) manipulate data structures using string processing;

(E) manipulate data values by casting between data types;

(F) identify and use the structured data type of one-dimensional arrays to traverse, search, modify, insert, and delete data;

(G) identify and use the structured data type of two-dimensional arrays to traverse, search, modify, insert, and delete data; and

(H) identify and use a list object data structure to traverse, search, insert, and delete data.

(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) 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 proficiency in the use of short-circuit evaluation;

(D) demonstrate proficiency in the use of Boolean algebra, including De Morgan's Law;

(E) develop iterative algorithms using nested loops;

(F) identify, trace, and appropriately use recursion in programming solutions, including algebraic computations;

(G) design, construct, evaluate, and compare search algorithms, including linear searching and binary searching;

(H) identify, describe, design, create, evaluate, and compare standard sorting algorithms, including selection sort, bubble sort, insertion sort, and merge sort;

(I) measure time/space efficiency of various sorting algorithms;

(J) compare and contrast search and sort algorithms, including linear, quadratic, and recursive strategies, for time/space efficiency;

(K) analyze algorithms using "big-O" notation for best, average, and worst-case data patterns;

(L) develop algorithms to solve various problems, including factoring, summing a series, finding the roots of a quadratic equation, and generating Fibonacci numbers;

(M) test program solutions by investigating boundary conditions; testing classes, methods, and libraries in isolation; and performing stepwise refinement;

(N) identify and debug compile, syntax, runtime, and logic errors;

(O) compare and contrast algorithm efficiency 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;

(P) demonstrate the ability to count, convert, and perform mathematical operations in the binary and hexadecimal number systems;

(Q) demonstrate knowledge of the maximum integer boundary, minimum integer boundary, imprecision of real number representations, and round-off errors;

(R) create program solutions to problems using the mathematics library class;

(S) use random algorithms to create simulations that model the real world;

(T) identify, understand, and create class specifications and relationships among classes, including composition and inheritance relationships;

(U) understand and explain object relationships among defined classes, abstract classes, and interfaces;

(V) create object-oriented definitions using class declarations, variable declarations, constant declarations, method declarations, parameter declarations, and interface declarations;

(W) create robust classes that encapsulate data and the methods that operate on that data and incorporate overloading to enrich the object's behavior;

(X) design and implement a set of interactive classes;

(Y) design, create, and evaluate multiclass programs that use abstract classes and interfaces;

(Z) understand and implement a student-created class hierarchy;

(AA) extend, modify, and improve existing code using inheritance;

(BB) create adaptive behaviors, including overloading, using polymorphism;

(CC) understand and use reference variables for object and string data types;

(DD) understand and implement access scope modifiers;

(EE) understand and demonstrate how to compare objects;

(FF) duplicate objects using the appropriate deep and/or shallow copy;

(GG) define and implement abstract classes and interfaces in program problem solutions;

(HH) apply functional decomposition to a program solution;

(II) create simple and robust objects from class definitions through instantiation;

(JJ) apply class membership of variables, constants, and methods;

(KK) examine and mutate the properties of an object using accessors and modifiers;

(LL) understand and implement a composite class; and

(MM) design and implement an interface.

(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 digital rights management.

(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) compare and contrast types of operating systems, software applications, hardware platforms, and programming languages;

(B) demonstrate knowledge of major hardware components, including primary and secondary memory, a central processing unit (CPU), and peripherals;

(C) demonstrate knowledge of major networking components, including hosts, servers, switches, and routers;

(D) demonstrate knowledge of computer communication systems, including single-user, peer-to-peer, workgroup, client-server, and networked;

(E) demonstrate knowledge of computer addressing systems, including Internet Protocol (IP) address and Media Access Control (MAC) address; and

(F) differentiate among the categories of programming languages, including machine, assembly, high-level compiled, high-level interpreted, and scripted.

§130.423. Computer Science III (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Computer Science II, Advanced Placement (AP) Computer Science A, or International Baccalaureate (IB) Computer Science. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 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 and regulations and by practicing integrity and respect. Students will gain an understanding of advanced computer science data structures through the study of technology operations, systems, and concepts. 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) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(5) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

(c) Knowledge and skills.

(1) Creativity and innovation. The student develops products and generates new understandings by extending existing knowledge. The student is expected to:

(A) apply data abstraction and encapsulation to manage complexity;

(B) implement a student-created class hierarchy;

(C) read and write class specifications using visual organizers, including Unified Modeling Language;

(D) use black box programming methodology;

(E) design, create, and use interfaces to apply protocols;

(F) identify, describe, design, create, evaluate, and compare standard sorting algorithms that perform sorting operations on data structures, including quick sort and heap sort;

(G) select, 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

(H) manage complexity by using a systems approach.

(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) use local area networks (LANs) and wide area networks (WANs), including the Internet and intranets, in research, file management, and collaboration;

(B) create interactive human interfaces to acquire data from a user and display program results using an advanced Graphical User Interface (GUI);

(C) write programs and communicate with proper programming style to enhance the readability and functionality of the code by using meaningful descriptive identifiers, internal comments, white space, indentation, and a standardized program style; and

(D) work in software design teams.

(3) Research and information fluency. The student locates, analyzes, processes, and organizes data. The student is expected to:

(A) identify and use the structured data type of arrays of objects to traverse, search, modify, insert, and delete data;

(B) identify and use two-dimensional ragged arrays to traverse, search, modify, insert, and delete data;

(C) identify and use a list object data structure, including vector, to traverse, search, insert, and delete object data;

(D) understand and trace a linked-list data structure;

(E) create program solutions using a linked-list data structure, including unordered single, ordered single, double, and circular linked;

(F) understand composite data structures, including a linked list of linked lists;

(G) understand and create program solutions using stacks, queues, trees, heaps, priority queues, graph theory, and enumerated data types;

(H) understand and create program solutions using sets, including HashSet and TreeSet;

(I) understand and create program solutions using maps, including HashMap and TreeMap; and

(J) write and modify text file data.

(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) develop choice algorithms using selection control statements, including break, label, and continue;

(B) demonstrate proficiency in the use of the bitwise operators;

(C) develop iterative algorithms using do-while loops;

(D) demonstrate proficiency in the use of the ternary operator;

(E) create program solutions that use iterators;

(F) identify, trace, and appropriately use recursion;

(G) understand and create program solutions using hashing;

(H) perform pattern recognition using regular expressions;

(I) explore common algorithms, including matrix addition and multiplication, fractals, Towers of Hanoi, and magic square;

(J) create program solutions that exhibit robust behavior by understanding and avoiding runtime errors and handling anticipated errors;

(K) understand object-oriented design concepts of inner classes, outer classes, and anonymous classes;

(L) use object reference scope identifiers, including null, this, and super;

(M) provide object functionality to primitive data types;

(N) write program assumptions in the form of assertions;

(O) write a Boolean expression to test a program assertion; and

(P) construct assertions to make explicit program invariants.

(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; and

(B) demonstrate proper digital etiquette, responsible use of software, and knowledge of acceptable use policies.

(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) compare and contrast high-level programming languages;

(B) create a small workgroup network;

(C) create and apply a basic network addressing scheme; and

(D) create discovery programs in a low-level language, high-level language, and scripting language.

§130.424. Digital Forensics (One Credit), Beginning with School Year 2019-2020.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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 forensics is an evolving discipline concerned with analyzing anomalous activity on computers, networks, programs, and data. As a discipline, it has grown with the emergence of a globally-connected digital society. As computing has become more sophisticated, so too have the abilities of malicious agents to access systems and private information. By evaluating prior incidents, digital forensics professionals have the ability to investigate and craft appropriate responses to disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 as well as accompanying duties and tasks;

(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 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 historic cases or events regarding digital forensics or cyber;

(D) examine ethical and legal behavior when presented with confidential or sensitive information in various scenarios related to cyber activities;

(E) analyze case studies of computer incidents;

(F) use the findings of a computer incident investigation to reconstruct the 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) maintain data integrity;

(D) examine metadata of a file; and

(E) examine 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;

(E) describe digital forensics tools;

(F) select the proper software tool based on appropriateness, effectiveness, and efficiency for a given digital forensics scenario; and

(G) describe components of applications such as configurations settings, data, supporting files, and user interface.

(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 MAC, 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; and

(B) identify points of weakness and attack vectors such as online spoofing, phishing, and social engineering.

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

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra II. This course is recommended for students in Grades 11 and 12.

(b) 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) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

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

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.427. Mobile Application Development (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisite: Algebra I. This course is recommended for students in Grades 9-12.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.428. Foundations of Cybersecurity (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 9-12.

(b) 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) Cybersecurity is an evolving discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the emergence of a globally-connected society. As computing has become more sophisticated, so too have the abilities of malicious agents looking to penetrate networks and seize private information. By evaluating prior incidents, cybersecurity professionals have the ability to craft appropriate responses to minimize disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 in relation to the field of cybersecurity.

(2) Employability skills. The student identifies various employment opportunities and requirements in the cybersecurity field. The student is expected to:

(A) identify job and internship opportunities as well as accompanying duties and tasks;

(B) research careers in cybersecurity and information assurance along with the 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) research and develop resumes, digital portfolios, or professional profiles in the cybersecurity field.

(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) research local, state, national, and international cyber law such as the PATRIOT Act of 2001, General Data Protection Regulation, and Digital Millennium Copyright Act;

(C) research historic cases or events regarding cyber;

(D) demonstrate an understanding of ethical and legal behavior when presented with various scenarios related to cyber activities;

(E) define and identify techniques such as hacking, phishing, social engineering, online piracy, spoofing, and data vandalism; and

(F) identify and use appropriate methods for citing sources.

(4) Ethics and laws. The student identifies the consequences of ethical versus malicious hacking. The student is expected to:

(A) identify motivations for hacking;

(B) identify and describe the impact of cyberattacks on the global community, society, and individuals;

(C) distinguish between a cyber attacker and a cyber defender;

(D) differentiate types of hackers such as black hats, white hats, and gray hats;

(E) determine possible outcomes and legal ramifications of ethical versus malicious hacking practices; and

(F) debate the varying perspectives of ethical versus malicious hacking.

(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 and counterterrorism;

(D) identify the role of cyber defenders in protecting national interests and corporations;

(E) identify 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 nuclear plants.

(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 prevent, deter, and report cyberbullying.

(7) Cybersecurity skills. The student understands basic cybersecurity concepts and definitions. The student is expected to:

(A) define information security and cyber defense;

(B) identify basic risk management and risk assessment principles related to cybersecurity threats and vulnerabilities;

(C) explain the fundamental concepts of confidentiality, integrity, availability, authentication, and authorization;

(D) describe the inverse relationship between privacy and security;

(E) identify and analyze cybersecurity breaches and incident responses;

(F) identify and analyze security concerns in areas such as physical, network, cloud, and web;

(G) define and discuss challenges faced by cybersecurity professionals;

(H) identify common risks, alerts, and warning signs of compromised computer and network systems;

(I) understand and explore the vulnerability of network-connected devices; and

(J) use appropriate cybersecurity terminology.

(8) 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 Trojans, worms, and viruses;

(C) discuss the impact malware has had on the cybersecurity landscape;

(D) explain the role of reverse engineering for detecting malware and viruses;

(E) compare free and commercial antivirus software alternatives; and

(F) compare free and commercial anti-malware software alternatives.

(9) 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) demonstrate basic use of 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; and

(G) research and understand standard practices for securing computers, networks, and operating systems.

(10) Cybersecurity skills. The student understands basic network operations. The student is expected to:

(A) identify basic network addressing and devices, including switches and routers;

(B) analyze incoming and outgoing rules for traffic passing through a firewall;

(C) identify well known ports by number and service provided, including port 22 (ssh), port 80 (http), and port 443 (https);

(D) identify commonly exploited ports and services, including ports 20 and 21 (ftp) and port 23 (telnet); and

(E) identify common tools for monitoring ports and network traffic.

(11) 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.

(12) Cybersecurity skills. The student demonstrates necessary steps to maintain user access on the computer system. The student is expected to:

(A) identify the 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 accounting;

(C) compare methods for single- and dual-factor authentication such as passwords, biometrics, personal identification numbers (PINs), and security tokens;

(D) define and explain the purpose of an air-gapped computer; and

(E) explain how hashes and checksums may be used to validate the integrity of transferred data.

(13) Cybersecurity skills. The student explores the field of digital forensics. The student is expected to:

(A) explain the importance of digital forensics to law enforcement, government agencies, and corporations;

(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.

(14) 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; and

(C) review simple cryptography methods such as shift cipher and substitution cipher.

(15) Risk assessment. The student understands information security vulnerabilities, threats, and computer attacks. The student is expected to:

(A) define and describe vulnerability, payload, exploit, port scanning, and packet sniffing as they relate to hacking;

(B) define and describe cyberattacks, including man-in-the-middle, distributed denial of service, and spoofing;

(C) explain how computer vulnerabilities leave systems open to cyberattacks;

(D) identify threats to systems such as back-door attacks and insider threats;

(E) differentiate types of social engineering attacks such as phishing, shoulder surfing, hoaxes, and dumpster diving;

(F) explain how users are the most common vehicle for compromising a system at the application level; and

(G) identify various types of application-specific attacks.

(16) Risk assessment. The student understands, identifies, and explains the strategies and techniques of both ethical and malicious hackers. The student is expected to:

(A) identify internal and external threats to computer systems;

(B) identify the capabilities of vulnerability assessment tools, including open source tools; and

(C) explain the concept of penetration testing, tools, and techniques.

(17) Risk assessment. The student evaluates the risks of wireless networks. The student is expected to:

(A) compare risks associated with connecting devices to public and private wireless networks;

(B) explain device vulnerabilities and security solutions on a wireless network;

(C) compare wireless encryption protocols;

(D) debate the broadcasting or hiding of a wireless service set identifier (SSID); and

(E) research and discuss wireless threats such as MAC spoofing and war driving.

(18) Risk assessment. 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 practices;

(C) discuss methods of online spoofing such as web links in email, instant messaging, social media, and other online communication with malicious links;

(D) explain the purpose and function of vulnerability scanners;

(E) explain how coding errors may create system vulnerabilities; and

(F) analyze the risks of distributing insecure programs.

(19) Risk assessment. The student understands the implications of sharing information and access with others. The student is expected to:

(A) describe the impact of granting applications unnecessary permissions;

(B) describe the risks of granting third parties access to personal and proprietary data on social media and systems; and

(C) 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.

§130.429. Cybersecurity Capstone (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 11 and 12. Recommended prerequisite: Foundations of Cybersecurity.

(b) 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 foundations.

(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) Cybersecurity is an evolving discipline concerned with safeguarding computers, networks, programs, and data from unauthorized access. As a field, it has gained prominence with the emergence of a globally-connected society. As computing has become more sophisticated, so too have the abilities of malicious agents looking to penetrate networks and seize private information. By evaluating prior incidents, cybersecurity professionals have the ability to craft appropriate responses to minimize disruptions to corporations, governments, 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 leadership or extracurricular organizations.

(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.

(c) 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 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) illustrate 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 cyber law such as David's Law and Digital Millennium Copyright Act;

(B) evaluate historic cases or events regarding cyber; and

(C) explore 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), and Gramm-Leach-Bliley Act (GLBA).

(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) identify ethical or unethical behavior when presented with various scenarios related to cyber activities.

(5) Cybersecurity skills. The student explains the importance and process of penetration testing. The student is expected to:

(A) define the phases of penetration testing, including plan, discover, attack, and report;

(B) develop a plan to gain authorization for penetration testing;

(C) identify 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) explain the purpose of hashing algorithms, including blockchain;

(C) explain the function of password salting;

(D) explain and create a digital signature; and

(E) explain steganography.

(7) Cybersecurity skills. The student understands the concept of cyber 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), and intrusion detection prevention systems (IDPS);

(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 the role of software-managed networks, including virtualization;

(C) discuss 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;

(B) explain proper data acquisition;

(C) examine evidence from devices for suspicious activities; and

(D) research current cybercrime cases involving digital forensics.

(10) Cybersecurity skills. The student explores emerging technology. The student is expected to:

(A) describe the integration of artificial intelligence and machine learning in cybersecurity;

(B) investigate impacts made by predictive analytics on cybersecurity; and

(C) research 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) issue 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 analyzes various types of threats, attacks, and vulnerabilities. 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 risk response techniques, including accept, transfer, avoid, and mitigate;

(D) develop a plan of preventative measures to address cyberattacks;

(E) describe common web vulnerabilities such as cross-site scripting, buffer overflow, injection, spoofing, and denial of service;

(F) describe common data destruction and media sanitation practices such as wiping, shredding, and degaussing; and

(G) develop an incident response plan for a given scenario or recent attack.

(14) Risk assessment. The student understands risk management processes and concepts. The student is expected to:

(A) describe 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 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.

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

(a) General requirements. 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.

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

(a) General requirements. 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.

§130.432. International Baccalaureate (IB) Computer Science 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 Computer Science Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.433. International Baccalaureate (IB) Computer Science 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 Computer Science Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.434. International Baccalaureate (IB) Information Technology in a Global 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 Information Technology in a Global Society Standard Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§130.435. International Baccalaureate (IB) Information Technology in a Global 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 Information Technology in a Global Society Higher Level are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

Subchapter Q. Energy

§130.485. Oil and Gas Production I (One Credit).

(a) General requirements. This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.486. Oil and Gas Production II (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.487. Oil and Gas Production III (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.488. Oil and Gas Production IV (One Credit).

(a) General requirements. This course 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.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.489. Introduction to Process Technology (One Credit).

(a) General requirements. This course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.490. Foundations of Energy (One Credit).

(a) General requirements This course is recommended for students in Grades 9-12. Students shall be awarded one credit for successful completion of the course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

§130.491. Petrochemical Safety, Health, and Environment (One Credit).

(a) General requirements. The course is recommended for students in Grades 11 and 12. Students shall be awarded one credit for successful completion of this course.

(b) 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 leadership or extracurricular organizations.

(5) Statements 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) 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.

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ATTACHMENT
Text of Proposed Revisions to 19 TAC

Chapter 113. Texas Essential Knowledge and Skills for Social Studies

Subchapter C. High School

§113.30. Implementation of Texas Essential Knowledge and Skills for Social Studies, High School [~~, Adopted 2018~~] .

(a) Implementation of the provisions of this subchapter begins with the effective date of the provision unless otherwise noted.

(b) [~~(a)~~] Implementation of the [~~The~~] provisions of [~~§113.31 and §§113.41-113.44 of~~] this subchapter adopted in 2018 begins [~~shall be implemented by school districts beginning~~] with the 2019-2020 school year.

[~~(b) The provisions of §§113.45-113.48 of this subchapter shall be implemented by school districts beginning with the 2011-2012 school year.~~]

§113.51. Ethnic Studies: African American Studies (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grades 10-12.

(b) Introduction.

(1) In Ethnic Studies: African American Studies, an elective course, students learn about the history and cultural contributions of African Americans. This course is designed to assist students in understanding issues and events from multiple perspectives. This course develops an understanding of the historical roots of African American culture, especially as it pertains to social, economic, and political interactions within the broader context of United States history. It requires an analysis of important ideas, social and cultural values, beliefs, and traditions. Knowledge of past achievements provides citizens of the 21st century with a broader context within which to address the many issues facing the United States.

(2) To support the teaching of the essential knowledge and skills, the use of a variety of rich primary and secondary source material such as biographies, autobiographies, landmark cases of the U.S. Supreme Court, novels, speeches, letters, diaries, poetry, songs, and artwork is encouraged. Resources are available from museums, historical sites, presidential libraries, and local and state preservation societies.

(3) The eight strands of the essential knowledge and skills for social studies are intended to be integrated for instructional purposes. Skills listed in the social studies skills strand in subsection (c) of this section should be incorporated into the teaching of all essential knowledge and skills for social studies. A greater depth of understanding of complex content material can be attained when integrated social studies content from the various disciplines and critical-thinking skills are taught together.

(4) Students identify the role of the U.S. free enterprise system within the parameters of this course and understand that this system may also be referenced as capitalism or the free market system.

(5) Throughout social studies in Kindergarten-Grade 12, students build a foundation in history; geography; economics; government; citizenship; culture; science, technology, and society; and social studies skills. The content, as appropriate for the grade level or course, enables students to understand the importance of patriotism, function in a free enterprise society, and appreciate the basic democratic values of our state and nation as referenced in the Texas Education Code (TEC), §28.002(h).

(6) Students understand that a constitutional republic is a representative form of government whose representatives derive their authority from the consent of the governed, serve for an established tenure, and are sworn to uphold the constitution.

(7) State and federal laws mandate a variety of celebrations and observances, including Celebrate Freedom Week.

(A) Each social studies class shall include, during Celebrate Freedom Week as provided under the TEC, §29.907, or during another full school week as determined by the board of trustees of a school district, appropriate instruction concerning the intent, meaning, and importance of the Declaration of Independence and the U.S. Constitution, including the Bill of Rights, in their historical contexts. The study of the Declaration of Independence must include the study of the relationship of the ideas expressed in that document to subsequent American history, including the relationship of its ideas to the rich diversity of our people as a nation of immigrants, the American Revolution, the formulation of the U.S. Constitution, and the abolitionist movement, which led to the Emancipation Proclamation and the women's suffrage movement.

(B) Each school district shall require that, during Celebrate Freedom Week or other week of instruction prescribed under subparagraph (A) of this paragraph, students in Grades 3-12 study and recite the following text: "We hold these Truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the Pursuit of Happiness--That to secure these Rights, Governments are instituted among Men, deriving their just Powers from the Consent of the Governed."

(8) Students identify and discuss how the actions of U.S. citizens and the local, state, and federal governments have either met or failed to meet the ideals espoused in the founding documents.

(9) Statements 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) History. The student understands the influential historical points of reference in African history prior to 1619. The student is expected to:

(A) identify the major eras, civilizations, and contributions of African history that are foundational to humanity and predate American slavery;

(B) describe and compare the various pre-colonial, indigenous, and ancestral roots of African Americans such as educational systems, social and political developments, family structures, global trade, and exchange; and

(C) analyze the effects of dehumanization through the capture, trade, and enslavement of Africans, within a regional and global context, including the Atlantic Slave Trade.

(2) History. The student understands the economic, political, and social development of slavery during the American colonial period, 1619 to 1775. The student is expected to:

(A) analyze the economic, political, and social reasons for the African diaspora, including the role of Africans and Europeans;

(B) compare and contrast the colonization of North, Central, and South America and the West Indies and neighboring islands and analyze the interactions among enslaved Africans and Native Americans;

(C) describe and explain the impact of the Middle Passage on African American culture; and

(D) explain the causes for the growth and development of slavery, primarily in the Southern colonies.

(3) History. The student understands the rationalization and ramifications for the continuation and growth of slavery and the anti-slavery movement in the United States from independence (1776) through the Emancipation Proclamation (1863). The student is expected to:

(A) analyze and evaluate the economic, social, religious, and legal rationalization used by Americans to continue and expand slavery after declaring independence from Great Britain;

(B) describe the impact of the Three-Fifths Compromise and the Fugitive Slave Act;

(C) analyze the role that slavery played in the development of nationalism and sectionalism during the early 19th century;

(D) analyze and evaluate various forms of individual and group resistance against the enslavement of African Americans;

(E) analyze the influence of significant individuals and groups prior to and during the abolitionist movement to determine their impact on ending slavery, including the work of David Walker, Elijah P. Lovejoy, John Brown, Sojourner Truth, Frederick Douglass, the American Anti-Slavery Society, and the Underground Railroad; and

(F) analyze national and international abolition efforts, including the U.S. ban on the slave trade (1808) and the abolition of slavery in Mexico (1829) and Great Britain (1833) and the significance of the Guerrero Decree in the Texas Revolution.

(4) History. The student understands African American life from the Civil War through World War I. The student is expected to:

(A) summarize the roles and experiences of African American soldiers and spies in both the North and South during the Civil War;

(B) describe and analyze the successes and failures of Reconstruction;

(C) compare the opportunities and challenges faced by African Americans from post-Reconstruction to the early 20th century and viewpoints and actions of African Americans, including Ida B. Wells, W.E.B. Du Bois, Booker T. Washington, Marcus Garvey, the National Association for the Advancement of Colored People (NAACP), Freedmen's Towns, and the Exodusters;

(D) explain the circumstances surrounding increased violence and extremism such as the Ku Klux Klan (KKK), the Colfax Massacre, lynchings, race riots, and the Camp Logan Mutiny (The Houston Riot of 1917);

(E) analyze how the rise of Jim Crow laws affected the life experiences of African Americans in the late 19th and early 20th centuries;

(F) describe the impact of the U.S. Supreme Court decision Plessy v. Ferguson (1896);

(G) analyze the social, economic, and political actions of African Americans in response to the Jim Crow era during the early 20th century such as the Great Migration, civil rights organizations, social organizations, political organizations, and organized labor unions;

(H) examine the experiences of African American soldiers during and after World War I; and

(I) evaluate the impact of African American military service from Reconstruction through World War I, including the role of the Buffalo Soldiers.

(5) History. The student understands change and continuity in the African American cultural identity during the Great Depression, World War II, and the Civil Rights Movement. The student is expected to:

(A) compare the positive and negative effects of the Great Depression and New Deal on the social and economic status of African Americans in various geographic regions;

(B) describe the continued struggle for civil rights in America during this time in history, including the notable works of the NAACP, National Urban League, Jackie Robinson, Martin Luther King Jr., Daisy Bates and the Little Rock Nine, and local leaders;

(C) describe the interactions of the people of the diaspora relative to the struggle for civil rights;

(D) describe the impact of racism during World War II;

(E) explain the contributions of significant African American individuals and groups during World War II, including Doris "Dorie" Miller, the Tuskegee Airmen, and the 761st Tank Battalion;

(F) analyze how the effects of World War II laid the groundwork for the Civil Rights Movement, including Harry S. Truman's Executive Order 9981 and the contributions of A. Phillip Randolph, Mary McLeod Bethune, and Thurgood Marshall;

(G) analyze the successes and failures of the Civil Rights Movement, including methods such as sit-ins, boycotts, marches, speeches, music, and organizations; and

(H) evaluate the extent to which the Civil Rights Movement transformed American politics and society.

(6) History. The student understands the progress made and challenges faced by African Americans from the post-Civil Rights Era to contemporary times. The student is expected to:

(A) identify and explain the issues confronting African Americans in the continuing quest for equality;

(B) describe the major contributions of contemporary African Americans and how their contributions have shaped the American experience such as John H. Johnson, Muhammad Ali, Shirley Chisholm, Earl G. Graves, Barbara Jordan, Colin Powell, Condoleezza Rice, and Barack Obama; and

(C) analyze the progress and challenges for African American men and women socially, economically, and politically from 1970 to the present such as the evolving role of education in the African American community.

(7) Geography. The student understands the impact of geographic factors on major events related to African Americans over time. The student is expected to:

(A) explain the causes and effects of forced and voluntary migration on individuals, groups, and societies throughout African American history;

(B) compare and contrast the physical and human geographic factors in the North and South related to the Atlantic Slave Trade, the plantation system, the expansion of slavery, and the Industrial Revolution;

(C) explain the westward movement and the Great Migration and summarize their impact on African Americans; and

(D) analyze how environmental changes impacted African American communities such as land use, settlement patterns, and urban development.

(8) Economics. The student understands ways in which African Americans have addressed opportunities, challenges, and strategies concerning economic well-being over time. The student is expected to:

(A) describe the development of the plantation system and slave labor in the American colonies;

(B) identify the groups that participated in the transatlantic triangular trade system and explain how the system worked;

(C) analyze the effects of the Industrial Revolution and the cotton gin on the economies of the United States and the world;

(D) explain how economic policies such as sharecropping, Jim Crow economics, and redlining impacted the standard of living of African Americans;

(E) explain how unsatisfactory economic opportunities in the South and increased economic opportunities in cities of the North and West caused the Great Migration;

(F) evaluate the economic impact of the American labor movement and unionism on African Americans from the late nineteenth century to today;

(G) analyze how various geographic, cultural, social, political, and financial factors influenced the economic mobility of African Americans such as skin color, wealth, and educational background;

(H) evaluate the effectiveness of various approaches African Americans have used to solve economic issues;

(I) trace the rise and development African American businesses and entrepreneurship from the late 19th century to today; and

(J) examine the contributions of African American and Black American Business entrepreneurship such as Black Wall Street, black inventors, and the black experience in business and the economic contributions of individuals such as Madame C. J. Walker and Fannie Lou Hamer.

(9) Government. The student understands the significant impact of political decisions on African Americans throughout history. The student is expected to:

(A) compare the effects of revolutionary ideologies such as life, liberty, and the pursuit of happiness on political perspectives of African Americans;

(B) explain the regional perspectives toward political rights of African American men and women from the early years of the republic through 1877;

(C) analyze the construction, interpretation, and implementation of the 13th, 14th, and 15th Amendments to the U.S. Constitution and the effects on African American men and women between 1877 and 1920;

(D) analyze how government policies, court actions, and legislation impacted African Americans from the 1920s through the 1950s;

(E) analyze the causes and effects of government actions and legislation addressing racial and social injustices from 1960 to the present day such as the issues of voting rights, civil rights, fair housing, education, employment, affirmative action, and health and nutrition; and

(F) analyze how the changing political environment has impacted civil rights from the late 20th century to the present.

(10) Government. The student understands the impact of political interactions on the African American struggle for human rights over time. The student is expected to:

(A) analyze examples of conflict and cooperation between African Americans and other groups in the pursuit of individual freedoms and civil rights such as the Freedom Riders and the Memphis Sanitation Workers Strike;

(B) explain how various philosophies and ideologies influenced the African American experience for social, political, and legal equality such as fair housing, equal opportunity, affirmative action, and voting rights; and

(C) identify and analyze the contributions of African American leadership roles at local, state, and national levels of government, including U.S. Supreme Court cases.

(11) Citizenship. The student understands the importance of multiple and changing points of view regarding citizenship of African Americans. The student is expected to:

(A) trace how perceptions of the rights and civic responsibilities of African Americans have changed over time, including the idea of being considered property with no rights under slavery;

(B) analyze how regional differences influenced political perspectives of African American communities;

(C) analyze the significance and associations of identity nomenclature relevant to African Americans such as Negro and Black; and

(D) analyze selected contemporary African American issues that have led to diverse points of view in public discourse, including rights and activism.

(12) Culture. The student understands the development of African American culture and society and the impact of shared identities and differing experiences. The student is expected to:

(A) analyze the impact of assimilation, stereotypes, de facto practices, and oppression on the lives of African Americans;

(B) analyze ways in which African Americans have retained cultural identity over time while adapting to and contributing to mainstream American culture; and

(C) analyze the various cultural practices that have shaped the individual and collective identity of African Americans over time to understand shared and differing experiences.

(13) Culture. The student understands the cultural traditions and contributions of African Americans from the colonial era through Reconstruction. The student is expected to:

(A) identify and describe the influence of African oral traditions, visual art, literary art, theater, music, and dance on African American culture;

(B) describe the influence of enslavement on African American culture;

(C) identify the contributions of early African American literature, including the works of Jupiter Hammon and Phillis Wheatley;

(D) explain the origins and characteristics of different musical genres and traditions of African Americans; and

(E) describe the expanding influence of African American music through the work of performers such as the Fisk Jubilee Singers.

(14) Culture. The student understands the influence of artistic expression on the African American experience and American culture from Reconstruction to the present. The student is expected to:

(A) describe the development of blues, ragtime, and jazz music, including the achievements of composers such as Scott Joplin and James Reese Europe;

(B) describe how various African American expressions of dance forms such as tap dance, step dance, hip hop, and modern dance and the contributions of African American dancers such as the Dance Theater of Harlem, Katherine Dunham, Bill "Bojangles" Robinson, Alvin Ailey, and Misty Copeland have contributed to the shared identity of various groups;

(C) explain the lasting impact of the Harlem Renaissance on American culture and society, including the achievements of individuals such as Louis Armstrong, Josephine Baker, Duke Ellington, Langston Hughes, Sargent Johnson, Jules Bledsoe, Paul Robeson, Augusta Savage, and James VanDerZee;

(D) describe the reactions to and the influence of selected works by African American authors such as The Souls of Black Folk by W.E.B. Du Bois, Native Son by Richard Wright, Their Eyes Were Watching God by Zora Neale Hurston, and Eyes on the Prize by Henry Hampton;

(E) describe storytelling, literary, filmmaking, and visual arts contributions related to self-identity made by African Americans such as Oscar Micheaux, John T. Biggers, Lorraine Hansberry, Amiri Baraka, Sidney Poitier, Maya Angelou, Faith Ringgold, August Wilson, bell hooks, Spike Lee, John Singleton, and Oprah Winfrey;

(F) describe how characteristics of African American history and culture have been reflected in various genres of art, music, film, theatre, visual arts, and dance; and

(G) analyze the impact of popular culture on African Americans during significant eras.

(15) Science, technology, and society. The student understands how African American achievements in science and technology have contributed to economic and social development in the United States. The student is expected to:

(A) identify examples of how advances made by African civilizations in areas such as astronomy, mathematics, architecture, and engineering have contributed to science and technology in the United States;

(B) identify examples of how industrialization was influenced by African Americans over time; and

(C) describe the contributions of significant African American individuals to science, philosophy, mathematics, and technology, including Benjamin Banneker, George Washington Carver, Granville Woods, Mary Jackson, Katherine Johnson, Henrietta Lacks, Dorothy Vaughan, Mae Jemison, and Neil deGrasse Tyson.

(16) Social studies skills. The student understands how historians use historiography to interpret the past and applies critical-thinking skills to organize and use information acquired from a variety of valid sources, including technology. The student is expected to:

(A) analyze primary and secondary sources such as maps, graphs, speeches, political cartoons, and artifacts to acquire information to answer historical questions;

(B) analyze information by applying absolute and relative chronology through sequencing, categorizing, identifying cause-and-effect relationships, comparing and contrasting, finding the main idea, summarizing, making generalizations, making predictions, drawing inferences, and drawing conclusions;

(C) apply the process of historical inquiry to research, interpret, and use multiple types of sources of evidence;

(D) evaluate the validity of a source based on corroboration with other sources and information about the author, including points of view, frames of reference, and historical context; and

(E) identify bias and support with historical evidence a point of view on a social studies issue or event.

(17) Social studies skills. The student communicates in written, oral, and visual forms. The student is expected to:

(A) create written, oral, and visual presentations of social studies information using effective communication skills, including proper citations and avoiding plagiarism; and

(B) use social studies terminology correctly.

(18) Social studies skills. The student uses geographic tools to collect, analyze, and interpret data. The student is expected to:

(A) create a visual representation of historical information such as thematic maps, graphs, and charts; and

(B) pose and answer questions about geographic distributions and patterns shown on maps, graphs, charts, and available databases.

(19) Social studies skills. The student uses problem-solving and decision-making skills, working independently and with others. The student is expected to use problem-solving and decision-making processes to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution.

§113.60. Social Studies Advanced Studies (One-Half Credit).

(a) General requirements. Students shall be awarded one-half unit of credit for successful completion of this course. Students may take this course with different course content for a maximum of two credits.

(b) Introduction. In Social Studies Advanced Studies, an elective course, students conduct in-depth research, prepare a product of professional quality, and present their findings to appropriate audiences. Students, working independently or in collaboration with a mentor, investigate a problem, issue, or concern; research the topic using a variety of technologies; and present a product of professional quality to an appropriate audience.

(c) Knowledge and skills.

(1) The student will investigate, independently or collaboratively, a problem, issue, or concern within a selected profession or discipline. The student is expected to:

(A) analyze the relationship between his or her interests and career/discipline;

(B) review literature from varied sources from the selected career or discipline;

(C) identify a problem, issue, or concern;

(D) survey and/or interview professionals to determine the appropriateness of a project; and

(E) develop a proposal that includes well-defined questions, goals and objectives, rationale, and procedures for the project.

(2) The student will demonstrate understanding of the research methods and/or technologies used in a selected profession or discipline. The student is expected to:

(A) develop an understanding of the requirements and practices of the profession in the selected career or discipline through observation;

(B) simulate the methods and/or technologies used in the research process particular to the selected field or discipline; and

(C) review and revise the original proposal to reflect changes needed based upon preliminary research and practices.

(3) The student will develop products that meet standards recognized by the selected profession or discipline. The student is expected to:

(A) collaborate with the appropriate professionals to define the product;

(B) develop a plan for product completion;

(C) develop assessment criteria for successful completion of the project;

(D) establish the appropriateness of the product for the intended audience;

(E) implement the plan for product completion; and

(F) maintain a journal to document all phases of the implementation of the plan and reflections on learning experiences and processes.

(4) The student will demonstrate an understanding of the selected problem, issue, or concern by explaining or justifying findings to an appropriate audience for public comment or professional response. The student is expected to:

(A) review and revise the plan to present the findings;

(B) make arrangements for the presentation of findings to an appropriate audience;

(C) present findings, simulating the skills used by professionals;

(D) consider feedback received from the audience;

(E) reflect on the study and its potential for impact on the field; and

(F) reflect on personal learning experiences of the study.

§113.61. Economics Advanced Studies (One-Half Credit).

(a) General requirements. Students may take this course with different course content for a maximum of one credit. Students who are pursuing the Distinguished Achievement Program may take Economics Advanced Studies to earn state credit for developing, researching, and presenting their mentorship or independent study advanced measure.

(b) Introduction. In Economics Advanced Studies, an elective course, students conduct in-depth research, prepare a product of professional quality, and present their findings to appropriate audiences. Students, working independently or in collaboration with a mentor, investigate a problem, issue, or concern; research the topic using a variety of technologies; and present a product of professional quality to an appropriate audience.

(c) Knowledge and skills.

(1) The student will investigate, independently or collaboratively, a problem, issue, or concern within a selected profession or discipline. The student is expected to:

(A) analyze the relationship between his or her interests and career/discipline;

(B) review literature from varied sources from the selected career or discipline;

(C) identify a problem, issue, or concern;

(D) survey and/or interview professionals to determine the appropriateness of a project; and

(E) develop a proposal that includes well-defined questions, goals and objectives, rationale, and procedures for the project.

(2) The student will demonstrate understanding of the research methods and/or technologies used in a selected profession or discipline. The student is expected to:

(A) develop an understanding of the requirements and practices of the profession in the selected career or discipline through observation;

(B) simulate the methods and/or technologies used in the research process particular to the selected field or discipline; and

(C) review and revise the original proposal to reflect changes needed based upon preliminary research and practices.

(3) The student will develop products that meet standards recognized by the selected profession or discipline. The student is expected to:

(A) collaborate with the appropriate professionals to define the product;

(B) develop a plan for product completion;

(C) develop assessment criteria for successful completion of the project;

(D) establish the appropriateness of the product for the intended audience;

(E) implement the plan for product completion; and

(F) maintain a journal to document all phases of the implementation of the plan and reflections on learning experiences and processes.

(4) The student will demonstrate an understanding of the selected problem, issue, or concern by explaining or justifying findings to an appropriate audience for public comment or professional response. The student is expected to:

(A) review and revise the plan to present the findings;

(B) make arrangements for the presentation of findings to an appropriate audience;

(C) present findings, simulating the skills used by professionals;

(D) consider feedback received from the audience;

(E) reflect on the study and its potential for impact on the field; and

(F) reflect on personal learning experiences of the study.

Subchapter D. Other Social Studies Courses

§113.101. Implementation of Texas Essential Knowledge and Skills for Social Studies, Other Social Studies Courses.

Implementation of the provisions of this subchapter begins with the effective date of the provision unless otherwise noted.

§113.102. Advanced Placement (AP) United States History (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may be used to meet either the course requirement for U.S. History for state graduation or elective course requirements.

(b) Content requirements. Content requirements for Advanced Placement (AP) United States History are prescribed in the College Board Publication *Advanced Placement Course in United States History*, published by The College Board and in §113.41 of this title (relating to United States History Studies Since 1877 (One Credit), Adopted 2018).

§113.103. Advanced Placement (AP) European History (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may not be used as a substitute for World History Studies.

(b) Content requirements. Content requirements for Advanced Placement (AP) European History are prescribed in the College Board Publication *Advanced Placement Course in European History*, published by The College Board.

§113.104. Advanced Placement (AP) World History (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may be used as a substitute for World History Studies.

(b) Content requirements. Content requirements for Advanced Placement (AP) World History are prescribed in the College Board Publication *Advanced Placement Course Description in World History*, published by The College Board and in §113.42 of this title (relating to World History Studies (One Credit), Adopted 2018).

§113.105. Advanced Placement (AP) Human Geography (One-Half to One Credit).

(a) General requirements. Students shall be awarded either one-half credit or one credit for successful completion of this course. When completed for one credit, this course may be used as a substitute for World Geography Studies. When completed for one-half credit, this course may be used to meet only elective course requirements.

(b) Content requirements. Content requirements for Advanced Placement (AP) Human Geography are prescribed in the College Board Publication *Advanced Placement Course Description in Human Geography*, published by The College Board and in §113.43 of this title (relating to World Geography Studies (One Credit), Adopted 2018) when taught as a one credit course. Content requirements for AP Human Geography are prescribed in the College Board Publication *Advanced Placement Course Description in Human Geography*, published by The College Board when taught as a one-half credit course.

§113.106. Advanced Placement (AP) U.S. Government and Politics (One-Half Credit).

(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet the course requirement in Government for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) U.S. Government and Politics are prescribed in the College Board Publication *Advanced Placement Course in U.S. Government and*

Politics, published by The College Board and in §113.44 of this title (relating to United States Government (One-Half Credit), Adopted 2018).

§113.107. Advanced Placement (AP) Comparative Government and Politics (One-Half Credit).

(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) Comparative Government and Politics are prescribed in the College Board Publication *Advanced Placement Course in Comparative Government and Politics*, published by The College Board.

§113.108. Advanced Placement (AP) Psychology (One-Half Credit).

(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) Psychology are prescribed in the College Board Publication *Advanced Placement Course in Psychology*, published by The College Board.

§113.109. International Baccalaureate (IB) History Standard Level (SL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.110. International Baccalaureate (IB) History of Africa and the Middle East Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Africa and the Middle East HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.111. International Baccalaureate (IB) History of the Americas Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. One credit may be used to meet the course requirement in United States history for state graduation; the other credit may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of the Americas HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.41 of this title (relating to United States History Studies Since 1877 (One Credit), Adopted 2018).

§113.112. International Baccalaureate (IB) History of Asia and Oceania Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Asia and Oceania HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.113. International Baccalaureate (IB) History of Europe Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Europe HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.114. International Baccalaureate (IB) Geography Standard Level (SL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet required course requirements for state graduation.

(b) Content requirements. Content requirements for IB Geography SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.43 of this title (relating to World Geography Studies (One Credit), Adopted 2018).

§113.115. International Baccalaureate (IB) Geography Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. One credit may be used to meet the course requirement in World Geography Studies for state graduation; the other credit may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Geography HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.43 of this title (relating to World Geography Studies (One Credit), Adopted 2018).

§113.116. International Baccalaureate (IB) Psychology Standard Level (SL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Psychology SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.117. International Baccalaureate (IB) Psychology Higher Level (HL) (Two Credits).

(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Psychology HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.118. International Baccalaureate (IB) Social and Cultural Anthropology Standard Level (SL) (Two Credits).

(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Social and Cultural Anthropology SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.

§113.119. International Baccalaureate (IB) Social and Cultural Anthropology Higher Level (HL) (Two Credits).

(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Social and Cultural Anthropology HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.

§113.120. International Baccalaureate (IB) World Religions Standard Level (SL) (Two Credits).

(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB World Religions SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.

§113.121. International Baccalaureate (IB) Global Politics Standard Level (SL) (Two Credits).

(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Global Politics SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.

§113.122. International Baccalaureate (IB) Global Politics Higher Level (HL) (Two Credits).

(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Global Politics HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.

§113.123. Advanced Placement (AP) Microeconomics (One-Half Credit).

(a) General requirements. This course may be used to meet required course requirements for state graduation. If Microeconomics is used to meet the required course requirement for state graduation, Macroeconomics may be used as a state-approved elective.

(b) Content requirements. Content requirements for Advanced Placement (AP) Microeconomics are prescribed in the College Board Publication *Advanced Placement Course in Microeconomics* published by The College Board.

§113.124. Advanced Placement (AP) Macroeconomics (One-Half Credit).

(a) General requirements. This course may be used to meet required course requirements for state graduation. If Macroeconomics is used to meet the required course requirement for state graduation, Microeconomics may be used as a state-approved elective.

(b) Content requirements. Content requirements for Advanced Placement (AP) Macroeconomics are prescribed in the College Board Publication *Advanced Placement Course in Macroeconomics* published by The College Board.

§113.125. International Baccalaureate (IB) Economics Standard Level (SL) (Two Credits).

(a) General requirements. One-half credit may be used to meet the course requirement in Economics for state graduation and one and one-half credits may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Economics SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

§113.126. International Baccalaureate (IB) Economics Higher Level (HL) (Two Credits).

(a) General requirements. One-half credit may be used to meet the course requirement in Economics for state graduation and one and one-half credits may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Economics HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.

[~~§113.51. Implementation of Texas Essential Knowledge and Skills for Social Studies, Other Social Studies Courses.~~]

[~~(a) The provisions of §§113.52–113.75 of this subchapter shall be implemented by school districts beginning September 1, 1998.~~

~~(b) The provisions of §§113.76–113.80 of this subchapter shall be implemented by school districts beginning with the 2019–2020 school year.~~]

[~~§113.52. Social Studies Advanced Studies (One-Half Credit).~~]

[~~(a) General requirements. Students shall be awarded one-half unit of credit for successful completion of this course. Students may take this course with different course content for a maximum of two credits.~~

~~(b) Introduction. In Social Studies Advanced Studies, an elective course, students conduct in-depth research, prepare a product of professional quality, and present their findings to appropriate audiences. Students, working independently or in collaboration with a mentor, investigate a problem, issue, or concern; research the topic using a variety of technologies; and present a product of professional quality to an appropriate audience.~~

~~(c) Knowledge and skills.~~

~~(1) The student will investigate, independently or collaboratively, a problem, issue, or concern within a selected profession or discipline. The student is expected to:~~

~~(A) analyze the relationship between his or her interests and career/discipline;~~

~~(B) review literature from varied sources from the selected career or discipline;~~

~~(C) identify a problem, issue, or concern;~~

~~(D) survey and/or interview professionals to determine the appropriateness of a project; and~~

~~(E) develop a proposal that includes well-defined questions, goals and objectives, rationale, and procedures for the project.~~

~~(2) The student will demonstrate understanding of the research methods and/or technologies used in a selected profession or discipline. The student is expected to:~~

~~(A) develop an understanding of the requirements and practices of the profession in the selected career or discipline through observation;~~

~~(B) simulate the methods and/or technologies used in the research process particular to the selected field or discipline; and~~

~~(C) review and revise the original proposal to reflect changes needed based upon preliminary research and practices.~~

~~(3) The student will develop products that meet standards recognized by the selected profession or discipline. The student is expected to:~~

~~(A) collaborate with the appropriate professionals to define the product;~~

~~(B) develop a plan for product completion;~~

~~(C) develop assessment criteria for successful completion of the project;~~

(D) establish the appropriateness of the product for the intended audience;

(E) implement the plan for product completion; and

(F) maintain a journal to document all phases of the implementation of the plan and reflections on learning experiences and processes.

(4) The student will demonstrate an understanding of the selected problem, issue, or concern by explaining or justifying findings to an appropriate audience for public comment or professional response. The student is expected to:

(A) review and revise the plan to present the findings;

(B) make arrangements for the presentation of findings to an appropriate audience;

(C) present findings, simulating the skills used by professionals;

(D) consider feedback received from the audience;

(E) reflect on the study and its potential for impact on the field; and

(F) reflect on personal learning experiences of the study.]

[§113.53. Advanced Placement (AP) United States History (One Credit).]

[(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may be used to meet either the course requirement for U.S. History for state graduation or elective course requirements.

(b) Content requirements. Content requirements for Advanced Placement (AP) United States History are prescribed in the College Board Publication *Advanced Placement Course in United States History*, published by The College Board and in §113.41 of this title (relating to United States History Studies Since 1877 (One Credit), Beginning with School Year 2011-2012).]

[§113.54. Advanced Placement (AP) European History (One Credit).]

[(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may not be used as a substitute for World History Studies.

(b) Content requirements. Content requirements for Advanced Placement (AP) European History are prescribed in the College Board Publication *Advanced Placement Course in European History*, published by The College Board.]

[§113.55. Advanced Placement (AP) World History (One Credit).]

[(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course may be used as a substitute for World History Studies.

(b) Content requirements. Content requirements for Advanced Placement (AP) World History are prescribed in the College Board Publication *Advanced Placement Course Description in World History*, published by The College Board and in §113.42 of this title (relating to World History Studies (One Credit), Beginning with School Year 2011-2012).]

[§113.56. Advanced Placement (AP) Human Geography (One-Half to One Credit).]

[(a) General requirements. Students shall be awarded either one-half credit or one credit for successful completion of this course. When completed for one credit, this course may be used as a substitute for World Geography Studies. When completed for one-half credit, this course may be used to meet only elective course requirements.

(b) Content requirements. Content requirements for Advanced Placement (AP) Human Geography are prescribed in the College Board Publication *Advanced Placement Course Description in Human Geography*, published by The College Board and in §113.43 of this title (relating to World Geography Studies (One Credit), Beginning with School Year 2011-2012) when taught as a one credit course. Content

requirements for AP Human Geography are prescribed in the College Board Publication *Advanced Placement Course Description in Human Geography*, published by The College Board when taught as a one-half credit course.]

[§113.57. Advanced Placement (AP) U.S. Government and Politics (One-Half Credit).]

[(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet the course requirement in Government for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) U.S. Government and Politics are prescribed in the College Board Publication *Advanced Placement Course in U.S. Government and Politics*, published by The College Board and in §113.44 of this title (relating to United States Government (One-Half Credit), Beginning with School Year 2011-2012).]

[§113.58. Advanced Placement (AP) Comparative Government and Politics (One-Half Credit).]

[(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) Comparative Government and Politics are prescribed in the College Board Publication *Advanced Placement Course in Comparative Government and Politics*, published by The College Board.]

[§113.59. Advanced Placement (AP) Psychology (One-Half Credit).]

[(a) General requirements. Students shall be awarded one-half credit for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for Advanced Placement (AP) Psychology are prescribed in the College Board Publication *Advanced Placement Course in Psychology*, published by The College Board.]

[§113.60. International Baccalaureate (IB) History Standard Level (SL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.61. International Baccalaureate (IB) History of Africa and the Middle East Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Africa and the Middle East HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.62. International Baccalaureate (IB) History of the Americas Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. One credit may be used to meet the course requirement in United States history for state graduation; the other credit may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of the Americas HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.41 of this title (relating to United States History Studies Since 1877 (One Credit), Beginning with School Year 2011-2012).]

[§113.63. International Baccalaureate (IB) History of Asia and Oceania Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Asia and Oceania HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.64. International Baccalaureate (IB) History of Europe Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB History of Europe HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.65. International Baccalaureate (IB) Geography Standard Level (SL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet required course requirements for state graduation.

(b) Content requirements. Content requirements for IB Geography SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.43 of this title (relating to World Geography Studies (One Credit), Beginning with School Year 2011-2012).]

[§113.66. International Baccalaureate (IB) Geography Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. One credit may be used to meet the course requirement in World Geography Studies for state graduation; the other credit may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Geography HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America and in §113.43 of this title (relating to World Geography Studies (One Credit), Beginning with School Year 2011-2012).]

[§113.67. International Baccalaureate (IB) Psychology Standard Level (SL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Psychology SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.68. International Baccalaureate (IB) Psychology Higher Level (HL) (Two Credits).]

[(a) General requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

(b) Content requirements. Content requirements for IB Psychology HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.]

[§113.71. International Baccalaureate (IB) Social and Cultural Anthropology Standard Level (SL) (Two Credits).]

[(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.

~~(b) Content requirements. Content requirements for IB Social and Cultural Anthropology SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.~~]

[~~§113.72. International Baccalaureate (IB) Social and Cultural Anthropology Higher Level (HL) (Two Credits).~~]

[~~(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB Social and Cultural Anthropology HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.~~]

[~~§113.73. International Baccalaureate (IB) World Religions Standard Level (SL) (Two Credits).~~]

[~~(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB World Religions SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.~~]

[~~§113.74. International Baccalaureate (IB) Global Politics Standard Level (SL) (Two Credits).~~]

[~~(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB Global Politics SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.~~]

[~~§113.75. International Baccalaureate (IB) Global Politics Higher Level (HL) (Two Credits).~~]

[~~(a) General Requirements. Students shall be awarded two credits for successful completion of this course. This course may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB Global Politics HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from the International Baccalaureate of North America.~~]

[~~§113.76. Economics Advanced Studies (One-Half Credit).~~]

[~~(a) General requirements. Students may take this course with different course content for a maximum of one credit. Students who are pursuing the Distinguished Achievement Program may take Economics Advanced Studies to earn state credit for developing, researching, and presenting their mentorship or independent study advanced measure.~~

~~(b) Introduction. In Economics Advanced Studies, an elective course, students conduct in-depth research, prepare a product of professional quality, and present their findings to appropriate audiences. Students, working independently or in collaboration with a mentor, investigate a problem, issue, or concern; research the topic using a variety of technologies; and present a product of professional quality to an appropriate audience.~~

~~(c) Knowledge and skills.~~

~~(1) The student will investigate, independently or collaboratively, a problem, issue, or concern within a selected profession or discipline. The student is expected to:~~

~~(A) analyze the relationship between his or her interests and career/discipline;~~

~~(B) review literature from varied sources from the selected career or discipline;~~

(C) identify a problem, issue, or concern;

(D) survey and/or interview professionals to determine the appropriateness of a project; and

(E) develop a proposal that includes well-defined questions, goals and objectives, rationale, and procedures for the project.

(2) The student will demonstrate understanding of the research methods and/or technologies used in a selected profession or discipline. The student is expected to:

(A) develop an understanding of the requirements and practices of the profession in the selected career or discipline through observation;

(B) simulate the methods and/or technologies used in the research process particular to the selected field or discipline; and

(C) review and revise the original proposal to reflect changes needed based upon preliminary research and practices.

(3) The student will develop products that meet standards recognized by the selected profession or discipline. The student is expected to:

(A) collaborate with the appropriate professionals to define the product;

(B) develop a plan for product completion;

(C) develop assessment criteria for successful completion of the project;

(D) establish the appropriateness of the product for the intended audience;

(E) implement the plan for product completion; and

(F) maintain a journal to document all phases of the implementation of the plan and reflections on learning experiences and processes.

(4) The student will demonstrate an understanding of the selected problem, issue, or concern by explaining or justifying findings to an appropriate audience for public comment or professional response. The student is expected to:

(A) review and revise the plan to present the findings;

(B) make arrangements for the presentation of findings to an appropriate audience;

(C) present findings, simulating the skills used by professionals;

(D) consider feedback received from the audience;

(E) reflect on the study and its potential for impact on the field; and

(F) reflect on personal learning experiences of the study.]

[§113.77. Advanced Placement (AP) Microeconomics (One-Half Credit).]

[(a) General requirements. This course may be used to meet required course requirements for state graduation. If Microeconomics is used to meet the required course requirement for state graduation, Macroeconomics may be used as a state-approved elective.

(b) Content requirements. Content requirements for Advanced Placement (AP) Microeconomics are prescribed in the College Board Publication *Advanced Placement Course in Microeconomics* published by The College Board.]

[§113.78. Advanced Placement (AP) Macroeconomics (One-Half Credit).]

[(a) General requirements. This course may be used to meet required course requirements for state graduation. If Macroeconomics is used to meet the required course requirement for state graduation, Microeconomics may be used as a state-approved elective.

~~(b) Content requirements. Content requirements for Advanced Placement (AP) Macroeconomics are prescribed in the College Board Publication *Advanced Placement Course in Macroeconomics* published by The College Board.~~]

[~~§113.79. International Baccalaureate (IB) Economics Standard Level (SL) (Two Credits).~~]

[~~(a) General requirements. One-half credit may be used to meet the course requirement in Economics for state graduation and one and one-half credits may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB Economics SL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.~~]

[~~§113.80. International Baccalaureate (IB) Economics Higher Level (HL) (Two Credits).~~]

[~~(a) General requirements. One-half credit may be used to meet the course requirement in Economics for state graduation and one and one-half credits may be used to meet only elective course requirements for state graduation.~~

~~(b) Content requirements. Content requirements for IB Economics HL are prescribed by the International Baccalaureate Organization. Subject guides may be obtained from International Baccalaureate of North America.~~]

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ATTACHMENT
Text of Proposed Repeal of 19 TAC

Chapter 110. Texas Essential Knowledge and Skills for English Language Arts and Reading

Subchapter C. High School

[§110.30. Implementation of Texas Essential Knowledge and Skills for English Language Arts and Reading, High School, Beginning with School Year 2009-2010.]

[(a) The provisions of §§110.31-110.34 of this subchapter shall be implemented by school districts beginning with the 2009-2010 school year.

(b) Students must develop the ability to comprehend and process material from a wide range of texts. Student expectations for Reading/Comprehension Skills as provided in this subsection are described for the appropriate grade level.

Figure: 19 TAC §110.30(b)]

[§110.31. English Language Arts and Reading, English I (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The English Language Arts and Reading Texas Essential Knowledge and Skills (TEKS) are organized into the following strands: Reading, where students read and understand a wide variety of literary and informational texts; Writing, where students compose a variety of written texts with a clear controlling idea, coherent organization, and sufficient detail; Research, where students are expected to know how to locate a range of relevant sources and evaluate, synthesize, and present ideas and information; Listening and Speaking, where students listen and respond to the ideas of others while contributing their own ideas in conversations and in groups; and Oral and Written Conventions, where students learn how to use the oral and written conventions of the English language in speaking and writing. The standards are cumulative - students will continue to address earlier standards as needed while they attend to standards for their grade. In English I, students will engage in activities that build on their prior knowledge and skills in order to strengthen their reading, writing, and oral language skills. Students should read and write on a daily basis.

(2) For students whose first language is not English, the students' native language serves as a foundation for English language acquisition.

(A) English language learners (ELLs) are acquiring English, learning content in English, and learning to read simultaneously. For this reason, it is imperative that reading instruction should be comprehensive and that students receive instruction in phonemic awareness, phonics, decoding, and word attack skills while simultaneously being taught academic vocabulary and comprehension skills and strategies. Reading instruction that enhances ELL's ability to decode unfamiliar words and to make sense of those words in context will expedite their ability to make sense of what they read and learn from reading. Additionally, developing fluency, spelling, and grammatical conventions of academic language must be done in meaningful contexts and not in isolation.

(B) For ELLs, comprehension of texts requires additional scaffolds to support comprehensible input. ELL students should use the knowledge of their first language (e.g., cognates) to further vocabulary development. Vocabulary needs to be taught in the context of connected discourse so that language is meaningful. ELLs must learn how rhetorical devices in English differ from those in their native language. At the same time English learners are learning in English, the focus is on academic English, concepts, and the language structures specific to the content.

(C) During initial stages of English development, ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. However, English language learners' abilities to meet these standards will be influenced by their proficiency in English. While English language learners can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. It is also critical to understand that ELLs with no previous or with interrupted schooling will require explicit and strategic support as they acquire English and learn to learn in English simultaneously.

(3) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge, skills, and student expectations in English I as described in subsection (b) of this section.

(4) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of grade-level technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to distinguish between the denotative and connotative meanings of words;

(C) produce analogies that describe a function of an object or its description;

(D) describe the origins and meanings of foreign words or phrases used frequently in written English (e.g., *caveat emptor, carte blanche, tete a tete, pas de deux, bon appetit, quid pro quo*); and

(E) use a dictionary, a glossary, or a thesaurus (printed or electronic) to determine or confirm the meanings of words and phrases, including their connotations and denotations, and their etymology.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) analyze how the genre of texts with similar themes shapes meaning;

(B) analyze the influence of mythic, classical and traditional literature on 20th and 21st century literature; and

(C) relate the figurative language of a literary work to its historical and cultural setting.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to analyze the effects of diction and imagery (e.g., controlling images, figurative language, understatement, overstatement, irony, paradox) in poetry.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support

their understanding. Students are expected to explain how dramatic conventions (e.g., monologues, soliloquies, dramatic irony) enhance dramatic text.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) analyze non-linear plot development (e.g., flashbacks, foreshadowing, sub-plots, parallel plot structures) and compare it to linear plot development;

(B) analyze how authors develop complex yet believable characters in works of fiction through a range of literary devices, including character foils;

(C) analyze the way in which a work of fiction is shaped by the narrator's point of view; and

(D) demonstrate familiarity with works by authors from non-English-speaking literary traditions with emphasis on classical literature.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to analyze how literary essays interweave personal examples and ideas with factual information to explain, present a perspective, or describe a situation or event.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to explain the role of irony, sarcasm, and paradox in literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to explain the controlling idea and specific purpose of an expository text and distinguish the most important from the less important details that support the author's purpose.

(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize text and distinguish between a summary that captures the main ideas and elements of a text and a critique that takes a position and expresses an opinion;

(B) differentiate between opinions that are substantiated and unsubstantiated in the text;

(C) make subtle inferences and draw complex conclusions about the ideas in text and their organizational patterns; and

(D) synthesize and make logical connections between ideas and details in several texts selected to reflect a range of viewpoints on the same topic and support those findings with textual evidence.

(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:

(A) analyze the relevance, quality, and credibility of evidence given to support or oppose an argument for a specific audience; and

(B) analyze famous speeches for the rhetorical structures and devices used to convince the reader of the authors' propositions.

(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) analyze the clarity of the objective(s) of procedural text (e.g., consider reading instructions for software, warranties, consumer publications); and

(B) analyze factual, quantitative, or technical data presented in multiple graphical sources.

(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are expected to:

(A) compare and contrast how events are presented and information is communicated by visual images (e.g., graphic art, illustrations, news photographs) versus non-visual texts;

(B) analyze how messages in media are conveyed through visual and sound techniques (e.g., editing, reaction shots, sequencing, background music);

(C) compare and contrast coverage of the same event in various media (e.g., newspapers, television, documentaries, blogs, Internet); and

(D) evaluate changes in formality and tone within the same medium for specific audiences and purposes.

(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;

(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and the rhetorical devices used to convey meaning;

(C) revise drafts to improve style, word choice, figurative language, sentence variety, and subtlety of meaning after rethinking how well questions of purpose, audience, and genre have been addressed;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:

(A) write an engaging story with a well-developed conflict and resolution, interesting and believable characters, and a range of literary strategies (e.g., dialogue, suspense) and devices to enhance the plot;

(B) write a poem using a variety of poetic techniques (e.g., structural elements, figurative language) and a variety of poetic forms (e.g., sonnets, ballads); and

(C) write a script with an explicit or implicit theme and details that contribute to a definite mood or tone.

(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:

(A) write an analytical essay of sufficient length that includes:

(i) effective introductory and concluding paragraphs and a variety of sentence structures;

(ii) rhetorical devices, and transitions between paragraphs;

(iii) a controlling idea or thesis;

(iv) an organizing structure appropriate to purpose, audience, and context; and

(v) relevant information and valid inferences;

(B) write procedural or work-related documents (e.g., instructions, e-mails, correspondence, memos, project plans) that include:

(i) organized and accurately conveyed information; and

(ii) reader-friendly formatting techniques;

(C) write an interpretative response to an expository or a literary text (e.g., essay or review) that:

(i) extends beyond a summary and literal analysis;

(ii) addresses the writing skills for an analytical essay and provides evidence from the text using embedded quotations; and

(iii) analyzes the aesthetic effects of an author's use of stylistic or rhetorical devices; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that conveys a distinctive point of view and appeals to a specific audience.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons supported by precise and relevant evidence;

(B) consideration of the whole range of information and views on the topic and accurate and honest representation of these views;

(C) counter-arguments based on evidence to anticipate and address objections;

(D) an organizing structure appropriate to the purpose, audience, and context; and

(E) an analysis of the relative value of specific data, facts, and ideas.

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of the following parts of speech in the context of reading, writing, and speaking:

(i) more complex active and passive tenses and verbals (gerunds, infinitives, participles);

(ii) restrictive and nonrestrictive relative clauses; and

(iii) reciprocal pronouns (e.g., each other, one another);

(B) identify and use the subjunctive mood to express doubts, wishes, and possibilities; and

(C) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to:

(A) use conventions of capitalization; and

(B) use correct punctuation marks including:

(i) quotation marks to indicate sarcasm or irony;

(ii) comma placement in nonrestrictive phrases, clauses, and contrasting expressions; and

(iii) dashes to emphasize parenthetical information.

(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.

(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:

(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and

(B) formulate a plan for engaging in research on a complex, multi-faceted topic.

(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:

(A) follow the research plan to compile data from authoritative sources in a manner that identifies the major issues and debates within the field of inquiry;

(B) organize information gathered from multiple sources to create a variety of graphics and forms (e.g., notes, learning logs); and

(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number).

(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:

(A) modify the major research question as necessary to refocus the research plan;

(B) evaluate the relevance of information to the topic and determine the reliability, validity, and accuracy of sources (including Internet sources) by examining their authority and objectivity; and

(C) critique the research process at each step to implement changes as the need occurs and is identified.

(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into a written or an oral presentation that:

(A) marshals evidence in support of a clear thesis statement and related claims;

(B) provides an analysis for the audience that reflects a logical progression of ideas and a clearly stated point of view;

(C) uses graphics and illustrations to help explain concepts where appropriate;

(D) uses a variety of evaluative tools (e.g., self-made rubrics, peer reviews, teacher and expert evaluations) to examine the quality of the research; and

(E) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials.

(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen responsively to a speaker by taking notes that summarize, synthesize, or highlight the speaker's ideas for critical reflection and by asking questions related to the content for clarification and elaboration;

(B) follow and give complex oral instructions to perform specific tasks, answer questions, solve problems, and complete processes; and

(C) evaluate the effectiveness of a speaker's main and supporting ideas.

(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to give presentations using informal, formal, and technical language effectively to meet the needs of audience, purpose, and occasion, employing eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.

(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, building on the ideas of others, contributing relevant information, developing a plan for consensus-building, and setting ground rules for decision-making.]

[§110.32. English Language Arts and Reading, English II (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The English Language Arts and Reading Texas Essential Knowledge and Skills (TEKS) are organized into the following strands: Reading, where students read and understand a wide variety of literary and informational texts; Writing, where students compose a variety of written texts with a clear controlling idea, coherent organization, and sufficient detail; Research, where students are expected to know how to locate a range of relevant sources and evaluate, synthesize, and present ideas and information; Listening and Speaking, where students listen and respond to the ideas of others while contributing their own ideas in conversations and in groups; and Oral and Written Conventions, where students learn how to use the oral and written conventions of the English language in speaking and writing. The standards are cumulative--students will continue to address earlier standards as needed while they attend to standards for their grade. In English II, students will engage in activities that build on their prior knowledge and skills in order to strengthen their reading, writing, and oral language skills. Students should read and write on a daily basis.

(2) For students whose first language is not English, the students' native language serves as a foundation for English language acquisition.

(A) English language learners (ELLs) are acquiring English, learning content in English, and learning to read simultaneously. For this reason, it is imperative that reading instruction should be comprehensive and that students receive instruction in phonemic awareness, phonics, decoding, and word attack skills while simultaneously being taught academic vocabulary and comprehension skills and strategies. Reading instruction that enhances ELL's ability to decode unfamiliar words and to make sense of those words in context will expedite their ability to make sense of what they read and learn from reading. Additionally, developing fluency, spelling, and grammatical conventions of academic language must be done in meaningful contexts and not in isolation.

(B) For ELLs, comprehension of texts requires additional scaffolds to support comprehensible input. ELL students should use the knowledge of their first language (e.g., cognates) to further vocabulary development. Vocabulary needs to be taught in the context of connected discourse so that language is meaningful. ELLs must learn how rhetorical devices in English differ from those in their native language. At the same time English learners are learning in English, the focus is on academic English, concepts, and the language structures specific to the content.

(C) During initial stages of English development, ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. However, English language learners' abilities to meet these standards will be influenced by their proficiency in English. While English language learners can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. It is also critical to understand that ELLs with no previous or with interrupted schooling will require explicit and strategic support as they acquire English and learn to learn in English simultaneously.

(3) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge, skills, and student expectations in English II as described in subsection (b) of this section.

(4) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of grade-level technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to distinguish between the denotative and connotative meanings of words;

(C) infer word meaning through the identification and analysis of analogies and other word relationships;

(D) show the relationship between the origins and meaning of foreign words or phrases used frequently in written English and historical events or developments (e.g., *glasnost, avant garde, coup d'état*); and

(E) use a dictionary, a glossary, or a thesaurus (printed or electronic) to determine or confirm the meanings of words and phrases, including their connotations and denotations, and their etymology.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) compare and contrast differences in similar themes expressed in different time periods;

(B) analyze archetypes (e.g., journey of a hero, tragic flaw) in mythic, traditional and classical literature; and

(C) relate the figurative language of a literary work to its historical and cultural setting.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to analyze the structure or prosody (e.g., meter, rhyme scheme) and graphic elements (e.g., line length, punctuation, word position) in poetry.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support their understanding. Students are expected to analyze how archetypes and motifs in drama affect the plot of plays.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) analyze isolated scenes and their contribution to the success of the plot as a whole in a variety of works of fiction;

(B) analyze differences in the characters' moral dilemmas in works of fiction across different countries or cultures;

(C) evaluate the connection between forms of narration (e.g., unreliable, omniscient) and tone in works of fiction; and

(D) demonstrate familiarity with works by authors from non-English-speaking literary traditions with emphasis on 20th century world literature.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to evaluate the role of syntax and diction and the effect of voice, tone, and imagery on a speech, literary essay, or other forms of literary nonfiction.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to explain the function of symbolism, allegory, and allusions in literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to analyze the controlling idea and specific purpose of a passage and the textual elements that support and elaborate it, including both the most important details and the less important details.

(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize text and distinguish between a summary and a critique and identify non-essential information in a summary and unsubstantiated opinions in a critique;

(B) distinguish among different kinds of evidence (e.g., logical, empirical, anecdotal) used to support conclusions and arguments in texts;

(C) make and defend subtle inferences and complex conclusions about the ideas in text and their organizational patterns; and

(D) synthesize and make logical connections between ideas and details in several texts selected to reflect a range of viewpoints on the same topic and support those findings with textual evidence.

(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:

(A) explain shifts in perspective in arguments about the same topic and evaluate the accuracy of the evidence used to support the different viewpoints within those arguments; and

(B) analyze contemporary political debates for such rhetorical and logical fallacies as appeals to commonly held opinions, false dilemmas, appeals to pity, and personal attacks.

(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) evaluate text for the clarity of its graphics and its visual appeal; and

(B) synthesize information from multiple graphical sources to draw conclusions about the ideas presented (e.g., maps, charts, schematics).

(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are expected to:

(A) evaluate how messages presented in media reflect social and cultural views in ways different from traditional texts;

(B) analyze how messages in media are conveyed through visual and sound techniques (e.g., editing, reaction shots, sequencing, background music);

(C) examine how individual perception or bias in coverage of the same event influences the audience; and

(D) evaluate changes in formality and tone within the same medium for specific audiences and purposes.

(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;

(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and rhetorical devices used to convey meaning;

(C) revise drafts to improve style, word choice, figurative language, sentence variety, and subtlety of meaning after rethinking how well questions of purpose, audience, and genre have been addressed;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:

(A) write an engaging story with a well-developed conflict and resolution, interesting and believable characters, a range of literary strategies (e.g., dialogue, suspense) and devices to enhance the plot, and sensory details that define the mood or tone;

(B) write a poem using a variety of poetic techniques (e.g., structural elements, figurative language) and a variety of poetic forms (e.g., sonnets, ballads); and

(C) write a script with an explicit or implicit theme and details that contribute to a definite mood or tone.

(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:

(A) write an analytical essay of sufficient length that includes:

(i) effective introductory and concluding paragraphs and a variety of sentence structures;

(ii) rhetorical devices, and transitions between paragraphs;

(iii) a thesis or controlling idea;

(iv) an organizing structure appropriate to purpose, audience, and context;

(v) relevant evidence and well-chosen details; and

(vi) distinctions about the relative value of specific data, facts, and ideas that support the thesis statement;

(B) write procedural or work-related documents (e.g., instructions, e-mails, correspondence, memos, project plans) that include:

(i) organized and accurately conveyed information;

(ii) reader-friendly formatting techniques; and

(iii) anticipation of readers' questions;

(C) write an interpretative response to an expository or a literary text (e.g., essay or review) that:

(i) extends beyond a summary and literal analysis;

(ii) addresses the writing skills for an analytical essay and provides evidence from the text using embedded quotations; and

(iii) analyzes the aesthetic effects of an author's use of stylistic and rhetorical devices; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that conveys a distinctive point of view and appeals to a specific audience.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons supported by precise and relevant evidence;

(B) consideration of the whole range of information and views on the topic and accurate and honest representation of these views (i.e., in the author's own words and not out of context);

(C) counter-arguments based on evidence to anticipate and address objections;

(D) an organizing structure appropriate to the purpose, audience, and context;

(E) an analysis of the relative value of specific data, facts, and ideas; and

(F) a range of appropriate appeals (e.g., descriptions, anecdotes, case studies, analogies, illustrations).

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of the following parts of speech in the context of reading, writing, and speaking:

(i) more complex active and passive tenses and verbals (gerunds, infinitives, participles);

(ii) restrictive and nonrestrictive relative clauses; and

(iii) reciprocal pronouns (e.g., each other, one another);

(B) identify and use the subjunctive mood to express doubts, wishes, and possibilities; and

(C) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to:

(A) use conventions of capitalization; and

(B) use correct punctuation marks including:

(i) comma placement in nonrestrictive phrases, clauses, and contrasting expressions;

(ii) quotation marks to indicate sarcasm or irony; and

(iii) dashes to emphasize parenthetical information.

(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.

(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:

(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and

(B) formulate a plan for engaging in research on a complex, multi-faceted topic.

(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:

(A) follow the research plan to compile data from authoritative sources in a manner that identifies the major issues and debates within the field of inquiry;

(B) organize information gathered from multiple sources to create a variety of graphics and forms (e.g., notes, learning logs); and

(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number).

(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:

(A) modify the major research question as necessary to refocus the research plan;

(B) evaluate the relevance of information to the topic and determine the reliability, validity, and accuracy of sources (including Internet sources) by examining their authority and objectivity; and

(C) critique the research process at each step to implement changes as the need occurs and is identified.

(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into a written or an oral presentation that:

(A) marshals evidence in support of a clear thesis statement and related claims;

(B) provides an analysis for the audience that reflects a logical progression of ideas and a clearly stated point of view;

(C) uses graphics and illustrations to help explain concepts where appropriate;

(D) uses a variety of evaluative tools (e.g., self-made rubrics, peer reviews, teacher and expert evaluations) to examine the quality of the research; and

(E) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials.

(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen responsively to a speaker by taking notes that summarize, synthesize, or highlight the speaker's ideas for critical reflection and by asking questions related to the content for clarification and elaboration;

(B) follow and give complex oral instructions to perform specific tasks, answer questions, solve problems, and complete processes; and

(C) evaluate how the style and structure of a speech support or undermine its purpose or meaning.

(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to advance a coherent argument that incorporates a clear thesis and a logical progression of valid evidence from reliable sources and that employs eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.

(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, building on the ideas of others, contributing relevant information, developing a plan for consensus-building, and setting ground rules for decision-making.]

[§110.33. English Language Arts and Reading, English III (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The English Language Arts and Reading Texas Essential Knowledge and Skills (TEKS) are organized into the following strands: Reading, where students read and understand a wide variety of literary and informational texts; Writing, where students compose a variety of written texts with a clear controlling idea, coherent organization, and sufficient detail; Research, where students are expected to know how to locate a range of relevant sources and evaluate, synthesize, and present ideas and information; Listening and Speaking, where students listen and respond to the ideas of others while contributing their own ideas in conversations and in groups; and Oral and Written Conventions, where students learn how to use the oral and written conventions of the English language in speaking and writing. The standards are cumulative--students will continue to address earlier standards as needed while they attend to standards for their grade. In English III, students will engage in activities that build on their prior knowledge and skills in order to strengthen their reading, writing, and oral language skills. Students should read and write on a daily basis.

(2) For students whose first language is not English, the students' native language serves as a foundation for English language acquisition.

(A) English language learners (ELLs) are acquiring English, learning content in English, and learning to read simultaneously. For this reason, it is imperative that reading instruction should be comprehensive and that students receive instruction in phonemic awareness, phonics, decoding, and word attack skills while simultaneously being taught academic vocabulary and comprehension skills and strategies. Reading instruction that enhances ELL's ability to decode unfamiliar words and to make sense of those words in context will expedite their ability to make sense of what they read and learn from reading. Additionally, developing fluency, spelling, and grammatical conventions of academic language must be done in meaningful contexts and not in isolation.

(B) For ELLs, comprehension of texts requires additional scaffolds to support comprehensible input. ELL students should use the knowledge of their first language (e.g., cognates) to further vocabulary development. Vocabulary needs to be taught in the context of connected discourse so that language is meaningful. ELLs must learn how rhetorical devices in English differ from those in their native language. At the same time English learners are learning in English, the focus is on academic English, concepts, and the language structures specific to the content.

(C) During initial stages of English development, ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. However, English language learners' abilities to meet these standards will be influenced by their proficiency in English. While English language learners can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. It is also critical to understand that ELLs with no previous or with interrupted schooling will require explicit and strategic support as they acquire English and learn to learn in English simultaneously.

(3) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge, skills, and student expectations in English III as described in subsection (b) of this section.

(4) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of grade-level technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to draw conclusions about the nuance in word meanings;

(C) infer word meaning through the identification and analysis of analogies and other word relationships;

(D) recognize and use knowledge of cognates in different languages and of word origins to determine the meaning of words; and

(E) use general and specialized dictionaries, thesauri, glossaries, histories of language, books of quotations, and other related references (printed or electronic) as needed.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) analyze the way in which the theme or meaning of a selection represents a view or comment on the human condition;

(B) relate the characters and text structures of mythic, traditional, and classical literature to 20th and 21st century American novels, plays, or films; and

(C) relate the main ideas found in a literary work to primary source documents from its historical and cultural setting.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to analyze the effects of metrics, rhyme schemes (e.g., end, internal, slant, eye), and other conventions in American poetry.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support their understanding. Students are expected to analyze the themes and characteristics in different periods of modern American drama.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) evaluate how different literary elements (e.g., figurative language, point of view) shape the author's portrayal of the plot and setting in works of fiction;

(B) analyze the internal and external development of characters through a range of literary devices;

(C) analyze the impact of narration when the narrator's point of view shifts from one character to another; and

(D) demonstrate familiarity with works by authors in American fiction from each major literary period.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to analyze how rhetorical techniques (e.g., repetition, parallel structure, understatement, overstatement) in literary essays, true life adventures, and historically important speeches influence the reader, evoke emotions, and create meaning.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to analyze the meaning of classical, mythological, and biblical allusions in words, phrases, passages, and literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to analyze how the style, tone, and diction of a text advance the author's purpose and perspective or stance.

(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize a text in a manner that captures the author's viewpoint, its main ideas, and its elements without taking a position or expressing an opinion;

(B) distinguish between inductive and deductive reasoning and analyze the elements of deductively and inductively reasoned texts and the different ways conclusions are supported;

(C) make and defend subtle inferences and complex conclusions about the ideas in text and their organizational patterns; and

(D) synthesize ideas and make logical connections (e.g., thematic links, author analyses) between and among multiple texts representing similar or different genres and technical sources and support those findings with textual evidence.

(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:

(A) evaluate how the author's purpose and stated or perceived audience affect the tone of persuasive texts; and

(B) analyze historical and contemporary political debates for such logical fallacies as non sequiturs, circular logic, and hasty generalizations.

(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) evaluate the logic of the sequence of information presented in text (e.g., product support material, contracts); and

(B) translate (from text to graphic or from graphic to text) complex, factual, quantitative, or technical information presented in maps, charts, illustrations, graphs, timelines, tables, and diagrams.

(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are 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 (e.g., layout, pictures, typeface in print media, images, text, sound in electronic journalism) used in multi-layered media;

(C) evaluate the objectivity of coverage of the same event in various types of media; and

(D) evaluate changes in formality and tone across various media for different audiences and purposes.

(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;

(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and rhetorical devices to convey meaning;

(C) revise drafts to clarify meaning and achieve specific rhetorical purposes, consistency of tone, and logical organization by rearranging the words, sentences, and paragraphs to employ tropes (e.g., metaphors, similes, analogies, hyperbole, understatement, rhetorical questions, irony), schemes (e.g., parallelism, antithesis, inverted word order, repetition, reversed structures), and by adding transitional words and phrases;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:

(A) write an engaging story with a well-developed conflict and resolution, complex and non-stereotypical characters, a range of literary strategies (e.g., dialogue, suspense) and devices to enhance the plot, and sensory details that define the mood or tone;

(B) write a poem that reflects an awareness of poetic conventions and traditions within different forms (e.g., sonnets, ballads, free verse); and

(C) write a script with an explicit or implicit theme, using a variety of literary techniques.

(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:

(A) write an analytical essay of sufficient length that includes:

(i) effective introductory and concluding paragraphs and a variety of sentence structures;

(ii) rhetorical devices, and transitions between paragraphs;

(iii) a clear thesis statement or controlling idea;

(iv) a clear organizational schema for conveying ideas;

(v) relevant and substantial evidence and well-chosen details; and

(vi) information on multiple relevant perspectives and a consideration of the validity, reliability, and relevance of primary and secondary sources;

(B) write procedural or work-related documents (e.g., résumés, proposals, college applications, operation manuals) that include:

(i) a clearly stated purpose combined with a well-supported viewpoint on the topic;

(ii) appropriate formatting structures (e.g., headings, graphics, white space);

(iii) relevant questions that engage readers and consider their needs;

(iv) accurate technical information in accessible language; and

(v) appropriate organizational structures supported by facts and details (documented if appropriate);

(C) write an interpretation of an expository or a literary text that:

(i) advances a clear thesis statement;

(ii) addresses the writing skills for an analytical essay, including references to and commentary on quotations from the text;

(iii) analyzes the aesthetic effects of an author's use of stylistic or rhetorical devices;

(iv) identifies and analyzes the ambiguities, nuances, and complexities within the text; and

(v) anticipates and responds to readers' questions or contradictory information; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that appeals to a specific audience and synthesizes information from multiple points of view.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay (e.g., evaluative essays, proposals) to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons supported by precise and relevant evidence, including facts, expert opinions, quotations, and/or expressions of commonly accepted beliefs;

(B) accurate and honest representation of divergent views (i.e., in the author's own words and not out of context);

(C) an organizing structure appropriate to the purpose, audience, and context;

(D) information on the complete range of relevant perspectives;

(E) demonstrated consideration of the validity and reliability of all primary and secondary sources used; and

(F) language attentively crafted to move a disinterested or opposed audience, using specific rhetorical devices to back up assertions (e.g., appeals to logic, emotions, ethical beliefs).

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of different types of clauses and phrases (e.g., adjectival, noun, adverbial clauses and phrases); and

(B) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to correctly and consistently use conventions of punctuation and capitalization.

(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.

(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:

(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and

(B) formulate a plan for engaging in in-depth research on a complex, multi-faceted topic.

(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:

(A) follow the research plan to gather evidence from experts on the topic and texts written for informed audiences in the field, distinguishing between reliable and unreliable sources and avoiding over-reliance on one source;

(B) systematically organize relevant and accurate information to support central ideas, concepts, and themes, outline ideas into conceptual maps/timelines, and separate factual data from complex inferences; and

(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number), differentiating among primary, secondary, and other sources.

(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:

(A) modify the major research question as necessary to refocus the research plan;

(B) differentiate between theories and the evidence that supports them and determine whether the evidence found is weak or strong and how that evidence helps create a cogent argument; and

(C) critique the research process at each step to implement changes as the need occurs and is identified.

(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into an extended written or oral presentation that:

(A) provides an analysis that supports and develops personal opinions, as opposed to simply restating existing information;

(B) uses a variety of formats and rhetorical strategies to argue for the thesis;

(C) develops an argument that incorporates the complexities of and discrepancies in information from multiple sources and perspectives while anticipating and refuting counter-arguments;

(D) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials; and

(E) is of sufficient length and complexity to address the topic.

(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen responsively to a speaker by framing inquiries that reflect an understanding of the content and by identifying the positions taken and the evidence in support of those positions; and

(B) evaluate the clarity and coherence of a speaker's message and critique the impact of a speaker's diction and syntax on an audience.

(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to give a formal presentation that exhibits a logical structure, smooth transitions, accurate evidence, well-chosen details, and rhetorical devices, and that employs eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.

(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, offering ideas or judgments that are purposeful in moving the team towards goals, asking relevant and insightful questions, tolerating a range of positions and

ambiguity in decision-making, and evaluating the work of the group based on agreed-upon criteria.]

[§110.34. English Language Arts and Reading, English IV (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The English Language Arts and Reading Texas Essential Knowledge and Skills (TEKS) are organized into the following strands: Reading, where students read and understand a wide variety of literary and informational texts; Writing, where students compose a variety of written texts with a clear controlling idea, coherent organization, and sufficient detail; Research, where students are expected to know how to locate a range of relevant sources and evaluate, synthesize, and present ideas and information; Listening and Speaking, where students listen and respond to the ideas of others while contributing their own ideas in conversations and in groups; and Oral and Written Conventions, where students learn how to use the oral and written conventions of the English language in speaking and writing. The standards are cumulative--students will continue to address earlier standards as needed while they attend to standards for their grade. In English IV, students will engage in activities that build on their prior knowledge and skills in order to strengthen their reading, writing, and oral language skills. Students should read and write on a daily basis.

(2) For students whose first language is not English, the students' native language serves as a foundation for English language acquisition.

(A) English language learners (ELLs) are acquiring English, learning content in English, and learning to read simultaneously. For this reason, it is imperative that reading instruction should be comprehensive and that students receive instruction in phonemic awareness, phonics, decoding, and word attack skills while simultaneously being taught academic vocabulary and comprehension skills and strategies. Reading instruction that enhances ELL's ability to decode unfamiliar words and to make sense of those words in context will expedite their ability to make sense of what they read and learn from reading. Additionally, developing fluency, spelling, and grammatical conventions of academic language must be done in meaningful contexts and not in isolation.

(B) For ELLs, comprehension of texts requires additional scaffolds to support comprehensible input. ELL students should use the knowledge of their first language (e.g., cognates) to further vocabulary development. Vocabulary needs to be taught in the context of connected discourse so that language is meaningful. ELLs must learn how rhetorical devices in English differ from those in their native language. At the same time English learners are learning in English, the focus is on academic English, concepts, and the language structures specific to the content.

(C) During initial stages of English development, ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. However, English language learners' abilities to meet these standards will be influenced by their proficiency in English. While English language learners can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. It is also critical to understand that ELLs with no previous or with interrupted schooling will require explicit and strategic support as they acquire English and learn to learn in English simultaneously.

(3) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge, skills, and student expectations in English IV as described in subsection (b) of this section.

(4) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students

will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to draw conclusions about the nuance in word meanings;

(C) use the relationship between words encountered in analogies to determine their meanings (e.g., synonyms/antonyms, connotation/denotation);

(D) analyze and explain how the English language has developed and been influenced by other languages; and

(E) use general and specialized dictionaries, thesauri, histories of language, books of quotations, and other related references (printed or electronic) as needed.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) compare and contrast works of literature that express a universal theme;

(B) compare and contrast the similarities and differences in classical plays with their modern-day novel, play, or film versions; and

(C) relate the characters, setting, and theme of a literary work to the historical, social, and economic ideas of its time.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to evaluate the changes in sound, form, figurative language, graphics, and dramatic structure in poetry across literary time periods.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support their understanding. Students are expected to evaluate how the structure and elements of drama change in the works of British dramatists across literary periods.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) analyze how complex plot structures (e.g., subplots) and devices (e.g., foreshadowing, flashbacks, suspense) function and advance the action in a work of fiction;

(B) analyze the moral dilemmas and quandaries presented in works of fiction as revealed by the underlying motivations and behaviors of the characters;

(C) compare and contrast the effects of different forms of narration across various genres of fiction; and

(D) demonstrate familiarity with works of fiction by British authors from each major literary period.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to analyze the effect of ambiguity, contradiction, subtlety, paradox, irony, sarcasm, and overstatement in literary essays, speeches, and other forms of literary nonfiction.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to analyze how the author's patterns of imagery, literary allusions, and conceits reveal theme, set tone, and create meaning in metaphors, passages, and literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to analyze the consistency and clarity of the expression of the controlling idea and the ways in which the organizational and rhetorical patterns of text support or confound the author's meaning or purpose.

(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize a text in a manner that captures the author's viewpoint, its main ideas, and its elements without taking a position or expressing an opinion;

(B) explain how authors writing on the same issue reached different conclusions because of differences in assumptions, evidence, reasoning, and viewpoints;

(C) make and defend subtle inferences and complex conclusions about the ideas in text and their organizational patterns; and

(D) synthesize ideas and make logical connections (e.g., thematic links, author analysis) among multiple texts representing similar or different genres and technical sources and support those findings with textual evidence.

(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:

(A) evaluate the merits of an argument, action, or policy by analyzing the relationships (e.g., implication, necessity, sufficiency) among evidence, inferences, assumptions, and claims in text; and

(B) draw conclusions about the credibility of persuasive text by examining its implicit and stated assumptions about an issue as conveyed by the specific use of language.

(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) draw conclusions about how the patterns of organization and hierarchic structures support the understandability of text; and

(B) evaluate the structures of text (e.g., format, headers) for their clarity and organizational coherence and for the effectiveness of their graphic representations.

(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are 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 (e.g., layout, pictures, typeface in print media, images, text, sound in electronic journalism) used in multi-layered media;

(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.

(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;

(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and the rhetorical devices to convey meaning;

(C) revise drafts to clarify meaning and achieve specific rhetorical purposes, consistency of tone, and logical organization by rearranging the words, sentences, and paragraphs to employ tropes (e.g., metaphors, similes, analogies, hyperbole, understatement, rhetorical questions, irony), schemes (e.g., parallelism, antithesis, inverted word order, repetition, reversed structures), and by adding transitional words and phrases;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:

(A) write an engaging story with a well-developed conflict and resolution, a clear theme, complex and non-stereotypical characters, a range of literary strategies (e.g., dialogue, suspense), devices to enhance the plot, and sensory details that define the mood or tone;

(B) write a poem that reflects an awareness of poetic conventions and traditions within different forms (e.g., sonnets, ballads, free verse); and

(C) write a script with an explicit or implicit theme, using a variety of literary techniques.

(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:

(A) write an analytical essay of sufficient length that includes:

(i) effective introductory and concluding paragraphs and a variety of sentence structures;

(ii) rhetorical devices, and transitions between paragraphs;

(iii) a clear thesis statement or controlling idea;

(iv) a clear organizational schema for conveying ideas;

(v) relevant and substantial evidence and well-chosen details;

(vi) information on all relevant perspectives and consideration of the validity, reliability, and relevance of primary and secondary sources; and

(vii) an analysis of views and information that contradict the thesis statement and the evidence presented for it;

(B) write procedural and work-related documents (e.g., résumés, proposals, college applications, operation manuals) that include:

(i) a clearly stated purpose combined with a well-supported viewpoint on the topic;

(ii) appropriate formatting structures (e.g., headings, graphics, white space);

(iii) relevant questions that engage readers and address their potential problems and misunderstandings;

(iv) accurate technical information in accessible language; and

(v) appropriate organizational structures supported by facts and details (documented if appropriate);

(C) write an interpretation of an expository or a literary text that:

(i) advances a clear thesis statement;

(ii) addresses the writing skills for an analytical essay including references to and commentary on quotations from the text;

(iii) analyzes the aesthetic effects of an author's use of stylistic or rhetorical devices;

(iv) identifies and analyzes ambiguities, nuances, and complexities within the text; and

(v) anticipates and responds to readers' questions and contradictory information; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that appeals to a specific audience and synthesizes information from multiple points of view.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay (e.g., evaluative essays, proposals) to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons with various forms of support (e.g., hard evidence, reason, common sense, cultural assumptions);

(B) accurate and honest representation of divergent views (i.e., in the author's own words and not out of context);

(C) an organizing structure appropriate to the purpose, audience, and context;

(D) information on the complete range of relevant perspectives;

(E) demonstrated consideration of the validity and reliability of all primary and secondary sources used;

(F) language attentively crafted to move a disinterested or opposed audience, using specific rhetorical devices to back up assertions (e.g., appeals to logic, emotions, ethical beliefs); and

(G) an awareness and anticipation of audience response that is reflected in different levels of formality, style, and tone.

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of different types of clauses and phrases (e.g., adjectival, noun, adverbial clauses and phrases); and

(B) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to correctly and consistently use conventions of punctuation and capitalization.

(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.

(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:

(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and

(B) formulate a plan for engaging in in-depth research on a complex, multi-faceted topic.

(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:

(A) follow the research plan to gather evidence from experts on the topic and texts written for informed audiences in the field, distinguishing between reliable and unreliable sources and avoiding over-reliance on one source;

(B) systematically organize relevant and accurate information to support central ideas, concepts, and themes, outline ideas into conceptual maps/timelines, and separate factual data from complex inferences; and

(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number), differentiating among primary, secondary, and other sources.

(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:

(A) modify the major research question as necessary to refocus the research plan;

(B) differentiate between theories and the evidence that supports them and determine whether the evidence found is weak or strong and how that evidence helps create a cogent argument; and

(C) critique the research process at each step to implement changes as the need occurs and is identified.

(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into an extended written or oral presentation that:

(A) provides an analysis that supports and develops personal opinions, as opposed to simply restating existing information;

(B) uses a variety of formats and rhetorical strategies to argue for the thesis;

(C) develops an argument that incorporates the complexities of and discrepancies in information from multiple sources and perspectives while anticipating and refuting counter-arguments;

(D) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials; and

(E) is of sufficient length and complexity to address the topic.

~~(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:~~

~~(A) listen responsively to a speaker by framing inquiries that reflect an understanding of the content and by identifying the positions taken and the evidence in support of those positions; and~~

~~(B) assess the persuasiveness of a presentation based on content, diction, rhetorical strategies, and delivery.~~

~~(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to formulate sound arguments by using elements of classical speeches (e.g., introduction, first and second transitions, body, and conclusion), the art of persuasion, rhetorical devices, eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.~~

~~(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, offering ideas or judgments that are purposeful in moving the team towards goals, asking relevant and insightful questions, tolerating a range of positions and ambiguity in decision-making, and evaluating the work of the group based on agreed-upon criteria.~~]

Subchapter D. Other High School English Language Arts and Reading Courses

[~~§110.85. Advanced Placement (AP) International English Language (One Credit).~~]

[~~(a) General requirements. Students shall be awarded one credit for successful completion of this course. Recommended prerequisite: English III.~~

~~(b) Content requirements. Content requirements for Advanced Placement (AP) International English Language are prescribed in the College Board Publication *Advanced Placement Course Description: English,* published by The College Board. This publication may be obtained from the College Board Advanced Placement Program.~~]

Chapter 128. Texas Essential Knowledge and Skills for Spanish Language Arts and Reading and English as a Second Language

Subchapter C. High School

[§128.30. Implementation of Texas Essential Knowledge and Skills for English as a Second Language, High School, Beginning with School Year 2009-2010.]

[(a) The provisions of §128.31 and §128.32 of this subchapter shall be implemented by school districts beginning with the 2009-2010 school year.

(b) Students must develop the ability to comprehend and process material from a wide range of texts. Student expectations for Reading/Comprehension Skills as provided in this subsection are described for the appropriate grade level.

Figure: 19 TAC §128.30(b)]

[§128.31. English I for Speakers of Other Languages (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The essential knowledge and skills as well as the student expectations for English I for Speakers of Other Languages (ESOL I) are described in §74.4 of this title (relating to English Language Proficiency Standards) as well as subsection (b) of this section and are identical to the knowledge and skills and student expectations in Chapter 110 of this title (relating to Texas Essential Knowledge and Skills for English Language Arts and Reading) with additional expectations for English language learners (ELLs).

(2) ESOL I may be substituted for English I as provided by Chapter 74, Subchapter B, of this title (relating to Graduation Requirements). All expectations apply to ESOL I students; however, it is imperative to recognize critical processes and features of second language acquisition and to provide appropriate instruction to enable students to meet these standards.

(3) ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. In addition, ELLs are acquiring English at the same time they are learning content in English. ELLs' abilities to meet these standards will be influenced by their proficiency in English. While ELLs can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. For this reason, comprehension of text requires additional scaffolds that include adapted text (e.g., appropriate for student proficiency level; translations), pictures, realia, glossaries, bilingual dictionaries, thesaurus, and other modes of comprehensible input. ELLs can and should be encouraged to use their knowledge of their first language (e.g., cognates) to enhance their vocabulary development, and vocabulary needs to be in the context of connected discourse so that it is meaningful. Strategic use of the student's first language is important to ensure linguistic, affective, cognitive, and academic development in English.

(4) Research consistently shows that a strong foundation in the native language of an ELL facilitates learning in English (Collier & Thomas, 1997; Cummins, 2001). Students can develop cognition, learn, and achieve best when they can understand the language of instruction (August, Calderon, & Carlo, 2003). Students can be expected to transfer those skills to English and progress rapidly in learning in English.

(5) For newcomers in secondary schooling, the challenge then is not only learning English, but learning in English. ELLs are challenged in working with linguistic, cognitive, and academic development in all of their coursework and in a new language. Some newcomers exhibit additional first language and/or academic needs due to their previous educational experiences that may include interrupted and/or limited schooling. Strategic use of the student's first language is important to ensure linguistic, affective, cognitive, and academic development in English.

especially for students who are newcomers and at beginning levels of English language proficiency. Their academic success depends on their ability to use academic language.

(6) Second language acquisition is a complex process that even under optimal conditions takes a long time (Collier, 1997). It is important to understand that limited knowledge of English structure and vocabulary is neither related to the students' intellectual capabilities nor their ability to use higher-order thinking skills. The development of receptive (listening/reading) and expressive (speaking/writing) skills in second language learners may be at different stages. In some instances, second language learners undergo silent periods of varying durations when they first begin to learn a new language. Students often understand more than they can produce and may repeat words in sentences that they do not entirely understand. Second language learners may also draw upon the resources of their language and culture as they acquire a new language and culture.

(7) In order for ELLs to be successful, they must acquire both social and academic language proficiency in English. Social language proficiency in English consists of the English needed for daily social interactions. Academic language proficiency consists of the English needed to think critically, understand and learn new concepts, process complex academic material, and interact and communicate in English academic settings.

(8) Academic language is a major factor in academic success. Academic language and grammatical structures are used across all subject areas and is specific to the content area, such as language arts, mathematics, science, and social studies. Current research stresses the importance of effectively integrating second language acquisition with quality content area education in order to ensure that ELLs acquire social and academic language proficiency in English, learn the knowledge and skills, and reach their full academic potential. This must also be provided in a manner that is linguistically accommodated (contextualized, communicated, sequenced, and scaffolded) commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum.

(9) ELLs require focused, targeted, and systematic second language acquisition to provide them with the foundation of English language vocabulary, grammar, syntax, and English mechanics necessary to support content based instruction and accelerated learning of English. Literacy development across the content areas is essential in building academic skills in a second language and can accelerate the learning of both English language skills and higher order thinking skills.

(10) ELL students are at different stages of language acquisition. Proficiency levels are not grade specific: Beginning, Intermediate, Advanced, and Advanced High. The ELL student may exhibit different proficiency levels within the four language components: listening, speaking, reading, and writing. A student may exhibit oral skills at the advanced level, reading skills at the intermediate level, and writing skills at the beginning level. Understanding the level of English language proficiency of the student is critical in order for the student to have access to the curriculum. The proficiency level of the student determines the accommodations in language that must be made (e.g., adapted text appropriate for student proficiency level; translations) as well as, determines additional scaffolds (e.g., pictures, realia, glossaries, bilingual dictionaries, thesaurus) in order to learn the academic content. Any combination of the language components is possible and is affected by opportunities for interaction in and outside of school. For further guidance in second language acquisition, refer to the English language proficiency standards (ELPS) described in §74.4 of this title.

(A) Beginning: Students associate utterances with meaning as they make inferences based on actions, visuals, text, tone of voice, and inflections. Receptive language with some comprehension is acquired earlier than oral production. Beginning students produce spoken English with increasing accuracy and fluency to convey appropriate meaning. They read English using graphophonic cues, syntax, visuals, the context of the text, and their prior knowledge of language and structure of text.

(B) Intermediate: Students use the listening process to improve comprehension and oral skills in English. Through listening and speaking in meaningful interactions, they clarify, distinguish, and evaluate ideas and responses in a variety of situations. Intermediate

students participate successfully in academic, social, and work contexts in English using the process of speaking to create, clarify, critique, and evaluate ideas and responses. Intermediate students read English using and applying developmental vocabulary to increase comprehension and produce written text to address a variety of audiences and purposes.

(C) Advanced: Students, through developmental listening skills, actively expand their vocabulary to evaluate and analyze spoken English for a variety of situations and purposes. These students participate in a variety of situations using spoken English to create, clarify, critique, and evaluate ideas and responses. Advanced students continually develop reading skills for increasing reading proficiency in content area texts for a variety of purposes and generate written text for different audiences in a variety of modes to convey appropriate meaning according to their level of proficiency.

(D) Advanced High: Students' reading, speaking, and writing abilities are comparable to those of their native English speaking peers. They understand grade appropriate English as it is used in academic and social settings. These students use language skills on their grade level in the academic subject areas with minimal interruptions and they use abstract and content based vocabulary effectively. Advanced High students continually use the English language to build additional foundational reading skills such as fluency and prosody as well as higher-order comprehension skills. These students have a strong command of English language structures necessary to address writing at appropriate grade levels.

(11) Students enrolled in ESOL I continue to increase and refine their communication skills. High school students are expected to plan, draft, and complete written compositions on a regular basis. Students edit their papers for clarity, engaging language, and the correct use of the conventions and mechanics of written English and, with increasing accuracy, produce final, error-free drafts. In English I, students practice all forms of writing. An emphasis is placed on organizing logical arguments with clearly expressed related definitions, thesis, and evidence. Students write to persuade and to report and describe. English I students read extensively in multiple genres from world literature such as reading selected stories, dramas, novels, and poetry originally written in English or translated to English from oriental, classical Greek, European, African, South American, and North American cultures. Students learn literary forms and terms associated with selections being read. Students interpret the possible influences of the historical context on a literary work.

(12) The knowledge and skills and/or student expectations that are applicable specifically to ELLs are indicated in §74.4 of this title as well as in subsection (b) of this section.

(13) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge and skills as well as the student expectations in English I as described in subsection (b) of this section.

(14) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of grade-level technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to distinguish between the denotative and connotative meanings of words;

(C) produce analogies that describe a function of an object or its description;

(D) describe the origins and meanings of foreign words or phrases used frequently in written English (e.g., *caveat emptor, carte blanche, tete a tete, pas de deux, bon appetit, quid pro quo*); and

(E) use a dictionary, a glossary, or a thesaurus (printed or electronic) to determine or confirm the meanings of words and phrases, including their connotations and denotations, and their etymology.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) analyze how the genre of texts with similar themes shapes meaning;

(B) analyze the influence of mythic, classical and traditional literature on 20th and 21st century literature; and

(C) relate the figurative language of a literary work to its historical and cultural setting.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to analyze the effects of diction and imagery (e.g., controlling images, figurative language, understatement, overstatement, irony, paradox) in poetry.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support their understanding. Students are expected to explain how dramatic conventions (e.g., monologues, soliloquies, dramatic irony) enhance dramatic text.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) analyze non-linear plot development (e.g., flashbacks, foreshadowing, sub-plots, parallel plot structures) and compare it to linear plot development;

(B) analyze how authors develop complex yet believable characters in works of fiction through a range of literary devices, including character foils;

(C) analyze the way in which a work of fiction is shaped by the narrator's point of view; and

(D) demonstrate familiarity with works by authors from non-English-speaking literary traditions with emphasis on classical literature.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to analyze how literary essays interweave personal examples and ideas with factual information to explain, present a perspective, or describe a situation or event.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to explain the role of irony, sarcasm, and paradox in literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students

~~are expected to explain the controlling idea and specific purpose of an expository text and distinguish the most important from the less important details that support the author's purpose.~~

~~(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:~~

~~(A) summarize text and distinguish between a summary that captures the main ideas and elements of a text and a critique that takes a position and expresses an opinion;~~

~~(B) differentiate between opinions that are substantiated and unsubstantiated in the text;~~

~~(C) make subtle inferences and draw complex conclusions about the ideas in text and their organizational patterns; and~~

~~(D) synthesize and make logical connections between ideas and details in several texts selected to reflect a range of viewpoints on the same topic and support those findings with textual evidence.~~

~~(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:~~

~~(A) analyze the relevance, quality, and credibility of evidence given to support or oppose an argument for a specific audience; and~~

~~(B) analyze famous speeches for the rhetorical structures and devices used to convince the reader of the authors' propositions.~~

~~(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:~~

~~(A) analyze the clarity of the objective(s) of procedural text (e.g., consider reading instructions for software, warranties, consumer publications); and~~

~~(B) analyze factual, quantitative, or technical data presented in multiple graphical sources.~~

~~(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are expected to:~~

~~(A) compare and contrast how events are presented and information is communicated by visual images (e.g., graphic art, illustrations, news photographs) versus non-visual texts;~~

~~(B) analyze how messages in media are conveyed through visual and sound techniques (e.g., editing, reaction shots, sequencing, background music);~~

~~(C) compare and contrast coverage of the same event in various media (e.g., newspapers, television, documentaries, blogs, Internet); and~~

~~(D) evaluate changes in formality and tone within the same medium for specific audiences and purposes.~~

~~(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;~~

~~(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and the rhetorical devices used to convey meaning;~~

(C) revise drafts to improve style, word choice, figurative language, sentence variety, and subtlety of meaning after rethinking how well questions of purpose, audience, and genre have been addressed;

(D) edit drafts for grammar, mechanics, and spelling; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.

(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:

(A) write an engaging story with a well-developed conflict and resolution, interesting and believable characters, and a range of literary strategies (e.g., dialogue, suspense) and devices to enhance the plot;

(B) write a poem using a variety of poetic techniques (e.g., structural elements, figurative language) and a variety of poetic forms (e.g., sonnets, ballads); and

(C) write a script with an explicit or implicit theme and details that contribute to a definite mood or tone.

(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:

(A) write an analytical essay of sufficient length that includes:

(i) effective introductory and concluding paragraphs and a variety of sentence structures;

(ii) rhetorical devices and transitions between paragraphs;

(iii) a controlling idea or thesis;

(iv) an organizing structure appropriate to purpose, audience, and context; and

(v) relevant information and valid inferences;

(B) write procedural or work-related documents (e.g., instructions, e-mails, correspondence, memos, project plans) that include:

(i) organized and accurately conveyed information; and

(ii) reader-friendly formatting techniques;

(C) write an interpretative response to an expository or a literary text (e.g., essay or review) that:

(i) extends beyond a summary and literal analysis;

(ii) addresses the writing skills for an analytical essay and provides evidence from the text using embedded quotations; and

(iii) analyzes the aesthetic effects of an author's use of stylistic or rhetorical devices; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that conveys a distinctive point of view and appeals to a specific audience.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons supported by precise and relevant evidence;

(B) consideration of the whole range of information and views on the topic and accurate and honest representation of these views;

(C) counter-arguments based on evidence to anticipate and address objections;

(D) an organizing structure appropriate to the purpose, audience, and context; and

(E) an analysis of the relative value of specific data, facts, and ideas.

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of the following parts of speech in the context of reading, writing, and speaking:

(i) more complex active and passive tenses and verbals (gerunds, infinitives, participles);

(ii) restrictive and nonrestrictive relative clauses; and

(iii) reciprocal pronouns (e.g., each other, one another);

(B) identify and use the subjunctive mood to express doubts, wishes, and possibilities; and

(C) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to:

(A) use conventions of capitalization; and

(B) use correct punctuation marks including:

(i) quotation marks to indicate sarcasm or irony;

(ii) comma placement in nonrestrictive phrases, clauses, and contrasting expressions; and

(iii) dashes to emphasize parenthetical information.

(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.

(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:

(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and

(B) formulate a plan for engaging in research on a complex, multi-faceted topic.

(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:

(A) follow the research plan to compile data from authoritative sources in a manner that identifies the major issues and debates within the field of inquiry;

(B) organize information gathered from multiple sources to create a variety of graphics and forms (e.g., notes, learning logs); and

(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number).

(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:

(A) modify the major research question as necessary to refocus the research plan;

(B) evaluate the relevance of information to the topic and determine the reliability, validity, and accuracy of sources (including Internet sources) by examining their authority and objectivity; and

(C) critique the research process at each step to implement changes as the need occurs and is identified.

(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into a written or an oral presentation that:

(A) marshals evidence in support of a clear thesis statement and related claims;

(B) provides an analysis for the audience that reflects a logical progression of ideas and a clearly stated point of view;

(C) uses graphics and illustrations to help explain concepts where appropriate;

(D) uses a variety of evaluative tools (e.g., self-made rubrics, peer reviews, teacher and expert evaluations) to examine the quality of the research; and

(E) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials.

(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen responsively to a speaker by taking notes that summarize, synthesize, or highlight the speaker's ideas for critical reflection and by asking questions related to the content for clarification and elaboration;

(B) follow and give complex oral instructions to perform specific tasks, answer questions, solve problems, and complete processes; and

(C) evaluate the effectiveness of a speaker's main and supporting ideas.

(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to give presentations using informal, formal, and technical language effectively to meet the needs of audience, purpose, and occasion, employing eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.

(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, building on the ideas of others, contributing relevant information, developing a plan for consensus-building, and setting ground rules for decision-making.

(27) Second language acquisition/learning strategies. The ESOL I student uses language learning strategies to develop an awareness of his/her own learning processes in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) use prior knowledge and experiences to understand meanings in English;

(B) monitor oral and written language production and employ self-corrective techniques or other resources;

(C) use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary;

(D) speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known);

(E) internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment;

(F) use accessible language and learn new and essential language in the process;

(G) demonstrate an increasing ability to distinguish between formal and informal English and an increasing knowledge of when to use each one commensurate with grade-level learning expectations;

(H) develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations; and

(I) make connections across content areas and use and reuse language and concepts in different ways.

(28) Second language acquisition/listening. The ESOL I student listens to a variety of speakers, including teachers, peers, and electronic media, to gain an increasing level of comprehension and appreciation for newly acquired language in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) distinguish sounds and intonation patterns of English with increasing ease;

(B) recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters;

(C) learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions;

(D) monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed;

(E) use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language;

(F) listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD-ROM to build and reinforce concept and language attainment;

(G) understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar;

(H) understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations;

(I) demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs;

(J) understand basic structures, expressions, and vocabulary such as school environment, greetings, questions, and directions;

(K) analyze and evaluate spoken discourse for appropriateness of purpose with a variety of audiences such as formal, consultative, casual, and intimate language registers; and

(L) infer meaning by making associations of utterances with actions, visuals, and the context of the situation.

(29) Second language acquisition/speaking. The ESOL I student speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using developmental vocabulary with increasing fluency and accuracy in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible;

(B) expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, objects, events, and basic concepts such as numbers, days of the week, food, occupations, and time by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication;

(C) speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired;

(D) speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency;

(E) share information in cooperative learning interactions;

(F) ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts such as directions and address as well as name, age, and nationality, to using abstract and content-based vocabulary during extended speaking assignments;

(G) express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics;

(H) narrate, describe, and explain with increasing specificity and detail as more English is acquired;

(I) adapt spoken language appropriately for formal and informal purposes;

(J) respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment;

(K) share prior knowledge with peers and others to facilitate communication and to foster respect for others; and

(L) describe the immediate surroundings such as classroom, school, and home.

(30) Second language acquisition/reading. The ESOL I student reads a variety of texts for a variety of purposes with an increasing level of comprehension in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words;

(B) recognize directionality of English reading such as left to right and top to bottom;

(C) develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials;

(D) use prereading supports such as graphic organizers, illustrations, and pre-taught topic-related vocabulary and other prereading activities to enhance comprehension of written text;

(E) read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned;

(F) use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language;

(G) demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs;

(H) read silently with increasing ease for longer periods;

(I) demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs;

(J) demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs;

(K) demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade level needs;

(L) read authentic literature and use kinesthetic visual support to develop vocabulary, structures, and build background knowledge needed to comprehend increasingly challenging language;

(M) use verbal cueing strategies such as pauses and exaggerated intonation for key words and non-verbal cueing strategies such as facial expressions and gestures to enhance the reading experience; and

(N) retell, role play, and/or visually illustrate the order of events.

(31) Second language acquisition/writing. The ESOL I student writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) learn relationships between sounds and letters of the English language to represent sounds when writing in English;

(B) write using newly acquired basic vocabulary and content-based grade-level vocabulary;

(C) spell familiar English words with increasing accuracy and employ English spelling patterns and rules with increasing accuracy as more English is acquired;

(D) edit writing for standard grammar and usage, including subject-verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade-level expectations as more English is acquired;

(E) employ increasingly complex grammatical structures in content area writing commensurate with grade-level expectations such as:

(i) using correct verbs, tenses, auxiliaries, and pronouns/antecedents;

(ii) using nominative, objective, and possessive case (apostrophe *s*) correctly;

(iii) demonstrating knowledge of parts of speech; and

(iv) using negatives and contractions correctly;

(F) write using a variety of grade-appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired;

(G) narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired;

(H) use basic capitalization and punctuation correctly such as capitalizing names and first letters in sentences and using periods, question marks, and exclamation points;

(I) use graphic organizers as pre-writing activity to demonstrate prior knowledge, to add new information, and to prepare to write;

(J) write with more proficient use of orthographic patterns such as digraphs and consonant blends with the initial s- and rules such as "qu" together, consonant doubling, dropping final "e," and changing "y" to "i"; and

(K) develop drafts by categorizing ideas, organizing them into sentences and paragraphs, and blending paragraphs within larger units of text.]

[§128.32. English II for Speakers of Other Languages (One Credit), Beginning with School Year 2009-2010.]

[(a) Introduction.

(1) The essential knowledge and skills as well as the student expectations for English II for Speakers of Other Languages (ESOL II) are described in §74.4 of this title (relating to English Language Proficiency Standards) as well as subsection (b) of this section and are identical to the knowledge and skills and student expectations in Chapter 110 of this title (relating to Texas Essential Knowledge and Skills for English Language Arts and Reading) with additional expectations for English language learners (ELLs).

(2) ESOL II may be substituted for English II as provided by Chapter 74, Subchapter B, of this title (relating to Graduation Requirements). All expectations apply to ESOL II students; however, it is imperative to recognize critical processes and features of second language acquisition and to provide appropriate instruction to enable students to meet these standards.

(3) ELLs are expected to meet standards in a second language that many monolingual English speakers find difficult to meet in their native language. In addition, ELLs are acquiring English at the same time they are learning content in English. ELLs' abilities to meet these standards will be influenced by their proficiency in English. While ELLs can analyze, synthesize, and evaluate, their level of English proficiency may impede their ability to demonstrate this knowledge during the initial stages of English language acquisition. For this reason, comprehension of text requires additional scaffolds that include adapted text (e.g., appropriate for student proficiency level; translations), pictures, realia, glossaries, bilingual dictionaries, thesaurus, and other modes of comprehensible input. ELL students can and should be encouraged to use their knowledge of their first language (e.g., cognates) to enhance their vocabulary development, and vocabulary needs to be in the context of connected discourse so that it is meaningful. Strategic use of the student's first language is important to ensure linguistic, affective, cognitive, and academic development in English.

(4) Research consistently shows that a strong foundation in the native language of an ELL facilitates learning in English (Collier & Thomas, 1997; Cummins, 2001). Students can develop cognition, learn, and achieve best when they can understand the language of instruction (August, Calderon, & Carlo, 2003). Students can be expected to transfer those skills to English and progress rapidly in learning in English.

(5) For newcomers in secondary schooling, the challenge then is not only learning English, but learning in English. ELLs are challenged in working with linguistic, cognitive, and academic development in all of their coursework and in a new language. Some newcomers exhibit additional first language and/or academic needs due to their previous educational experiences that may include interrupted and/or limited schooling. Strategic use of the student's first language is important to ensure linguistic, affective, cognitive, and academic development in English, especially for students who are newcomers and at beginning levels of English language proficiency. Their academic success depends on their ability to use academic language.

(6) Second language acquisition is a complex process that even under optimal conditions takes a long time (Collier, 1997). It is important to understand that limited knowledge of English structure and vocabulary is neither related to the students' intellectual capabilities nor their ability to use higher-order thinking skills. The development of receptive (listening/reading) and expressive (speaking/writing) skills in second language learners may be at different stages. In some instances, second language learners undergo silent periods of varying durations when they first begin to learn a new language. Students often understand more than they can produce and may repeat words in sentences that they do not entirely understand. Second language learners may also draw upon the resources of their language and culture as they acquire a new language and culture.

(7) In order for ELLs to be successful, they must acquire both social and academic language proficiency in English. Social language proficiency in English consists of the English needed for daily social interactions. Academic language proficiency consists of the English needed to think critically, understand and learn new concepts, process complex academic material, and interact and communicate in English academic settings.

(8) Academic language is a major factor in academic success. Academic language and grammatical structures are used across all subject areas and is specific to the content area, such as language arts, mathematics, science, and social studies. Current research stresses the importance of effectively integrating second language acquisition with quality content area education in order to ensure that ELLs acquire social and academic language proficiency in English, learn the knowledge and skills, and reach their full academic potential. This must also be provided in a manner that is linguistically accommodated (contextualized, communicated, sequenced, and scaffolded) commensurate with the student's levels of English language proficiency to ensure that the student learns the knowledge and skills in the required curriculum.

(9) ELLs require focused, targeted, and systematic second language acquisition to provide them with the foundation of English language vocabulary, grammar, syntax, and English mechanics necessary to support content-based instruction and accelerated learning of English. Literacy development across the content areas is essential in building academic skills in a second language and can accelerate the learning of both English language skills and higher-order thinking skills.

(10) ELL students are at different stages of language acquisition. Proficiency levels are not grade-specific: Beginning, Intermediate, Advanced, and Advanced High. The ELL student may exhibit different proficiency levels within the four language components: listening, speaking, reading, and writing. A student may exhibit oral skills at the advanced level, reading skills at the intermediate level, and writing skills at the beginning level. Understanding the level of English language proficiency of the student is critical in order for the student to have access to the curriculum. The proficiency level of the student determines the accommodations in language that must be made (e.g., adapted text appropriate for student proficiency level; translations) as well as, determines additional scaffolds (e.g., pictures, realia, glossaries, bilingual dictionaries, thesaurus) in order to learn the academic content. Any combination of the language components is possible and is affected by opportunities for interaction in and outside of school. For further guidance in second language acquisition, refer to the English language proficiency standards (ELPS) described in §74.4 of this title.

(A) Beginning: Students associate utterances with meaning as they make inferences based on actions, visuals, text, tone of voice, and inflections. Receptive language with some comprehension is acquired earlier than oral production. Beginning students produce spoken English with increasing accuracy and fluency to convey appropriate meaning.

They read English using graphophonic cues, syntax, visuals, the context of the text, and their prior knowledge of language and structure of text.

(B) Intermediate: Students use the listening process to improve comprehension and oral skills in English. Through listening and speaking in meaningful interactions, they clarify, distinguish, and evaluate ideas and responses in a variety of situations. Intermediate students participate successfully in academic, social, and work contexts in English using the process of speaking to create, clarify, critique, and evaluate ideas and responses. Intermediate students read English using and applying developmental vocabulary to increase comprehension and produce written text to address a variety of audiences and purposes.

(C) Advanced: Students, through developmental listening skills, actively expand their vocabulary to evaluate and analyze spoken English for a variety of situations and purposes. These students participate in a variety of situations using spoken English to create, clarify, critique, and evaluate ideas and responses. Advanced students continually develop reading skills for increasing reading proficiency in content area texts for a variety of purposes and generate written text for different audiences in a variety of modes to convey appropriate meaning according to their level of proficiency.

(D) Advanced High: Students' reading, speaking, and writing abilities are comparable to those of their native English speaking peers. They understand grade appropriate English as it is used in academic and social settings. These students use language skills on their grade level in the academic subject areas with minimal interruptions and they use abstract and content based vocabulary effectively. Advanced High students continually use the English language to build additional foundational reading skills such as fluency and prosody as well as higher order comprehension skills. These students have a strong command of English language structures necessary to address writing at appropriate grade levels.

(11) Students enrolled in ESOL II continue to increase and refine their communication skills. High school students are expected to plan, draft, and complete written compositions on a regular basis. Students edit their papers for clarity, engaging language, and the correct use of the conventions and mechanics of written English and, with increasing accuracy, produce final, error-free drafts. In English II, students practice all forms of writing. An emphasis is placed on organizing logical arguments with clearly expressed related definitions, thesis, and evidence. Students write to persuade and to report and describe. English II students read extensively in multiple genres from world literature such as reading selected stories, dramas, novels, and poetry originally written in English or translated to English from oriental, classical Greek, European, African, South American, and North American cultures. Students learn literary forms and terms associated with selections being read. Students interpret the possible influences of the historical context on a literary work.

(12) The knowledge and skills and/or student expectations that are applicable specifically to ELLs are indicated in §74.4 of this title as well as in subsection (b) of this section.

(13) To meet Public Education Goal 1 of the Texas Education Code, §4.002, which states, "The students in the public education system will demonstrate exemplary performance in the reading and writing of the English language," students will accomplish the essential knowledge and skills as well as the student expectations in English II as described in subsection (b) of this section.

(14) To meet Texas Education Code, §28.002(h), which states, "... each school district shall foster the continuation of the tradition of teaching United States and Texas history and the free enterprise system in regular subject matter and in reading courses and in the adoption of textbooks," students will be provided oral and written narratives as well as other informational texts that can help them to become thoughtful, active citizens who appreciate the basic democratic values of our state and nation.

(b) Knowledge and skills.

(1) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(A) determine the meaning of grade-level technical academic English words in multiple content areas (e.g., science, mathematics, social studies, the arts) derived from Latin, Greek, or other linguistic roots and affixes;

(B) analyze textual context (within a sentence and in larger sections of text) to distinguish between the denotative and connotative meanings of words;

(C) infer word meaning through the identification and analysis of analogies and other word relationships;

(D) show the relationship between the origins and meaning of foreign words or phrases used frequently in written English and historical events or developments (e.g., *glasnost, avant-garde, coup d'état*); and

(E) use a dictionary, a glossary, or a thesaurus (printed or electronic) to determine or confirm the meanings of words and phrases, including their connotations and denotations, and their etymology.

(2) Reading/Comprehension of Literary Text/Theme and Genre. Students analyze, make inferences and draw conclusions about theme and genre in different cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to:

(A) compare and contrast differences in similar themes expressed in different time periods;

(B) analyze archetypes (e.g., journey of a hero, tragic flaw) in mythic, traditional and classical literature; and

(C) relate the figurative language of a literary work to its historical and cultural setting.

(3) Reading/Comprehension of Literary Text/Poetry. Students understand, make inferences and draw conclusions about the structure and elements of poetry and provide evidence from text to support their understanding. Students are expected to analyze the structure or prosody (e.g., meter, rhyme scheme) and graphic elements (e.g., line length, punctuation, word position) in poetry.

(4) Reading/Comprehension of Literary Text/Drama. Students understand, make inferences and draw conclusions about the structure and elements of drama and provide evidence from text to support their understanding. Students are expected to analyze how archetypes and motifs in drama affect the plot of plays.

(5) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) analyze isolated scenes and their contribution to the success of the plot as a whole in a variety of works of fiction;

(B) analyze differences in the characters' moral dilemmas in works of fiction across different countries or cultures;

(C) evaluate the connection between forms of narration (e.g., unreliable, omniscient) and tone in works of fiction; and

(D) demonstrate familiarity with works by authors from non-English-speaking literary traditions with emphasis on 20th century world literature.

(6) Reading/Comprehension of Literary Text/Literary Nonfiction. Students understand, make inferences and draw conclusions about the varied structural patterns and features of literary nonfiction and provide evidence from text to support their understanding. Students are expected to evaluate the role of syntax and diction and the effect of voice, tone, and imagery on a speech, literary essay, or other forms of literary nonfiction.

(7) Reading/Comprehension of Literary Text/Sensory Language. Students understand, make inferences and draw conclusions about how an author's sensory language creates imagery in literary text and provide evidence from text to support their understanding. Students are expected to explain the function of symbolism, allegory, and allusions in literary works.

(8) Reading/Comprehension of Informational Text/Culture and History. Students analyze, make inferences and draw conclusions about the author's purpose in cultural, historical, and contemporary contexts and provide evidence from the text to support their understanding. Students are expected to analyze the controlling idea and specific purpose of a passage and the textual elements that support and elaborate it, including both the most important details and the less important details.

(9) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize text and distinguish between a summary and a critique and identify non-essential information in a summary and unsubstantiated opinions in a critique;

(B) distinguish among different kinds of evidence (e.g., logical, empirical, anecdotal) used to support conclusions and arguments in texts;

(C) make and defend subtle inferences and complex conclusions about the ideas in text and their organizational patterns; and

(D) synthesize and make logical connections between ideas and details in several texts selected to reflect a range of viewpoints on the same topic and support those findings with textual evidence.

(10) Reading/Comprehension of Informational Text/Persuasive Text. Students analyze, make inferences and draw conclusions about persuasive text and provide evidence from text to support their analysis. Students are expected to:

(A) explain shifts in perspective in arguments about the same topic and evaluate the accuracy of the evidence used to support the different viewpoints within those arguments; and

(B) analyze contemporary political debates for such rhetorical and logical fallacies as appeals to commonly held opinions, false dilemmas, appeals to pity, and personal attacks.

(11) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) evaluate text for the clarity of its graphics and its visual appeal; and

(B) synthesize information from multiple graphical sources to draw conclusions about the ideas presented (e.g., maps, charts, schematics).

(12) Reading/Media Literacy. Students use comprehension skills to analyze how words, images, graphics, and sounds work together in various forms to impact meaning. Students will continue to apply earlier standards with greater depth in increasingly more complex texts. Students are expected to:

(A) evaluate how messages presented in media reflect social and cultural views in ways different from traditional texts;

(B) analyze how messages in media are conveyed through visual and sound techniques (e.g., editing, reaction shots, sequencing, background music);

(C) examine how individual perception or bias in coverage of the same event influences the audience; and

(D) evaluate changes in formality and tone within the same medium for specific audiences and purposes.

~~(13) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are 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 (e.g., discussion, background reading, personal interests, interviews), and developing a thesis or controlling idea;~~

~~(B) structure ideas in a sustained and persuasive way (e.g., using outlines, note taking, graphic organizers, lists) and develop drafts in timed and open-ended situations that include transitions and rhetorical devices used to convey meaning;~~

~~(C) revise drafts to improve style, word choice, figurative language, sentence variety, and subtlety of meaning after rethinking how well questions of purpose, audience, and genre have been addressed;~~

~~(D) edit drafts for grammar, mechanics, and spelling; and~~

~~(E) revise final draft in response to feedback from peers and teacher and publish written work for appropriate audiences.~~

~~(14) Writing/Literary Texts. Students write literary texts to express their ideas and feelings about real or imagined people, events, and ideas. Students are responsible for at least two forms of literary writing. Students are expected to:~~

~~(A) write an engaging story with a well-developed conflict and resolution, interesting and believable characters, a range of literary strategies (e.g., dialogue, suspense) and devices to enhance the plot, and sensory details that define the mood or tone;~~

~~(B) write a poem using a variety of poetic techniques (e.g., structural elements, figurative language) and a variety of poetic forms (e.g., sonnets, ballads); and~~

~~(C) write a script with an explicit or implicit theme and details that contribute to a definite mood or tone.~~

~~(15) Writing/Expository and Procedural Texts. Students write expository and procedural or work-related texts to communicate ideas and information to specific audiences for specific purposes. Students are expected to:~~

~~(A) write an analytical essay of sufficient length that includes:~~

~~(i) effective introductory and concluding paragraphs and a variety of sentence structures;~~

~~(ii) rhetorical devices and transitions between paragraphs;~~

~~(iii) a thesis or controlling idea;~~

~~(iv) an organizing structure appropriate to purpose, audience, and context;~~

~~(v) relevant evidence and well-chosen details; and~~

~~(vi) distinctions about the relative value of specific data, facts, and ideas that support the thesis statement;~~

~~(B) write procedural or work-related documents (e.g., instructions, e-mails, correspondence, memos, project plans) that include:~~

~~(i) organized and accurately conveyed information;~~

~~(ii) reader-friendly formatting techniques; and~~

~~(iii) anticipation of readers' questions;~~

~~(C) write an interpretative response to an expository or a literary text (e.g., essay or review) that:~~

(i) extends beyond a summary and literal analysis;

(ii) addresses the writing skills for an analytical essay and provides evidence from the text using embedded quotations; and

(iii) analyzes the aesthetic effects of an author's use of stylistic and rhetorical devices; and

(D) produce a multimedia presentation (e.g., documentary, class newspaper, docudrama, infomercial, visual or textual parodies, theatrical production) with graphics, images, and sound that conveys a distinctive point of view and appeals to a specific audience.

(16) Writing/Persuasive Texts. Students write persuasive texts to influence the attitudes or actions of a specific audience on specific issues. Students are expected to write an argumentative essay to the appropriate audience that includes:

(A) a clear thesis or position based on logical reasons supported by precise and relevant evidence;

(B) consideration of the whole range of information and views on the topic and accurate and honest representation of these views (i.e., in the author's own words and not out of context);

(C) counter-arguments based on evidence to anticipate and address objections;

(D) an organizing structure appropriate to the purpose, audience, and context;

(E) an analysis of the relative value of specific data, facts, and ideas; and

(F) a range of appropriate appeals (e.g., descriptions, anecdotes, case studies, analogies, illustrations).

(17) Oral and Written Conventions/Conventions. Students understand the function of and use the conventions of academic language when speaking and writing. Students will continue to apply earlier standards with greater complexity. Students are expected to:

(A) use and understand the function of the following parts of speech in the context of reading, writing, and speaking:

(i) more complex active and passive tenses and verbals (gerunds, infinitives, participles);

(ii) restrictive and nonrestrictive relative clauses; and

(iii) reciprocal pronouns (e.g., each other, one another);

(B) identify and use the subjunctive mood to express doubts, wishes, and possibilities; and

(C) use a variety of correctly structured sentences (e.g., compound, complex, compound-complex).

(18) Oral and Written Conventions/Handwriting, Capitalization, and Punctuation. Students write legibly and use appropriate capitalization and punctuation conventions in their compositions. Students are expected to:

(A) use conventions of capitalization; and

(B) use correct punctuation marks including:

(i) comma placement in nonrestrictive phrases, clauses, and contrasting expressions;

(ii) quotation marks to indicate sarcasm or irony; and

(iii) dashes to emphasize parenthetical information.

~~(19) Oral and Written Conventions/Spelling. Students spell correctly. Students are expected to spell correctly, including using various resources to determine and check correct spellings.~~

~~(20) Research/Research Plan. Students ask open-ended research questions and develop a plan for answering them. Students are expected to:~~

~~(A) brainstorm, consult with others, decide upon a topic, and formulate a major research question to address the major research topic; and~~

~~(B) formulate a plan for engaging in research on a complex, multi-faceted topic.~~

~~(21) Research/Gathering Sources. Students determine, locate, and explore the full range of relevant sources addressing a research question and systematically record the information they gather. Students are expected to:~~

~~(A) follow the research plan to compile data from authoritative sources in a manner that identifies the major issues and debates within the field of inquiry;~~

~~(B) organize information gathered from multiple sources to create a variety of graphics and forms (e.g., notes, learning logs); and~~

~~(C) paraphrase, summarize, quote, and accurately cite all researched information according to a standard format (e.g., author, title, page number).~~

~~(22) Research/Synthesizing Information. Students clarify research questions and evaluate and synthesize collected information. Students are expected to:~~

~~(A) modify the major research question as necessary to refocus the research plan;~~

~~(B) evaluate the relevance of information to the topic and determine the reliability, validity, and accuracy of sources (including Internet sources) by examining their authority and objectivity; and~~

~~(C) critique the research process at each step to implement changes as the need occurs and is identified.~~

~~(23) Research/Organizing and Presenting Ideas. Students organize and present their ideas and information according to the purpose of the research and their audience. Students are expected to synthesize the research into a written or an oral presentation that:~~

~~(A) marshals evidence in support of a clear thesis statement and related claims;~~

~~(B) provides an analysis for the audience that reflects a logical progression of ideas and a clearly stated point of view;~~

~~(C) uses graphics and illustrations to help explain concepts where appropriate;~~

~~(D) uses a variety of evaluative tools (e.g., self-made rubrics, peer reviews, teacher and expert evaluations) to examine the quality of the research; and~~

~~(E) uses a style manual (e.g., *Modern Language Association*, *Chicago Manual of Style*) to document sources and format written materials.~~

~~(24) Listening and Speaking/Listening. Students will use comprehension skills to listen attentively to others in formal and informal settings. Students will continue to apply earlier standards with greater complexity. Students are expected to:~~

~~(A) listen responsively to a speaker by taking notes that summarize, synthesize, or highlight the speaker's ideas for critical reflection and by asking questions related to the content for clarification and elaboration;~~

~~(B) follow and give complex oral instructions to perform specific tasks, answer questions, solve problems, and complete processes; and~~

~~(C) evaluate how the style and structure of a speech support or undermine its purpose or meaning.~~

(25) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students will continue to apply earlier standards with greater complexity. Students are expected to advance a coherent argument that incorporates a clear thesis and a logical progression of valid evidence from reliable sources and that employs eye contact, speaking rate (e.g., pauses for effect), volume, enunciation, purposeful gestures, and conventions of language to communicate ideas effectively.

(26) Listening and Speaking/Teamwork. Students work productively with others in teams. Students will continue to apply earlier standards with greater complexity. Students are expected to participate productively in teams, building on the ideas of others, contributing relevant information, developing a plan for consensus-building, and setting ground rules for decision-making.

(27) Second language acquisition/learning strategies. The ESOL II student uses language learning strategies to develop an awareness of his/her own learning processes in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) use prior knowledge and experiences to understand meanings in English;

(B) monitor oral and written language production and employ self-corrective techniques or other resources;

(C) use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary;

(D) speak using learning strategies such as requesting assistance, employing non-verbal cues, and using synonyms and circumlocution (conveying ideas by defining or describing when exact English words are not known);

(E) internalize new basic and academic language by using and reusing it in meaningful ways in speaking and writing activities that build concept and language attainment;

(F) use accessible language and learn new and essential language in the process;

(G) demonstrate an increasing ability to distinguish between formal and informal English and an increasing knowledge of when to use each one commensurate with grade-level learning expectations;

(H) develop and expand repertoire of learning strategies such as reasoning inductively or deductively, looking for patterns in language, and analyzing sayings and expressions commensurate with grade-level learning expectations; and

(I) make connections across content areas and use and reuse language and concepts in different ways.

(28) Second language acquisition/listening. The ESOL II student listens to a variety of speakers, including teachers, peers, and electronic media, to gain an increasing level of comprehension and appreciation for newly acquired language in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) distinguish sounds and intonation patterns of English with increasing ease;

(B) recognize elements of the English sound system in newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters;

(C) learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions;

(D) monitor understanding of spoken language during classroom instruction and interactions and seek clarification as needed;

(E) use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language;

(F) listen to and derive meaning from a variety of media such as audio tape, video, DVD, and CD ROM to build and reinforce concept and language attainment;

(G) understand the general meaning, main points, and important details of spoken language ranging from situations in which topics, language, and contexts are familiar to unfamiliar;

(H) understand implicit ideas and information in increasingly complex spoken language commensurate with grade-level learning expectations;

(I) demonstrate listening comprehension of increasingly complex spoken English by following directions, retelling or summarizing spoken messages, responding to questions and requests, collaborating with peers, and taking notes commensurate with content and grade-level needs;

(J) understand basic structures, expressions, and vocabulary such as school environment, greetings, questions, and directions;

(K) analyze and evaluate spoken discourse for appropriateness of purpose with a variety of audiences such as formal, consultative, casual, and intimate language registers; and

(L) infer meaning by making associations of utterances with actions, visuals, and the context of the situation.

(29) Second language acquisition/speaking. The ESOL II student speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using developmental vocabulary with increasing fluency and accuracy in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) practice producing sounds of newly acquired vocabulary such as long and short vowels, silent letters, and consonant clusters to pronounce English words in a manner that is increasingly comprehensible;

(B) expand and internalize initial English vocabulary by learning and using high-frequency English words necessary for identifying and describing people, places, objects, events, and basic concepts such as numbers, days of the week, food, occupations, and time by retelling simple stories and basic information represented or supported by pictures, and by learning and using routine language needed for classroom communication;

(C) speak using a variety of grammatical structures, sentence lengths, sentence types, and connecting words with increasing accuracy and ease as more English is acquired;

(D) speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency;

(E) share information in cooperative learning interactions;

(F) ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts such as directions and address as well as name, age, and nationality, to using abstract and content-based vocabulary during extended speaking assignments;

(G) express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics;

(H) narrate, describe, and explain with increasing specificity and detail as more English is acquired;

(I) adapt spoken language appropriately for formal and informal purposes;

(J) respond orally to information presented in a wide variety of print, electronic, audio, and visual media to build and reinforce concept and language attainment;

(K) share prior knowledge with peers and others to facilitate communication and to foster respect for others; and

(L) describe the immediate surroundings such as classroom, school, and home.

(30) Second language acquisition/reading. The ESOL II student reads a variety of texts for a variety of purposes with an increasing level of comprehension in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:

(A) learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words;

(B) recognize directionality of English reading such as left to right and top to bottom;

(C) develop basic sight vocabulary, derive meaning of environmental print, and comprehend English vocabulary and language structures used routinely in written classroom materials;

(D) use prereading supports such as graphic organizers, illustrations, and pre-taught topic-related vocabulary and other prereading activities to enhance comprehension of written text;

(E) read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned;

(F) use visual and contextual support and support from peers and teachers to read grade-appropriate content area text, enhance and confirm understanding, and develop vocabulary, grasp of language structures, and background knowledge needed to comprehend increasingly challenging language;

(G) demonstrate comprehension of increasingly complex English by participating in shared reading, retelling or summarizing material, responding to questions, and taking notes commensurate with content area and grade level needs;

(H) read silently with increasing ease for longer periods;

(I) demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs;

(J) demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs;

(K) demonstrate English comprehension and expand reading skills by employing analytical skills such as evaluating written information and performing critical analyses commensurate with content area and grade level needs;

(L) read authentic literature and use kinesthetic visual support to develop vocabulary, structures, and build background knowledge needed to comprehend increasingly challenging language;

(M) use verbal cueing strategies such as pauses and exaggerated intonation for key words and non-verbal cueing strategies such as facial expressions and gestures to enhance the reading experience; and

(N) retell, role play, and/or visually illustrate the order of events.

~~(31) Second language acquisition/writing. The ESOL II student writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in language arts and all content areas. The following expectations apply to the second language learner at his/her level of proficiency in English. Students are expected to:~~

~~(A) learn relationships between sounds and letters of the English language to represent sounds when writing in English;~~

~~(B) write using newly acquired basic vocabulary and content based grade level vocabulary;~~

~~(C) spell familiar English words with increasing accuracy and employ English spelling patterns and rules with increasing accuracy as more English is acquired;~~

~~(D) edit writing for standard grammar and usage, including subject verb agreement, pronoun agreement, and appropriate verb tenses commensurate with grade level expectations as more English is acquired;~~

~~(E) employ increasingly complex grammatical structures in content area writing commensurate with grade level expectations such as:~~

~~(i) using correct verbs, tenses, auxiliaries, and pronouns/antecedents;~~

~~(ii) using nominative, objective, and possessive case (apostrophe *s*) correctly;~~

~~(iii) demonstrating knowledge of parts of speech; and~~

~~(iv) using negatives and contractions correctly;~~

~~(F) write using a variety of grade appropriate sentence lengths, patterns, and connecting words to combine phrases, clauses, and sentences in increasingly accurate ways as more English is acquired;~~

~~(G) narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired;~~

~~(H) use basic capitalization and punctuation correctly such as capitalizing names and first letters in sentences and using periods, question marks, and exclamation points;~~

~~(I) use graphic organizers as pre writing activity to demonstrate prior knowledge, to add new information, and to prepare to write;~~

~~(J) write with more proficient use of orthographic patterns such as digraphs and consonant blends with the initial s- and rules such as "qu" together, consonant doubling, dropping final "e," and changing "y" to "i"; and~~

~~(K) develop drafts by categorizing ideas, organizing them into sentences and paragraphs, and blending paragraphs within larger units of text.~~]

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ATTACHMENT
Text of Proposed Repeal of 19 TAC

Chapter 105. Foundation School Program

Subchapter B. Use of State Funds

[~~§105.11. Maximum Allowable Indirect Cost.~~]

[~~(a) No more than 48% of each school district's Foundation School Program (FSP) special allotments under the Texas Education Code, Chapter 42, Subchapter C, may be expended for indirect costs related to the following programs: compensatory education, bilingual education and special language programs, and special education. No more than 45% of each school district's FSP special allotments under the Texas Education Code, Chapter 42, Subchapter C, may be expended for indirect costs related to gifted and talented education programs. No more than 42% of each school district's FSP special allotments under the Texas Education Code, Chapter 42, Subchapter C, may be expended for indirect costs related to career and technical education programs. Indirect costs may be attributed to the following expenditure function codes: 34 - Student Transportation; 41 - General Administration; 81 - Facilities Acquisition and Construction; and the Function 90 series of the general fund, as defined in the Texas Education Agency publication, Financial Accountability System Resource Guide.~~

~~(b) For the 2012-2013 school year and each year thereafter, a school district may choose to use a greater indirect cost allotment under the Texas Education Code, §§42.151, 42.153, 42.154, and 42.156, to the extent the school district receives less funding per weighted student in state and local maintenance and operations revenue than in the 2011-2012 school year. The commissioner of education shall develop a methodology for a school district to make a determination under this section and may require any information necessary to implement this subsection. The commissioner's methodology must limit the percentage increase in allowable indirect cost to no more than the percentage decrease in state and local maintenance and operations revenue from the 2011-2012 school year.~~]

[~~§105.12. Basic Allotment.~~]

[~~A school district may use state aid received pursuant to the Texas Education Code (TEC), Chapter 42, Subchapter B, and indirect costs as defined in §105.11 of this title (relating to Maximum Allowable Indirect Cost) for any lawful purpose, including operations and using, purchasing, or acquiring real property or land; improving real property; constructing or equipping buildings; renovating real property; repairing real property; or maintaining real property. A school district may fund obligations from state aid received pursuant to the TEC, Chapter 42, Subchapter B, including reduction of bond tax by deposit into the district debt service fund, lease purchase agreements, and public property finance contracts authorized under the Local Government Code, §271.004 and §271.005; time warrants issued pursuant to the TEC, §45.103; maintenance notes issued pursuant to the TEC, §45.108; and contracts issued pursuant to the TEC, §44.901.~~]

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ATTACHMENT
Text of Proposed Amendment to 19 TAC

Chapter 109. Budgeting, Accounting, and Auditing

Subchapter B. Texas Education Agency Audit Functions

§109.23. School District Independent Audits and Agreed-Upon Procedures.

(a) A school district, governmental charter school, open-enrollment charter school, nonprofit service provider, county education district, or regional education service center must file with the Texas Education Agency (TEA) an annual financial and compliance report and, if applicable, a state compensatory agreed-upon procedures report. These reports must be audited by an independent auditor, and the audit must be reviewed by the TEA, including review of auditors' working papers, in accordance with the Financial Accountability System Resource Guide, as adopted by reference in §109.41 of this title (relating to Financial Accountability System Resource Guide).

(b) The annual financial audit report and state compensatory agreed-upon procedures report are due 150 days after the end of the fiscal year.

(c) Auditors from the TEA must review independent audit reports. The commissioner's designee must resolve audit findings.

(d) The district or other educational entity must hire at its own expense an independent auditor to conduct an independent audit of its financial statements and provide an opinion on its annual financial and compliance report.

(1) The independent auditor must:

(A) be associated with a certified public accountancy (CPA) firm that has a current valid license issued by the Texas State Board of Public Accountancy or a state licensing agency from another state ;

(B) be a certified public accountant with a current valid license issued by the Texas State Board of Public Accountancy, as required under the Texas Education Code, §44.008; and

(C) adhere to the generally accepted auditing standards (GAAS), adopted by the American Institute of CPAs (AICPA), as amended, and the generally accepted government auditing standards (GAGAS), adopted by the US Government Accountability Office, as amended.

(2) The CPA firm must:

(A) be a member of the AICPA Governmental Audit Quality Center (GAQC);

(B) adhere to GAQC's membership requirements; and

(C) collectively have the knowledge, skills, and experience to be competent for the audit being conducted, including thorough knowledge of the government auditing requirements and:

(i) Texas public school district environment; [~~or~~]

(ii) public sector; or

(iii) nonprofit sector.

(e) If at any time the TEA division responsible for financial compliance reviews an audit firm's working papers and finds that the firm or the quality of the work does not meet the standards required as stated in subsection (d) of this section, the division may require the district or other educational entity to change its audit firm.

(f) To the extent that this section conflicts with any other rule regarding audits of school districts and other educational entities by independent auditors and the TEA, this section controls.