Career and Technical Education TEKS Review Draft Recommendations

Texas Essential Knowledge and Skills (TEKS) for Career and Technical Education Draft Recommendations

Civil Engineering Program of Study

Courses: Engineering Project Management, Surveying and Geomatics, Civil Engineering I, Civil Engineering II, Architectural Engineering

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The document reflects the draft recommendations to the career and technical education (CTE) Texas Essential Knowledge and Skills (TEKS) that have been recommended by the State Board of Education's TEKS review work groups.

Proposed additions and new courses are shown in green font with underline (additions). Proposed deletions are shown in red font with strikethroughs (~~deletions~~). Text proposed to be moved from its current student expectation is shown in purple italicized font with strikethrough (~~*moved text*~~) and is shown in the proposed new location in purple italicized font with underlines (*new text location*). Numbering for the knowledge and skills statements in the document will be finalized when the proposal is prepared to file with the *Texas Register*.

Comments in the right-hand column provide explanations for the proposed changes. The following notations may be used as part of the explanations.

Abbreviation	Description
CCRS	refers to the College and Career Readiness Standards
CDS	refers to cross disciplinary standards in the CCRS
ELA	refers to English language arts standards in the CCRS
M	refers to mathematics standards in the CCRS
SCI	refers to science standards in the CCRS
SS	refers to social studies standards in the CCRS
KS	refers to knowledge and skills statement
SE	refers to student expectation

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§127.XX Engineering Project Management (One Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I. Recommended prerequisite: English II. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students enrolled in Engineering Project Management will develop cursory knowledge and essential skills to lead an engineering team through the development and construction of a project. Students will assess project documentation for compliance with best management practices. They will engage in project planning, risk management, team management, and stakeholder communication to ensure project completion, adherence to safety guidelines, and continuous improvement.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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.	

(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	New employability strand
(A)	explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	
(B)	describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;	
(D)	identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities how these practices optimize efficiency and results;	
(E)	define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;	
(F)	discuss the importance of professionalism and ethics in engineering design as defined by professional organizations such as the National Society of Professional Engineers;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	identify and discuss elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers;	
(J)	discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	describe the roles and responsibilities of managers.	
(2)	The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:	Engineering design process strand
(A)	explain the importance of defining an engineering problem as an initial step in the engineering design process;	CCRS: SCI: I.A.3

(B)	describe the research stage of the engineering design process;	CCRS: SCI: III.B.1; III.B.3; III.D.1; III.D.2; IV.B.1
(C)	define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;	
(D)	explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;	
(E)	describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;	
(F)	describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;	CCRS: SCI: I.A.4; I.B.1; III.B.2;
(G)	explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and	
(H)	describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.	CCRS: SCI: I.E.1; III.C.1
(3)	Students explore and develop skills to solve problems, make decisions, and manage a project. The student is expected to:	
(A)	discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;	
(B)	identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;	
(C)	define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;	
(D)	identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and	
(E)	identify strategies to solve problems and describe how problem-solving is utilized to accomplish personal and team objectives.	
(4)	The student understands the foundations of occupational safety and health. The student is expected to:	
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	

(B)	explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;	
(C)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	
(D)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(E)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	
(F)	describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;	
(G)	analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;	
(H)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;	
(I)	describe the elements of a safety and health program, including management leadership, worker participation, and education and training;	
(J)	explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;	
(K)	explain the components of a hazard communication program; and	
(L)	explain and give examples of safety and health training requirements specified by standard setting organizations.	
(5)	The student explores the methods and aspects of project management in relation to engineering projects. The student is expected to:	CCRS: SS: IV.A; ELA: I, II
(A)	identify and prioritize engineering tasks for an engineering project plan;	CCRS: CDS.I.B.3-4 CDS.I.C.1-2 CDS.I.D.1, 3-4 CDS.I.E.1-2 CDS.II.B.1-3 CDS.II.C.4-6, 8

(B)	identify and outline the critical path of a set of tasks in an engineering project;	CCRS: CDS: I.B.3-4; I.C.1-2; I.D.1, 3-4; I.E.1-2; II.B.1-3; II.C.4-6, 8; SCI: I.A.2; III.A.1
(C)	develop a project budget based on billable hours and engineering tasks in a project;	CCRS: CDS: I.C.1-3
(D)	track and maintain time spent on engineering tasks for a given project;	CCRS: SCI: I.A.2
(E)	generate a Gantt chart for an engineering project, including project tasks, time to complete tasks, critical path, and schedule of tasks;	CCRS: CDS: I.C.1-3; II.E.1-4; SCI: III.A.1
(F)	develop and implement a systematic folder structure for organizing project documents considering factors such as project phase, discipline, and document type;	CCRS: CDS: I.C.1-3; II.E.1-4; SCI: III.A.1
(G)	apply naming conventions consistently to all project documents to facilitate quick identification and retrieval;	CCRS: CDS.I.C.1-3; II.E.1-4
(H)	research and describe best management practices such as quality control and quality assurance, risk management, and project management plan for an engineering project;	CCRS: CDS: II.C.1-5; SCI: III.D.1; III.A.1
(I)	evaluate an engineering project for adherence to local, state, and federal regulations;	CCRS: CDS: II.C.1-5
(J)	evaluate an engineering project for adherence to best management practices; and	CCRS: CDS: II.C.1-5
(K)	evaluate an engineering project for implementation of sustainable practices.	CCRS: CDS: II.C.1-5
(6)	The student explores processes involved in the construction phase of an engineering project. The student is expected to:	CCRS: SS: IV.A; ELA: I, II
(A)	identify parts of an engineering project manual associated with a construction bid, including bid schedule, bid tabulation, construction plan set, and material specifications;	
(B)	explain the bid process for a project, including timeline, value engineering, request for information (RFI), request for qualifications (RFQ), request for price (RFP), interview process, bid opening, bid evaluations, and bid award;	CCRS: CDS: II.C.1-5; ELA: III
(C)	develop a quantity takeoff for an engineering project; and	CCRS: CDS: II.D.1-3
(D)	identify applicable materials based on the engineering project specifications to conduct a material quantity takeoff.	CCRS: CDS: II.D.1-3

(7)	The student researches and identifies methods and divisions of project documentation. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: I, II, III
(A)	compare shop drawings and construction documents to identify and rectify variances;	QC CCRS: CDS: I.C.1-3; II.D.1-3; SCI: III.B.1
(B)	identify and justify applicable material specifications for a given project;	CCRS: CDS: I.C.1-3; II.D.1-3
(C)	compile and organize material specifications to create a submittal log;	CCRS: CDS: I.C.1-3; II.E.1-4; SCI: III.C.1
(D)	analyze a construction drawing to develop applicable design questions and create a request for information (RFI) document;	QC CCRS: CDS: I.C.1-3; II.D.1-3
(E)	identify and explain the permitting process for an engineering project;	CCRS: CDS: II.C.1-5
(F)	identify permitting stakeholders and explain stakeholder roles in the permitting process;	CCRS: CDS: I.C.1-3
(G)	identify permitting entities and create a permit request;	CCRS: CDS: I.C.1-3; II.B.1-3; II.D.1-3
(H)	identify and explain the purpose and parts of a change order for a project;	CCRS: CDS: II.D.1-3
(I)	develop a method of documentation to track project changes, including field changes, design changes, and change orders, and analyze cost and schedule impacts of project changes; and	CCRS: CDS: I.C.1-3; II.E.1-4; SCI: III.C.1
(J)	identify and draft applicable completion documents, including certificate of occupancy, temporary certificate of occupancy, field changes, as-built or plan of record documents, and engineer's certification of substantial completion.	QA Identify completion documents ; Draft applicable completion documents CCRS: CDS: I.C.1-3; II.B.1-3; SCI: III.C.1
(8)	The student explores applicable federal, state, and local regulations as they pertain to engineering projects. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: I, II
(A)	research federal regulatory agencies and identify the role federal regulatory agencies serve in relation to an engineering project such as the Environmental Protection Agency (EPA), Federal Aviation Administration (FAA), and Army Corps of Engineers;	Insert OSHA TEKS after this section CCRS: CDS: II.C.1-5

(B)	research state regulatory agencies and identify the role state regulatory agencies serve in relation to an engineering project such as the Texas Department of Transportation (TxDOT), Texas Commission on Environmental Quality (TCEQ), and the Texas Railroad Commission (TRC);	CCRS: CDS: II.C.1-5
(C)	research local regulatory agencies and identify the role local regulatory agencies serve in relation to an engineering project; and	CCRS: CDS: I.C.1-3; II.C.1-5
(D)	describe local codes and ordinances affecting construction and development activities.	CCRS: CDS: I.C.1-3; II.C.1-5; ELA: III
(9)	The student explores methods of risk management and the effects on engineering projects. The student is expected to:	Related costs CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II
(A)	identify and describe various methods of risk management related to engineering projects;	CCRS: CDS: I.C.1-3; ELA: III
(B)	identify and analyze the potential risks in a project with respect to the project stakeholders;	CCRS: CDS: I.C.1-3; ELA: III
(C)	develop and communicate a job hazard analysis (JHA) for a given project task;	CCRS: CDS: I.C.1-3; SCI: III.C.1; ELA: III
(D)	identify factors of contingency related to an engineering project;	CCRS: CDS: I.C.1-3
(E)	create a contingency estimate analyzing events that can cause potential losses to a project; and	CCRS: CDS: I.C.1-3; II.B.1-3; SCI: III.C.1
(F)	present a risk management plan for a given project.	CCRS: CDS: II.B.1-3; SCI: III.C.1
(10)	The student examines components of value engineering practices in relation to an engineering project. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III
(A)	describe value engineering;	
(B)	identify and analyze common areas of engineering projects that are susceptible to value engineering;	CCRS: CDS: I.C.1-3
(C)	analyze an existing project design and cost estimate to identify potential cost saving areas;	CCRS: CDS: I.C.1-3; II.D.1-3
(D)	describe an opinion of probable cost (OPC) associated with an engineering project;	
(E)	generate an OPC for an engineering project, including construction mobilization, material cost, material quantities, waste disposal, contingency, and total price; and	CCRS: CDS: II.D.1-3; II.E.1-4; SCI: III.C.1

(F)	create a cost benefit analysis of an engineering project that compares the monetary cost of the project to the benefit to end user.	CCRS: CDS.I.C.1-3; II.B.1-3; II.D.1-3; II.E.1-4; SCI: III.C.1
(11)	The student demonstrates effective leadership and communications skills necessary to manage engineering projects. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III
(A)	identify and describe the various team roles for an engineering project;	CCRS: SCI: I.C.1
(B)	research and describe various methods of team management;	CCRS: CDS: I.C.1-3; CDS.I.E.2; SCI.I.C.1
(C)	create a schedule of roles for team members in an engineering project;	CCRS: CDS: I.C.1-3; I.E.2; II.B.1-3; SCI: I.C.1; III.C.1
(D)	conduct an effective kick-off meeting for a given engineering project to communicate the project management plan;	CCRS: CDS: I.C.1-3; I.E.2; II.B.1-3
(E)	apply and evaluate how project team dynamics impact the successful completion of a project;	CCRS: CDS: I.C.1-3; I.E.2; SCI: I.C.1
(F)	prepare and document effective meeting agendas;	CCRS: CDS: II.B.1-3; SCI: III.C.1
(G)	record, prepare, and distribute clear and accurate meeting minutes;	CCRS: CDS: II.B.1-3
(H)	research and describe effective leadership qualities;	CCRS: CDS: II.C.1-3
(I)	research and identify examples of effective leadership styles;	CCRS: CDS: II.C.1-3
(J)	identify and describe personal leadership styles and strengths; and	CCRS: CDS: I.B.1-4; I.E.2
(K)	apply and evaluate how student leadership styles impact the success of the project team.	CCRS: CDS: I.B.1-4; I.E.2; II.B.1-3

§127.XX Surveying and Geomatics (Two Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I. Recommended prerequisite: Geometry. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students enrolled in Surveying and Geomatics will be introduced to the principles and practices essential to the field of surveying. Throughout this course students will investigate different tools, applications, and techniques used to capture and process geomatic data. They will also use the functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of visual representations of data in multiple mediums, ethical considerations, and the legal or regulatory impact of surveying on the community and society.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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.	

(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	New employability strand
(A)	explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	
(B)	describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;	
(D)	identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities how these practices optimize efficiency and results;	
(E)	define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;	
(F)	discuss the importance of professionalism and ethics in engineering design as defined by professional organizations such as the National Society of Professional Engineers;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	identify and discuss elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers;	
(J)	discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	describe the roles and responsibilities of managers.	
(2)	The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:	Engineering design process strand
(A)	explain the importance of defining an engineering problem as an initial step in the engineering design process;	CCRS: SCI: I.A.3

(B)	describe the research stage of the engineering design process;	CCRS: SCI: III.B.1; III.B.3; III.D.1; III.D.2; IV.B.1
(C)	define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;	
(D)	explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;	
(E)	describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;	
(F)	describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;	CCRS: SCI: I.A.4; I.B.1; III.B.2;
(G)	explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and	
(H)	describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.	CCRS: SCI: I.E.1; III.C.1
(3)	Students explore and develop skills to solve problems, make decisions, and manage a project. The student is expected to:	Project management strand
(A)	discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;	
(B)	identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;	
(C)	define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;	
(D)	identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and	
(E)	identify strategies to solve problems and describe how problem-solving is utilized to accomplish personal and team objectives.	
(4)	The student understands the foundations of occupational safety and health. The student is expected to:	
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	

(B)	explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;	
(C)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	
(D)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(E)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	
(F)	describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;	
(G)	analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;	
(H)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;	
(I)	describe the elements of a safety and health program, including management leadership, worker participation, and education and training;	
(J)	explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;	
(K)	explain the components of a hazard communication program; and	
(L)	explain and give examples of safety and health training requirements specified by standard setting organizations.	
(5)	The student examines the functional mathematics of surveying. The student is expected to:	CCRS: ELA: II.B
(A)	calculate central tendencies of a given data set, including mean, median, and mode;	
(B)	calculate standard deviation of a given data set;	
(C)	identify parts of a normal distribution curve;	
(D)	define the Empirical Rule and analyze the distribution of a data set using the Empirical Rule;	

(E)	define systematic and random error;	
(F)	identify and describe the relationship between accuracy and precision;	
(G)	identify the types and properties of various polygons;	
(H)	solve for the parts of a triangle, including Pythagorean theorem, sine, cosine, tangent, arcsine, arccosine, and arctangent;	CCRS: SCI: II.C.3
(I)	identify the properties of circles;	CCRS: SCI: II.C.4
(J)	solve for the parts of a unit circle, including diameter, radius, circumference, area, cord, arclength, delta, and tangent;	CCRS: SCI: II.C.2
(K)	identify and solve for linear functions, including standard form, slope-intercept form, point-slope form, and the distance between two points, on a Cartesian Coordinate System; and	CCRS: SCI: II.C,3
(L)	identify and solve for volumetric calculations of three-dimensional shapes, including a cylinder, sphere, rectangular prisms, trapezoidal prisms, and triangular prisms.	CCRS: SCI: II.A.4
(6)	The student researches and understands global positioning systems (GPS) used in surveying. The student is expected to:	CCRS: SS: I.A.1; IV.A; B; D
(A)	identify and explain data terminology related to GPS such as latitude, longitude, datum, ellipsoid, geoid, orthometric height, World Geodetic System 1984, Earth Centered Earth Fixed (ECEF), 3D coordinate geometry, and state plane coordinate system;	CCRS: ELA: II.B; SS: I.A.1
(B)	explain the different types and applications of GPS surveying, including static, differential, and real-time kinematic (RTK);	CCRS: ELA: III.B
(C)	tie down a point and derive a geographic latitude and longitude coordinate using GPS;	Tie down = an industry term for collecting a point on, above, or below the surface of the earth CCRS: ELA: II.B; SS: I.A.1
(D)	identify and explain GPS components, including the space segment, control segment, and the user segment;	CCRS: SCI: I.D.3; ELA: I, II.B, III; SS: I.A.1; V
(E)	describe the functions of a GPS satellite;	CCRS: SCI: I.D.3; ELA: I, II, III; SS: V

(F)	describe the functions of GPS ground stations;	CCRS: SCI: I.D.3; ELA: I, II, III; SS: V
(G)	describe the functions of GPS receivers; and	CCRS: SCI: I.D.3; ELA: I, II, III; SS: V
(H)	generate a map using GPS coordinates.	CCRS: SCI: I.D.3; ELA: I, II
(7)	The student researches and understands the industry standard methods and means of collecting various topographical data used in the civil engineering and construction professions. The student is expected to:	
(A)	research and explain the components of optomechanical equipment, including vertical and horizontal plates and optics;	CCRS: CDS.II.C.2; SCI: I.D.3; SS: I.A.1; B.2, F; IV.A, B, D; V.B; ELA: II
(B)	explain the types of optomechanical equipment and their application, including theodolite, level, Total Station;	CCRS: SCI: I.D.3; SS: IV.A, D; V.A; ELA: II, III
(C)	research and explain methods of Remote Sensing, including UAV, LiDAR, sonar, ground penetrating radar, underwater ROV, photogrammetry, and gravity satellite;	CCRS: SCI: I.D.3; CDS: II.C.2; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(D)	explain the benefits and limitations of Remote Sensing data collection methods, including UAV, LiDAR, sonar, ground penetrating radar, underwater ROV, photogrammetry, gravity satellite, and GPS;	CCRS: SCI: I.D.3; CDS: II.C.2; I.B.2-4; SS: IV.A, D; V.A; ELA: II, III
(E)	identify the tools used to make distance measurements, including steel tape, electric distance meter, pacing, odometer, stadia, and estimating;	CCRS: SS: IV.A; ELA: II
(F)	explain the various methods to measure the distance between two points on the surface of the earth;	CCRS: CDS: II.C.2; I.B.2-4; SS: IV.A; ELA: II
(G)	measure the distance between two points on the surface of the earth using different methods and tools;	CCRS: CDS: II.E.1; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(H)	compare the data collected from different methods used to measure the distance between two points on the surface of the earth for accuracy;	CCRS: CDS: II.D.I-2; II.E.2; SCI: I.D.1; ELA: II, III, IV
(I)	identify the tools used to make angular measurements, including protractor, compass, theodolite, total station, and estimating;	CCRS: SCI: I.D.3; SS: IV.A, D; V.A; ELA: II, III
(J)	explain the various methods to measure the angle between two vectors;	CCRS: CDS: II.C.2; SS: IV.A, D; V.A; ELA: II, III
(K)	measure the angle between two vectors using different methods and tools;	CCRS: CDS: II.E.1; SCI.II.C.1

(L)	compare the data collected from different methods used to measure the angles between two vectors for accuracy;	CCRS: CDS: II.D.1-2; II.E.2; SCI.II.C.1; SS: IV.A, D; V.A; ELA: II, III
(M)	research and describe known control points and their application to collection elevation;	CCRS: CDS: II.C.2; SS: I.A.1; B.2, F; IV.A, B, D; V.B; ELA: II
(N)	identify the tools used to measure elevation, including level, theodolite, total station, barometer, and estimating;	CCRS: SS: IV.A, D; V.A; ELA: II, III
(O)	explain the various methods to measure the elevation between a known point and a remote point;	CCRS: CDS: II.C.2; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(P)	measure the height of an object using a theodolite and trigonometric calculations;	CCRS: CDS: II.D.1-2; II.E.2; SS: IV.A, D; V.A; ELA: II, III
(Q)	establish the elevation of a point assuming the elevation of a relative point is zero using various methods and tools;	CCRS: CDS: I.C.1-4; SS: IV.A; ELA: II
(R)	compare the data collected from different methods used to measure elevation between two points for accuracy;	CCRS: CDS: II.D.1-3; II.E.1-4; SS: IV.A; ELA: II
(S)	research and explain regulations of UAV piloting and control specified by the FAA Small UAS Rule (Part 107);	CCRS: CDS: II.C.2; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(T)	operate and control a UAV in accordance with FAA regulations;	Mini and midsize UAVs are no longer cost-prohibitive. CCRS: SCI: I.D.3; ELA: II, III, IV
(U)	explain the purposes of specialized surveys used in engineering, including Engineering topographic, control, construction, boundary, hydrographic, optical tooling, American Land Title Association, photogrammetry, and an as-built; and	CCRS: CDS: B.2-3; II.C.2; SS: IV.A, D; V.A; ELA: II, III
(V)	explain why and how surveyors defer to the work of existing surveys.	CCRS: CDS: I.C.1-3; II.C.1-5; SS: IV.A, D; V.A; ELA: II, III

(8)	The student researches and understands the industry standard methods and means of analyzing various topographical data used in the civil engineering and construction professions. The student is expected to:	
(A)	explain the process to generate a control survey;	CCRS: CDS: I.C.1-3; II.C.1-5; SS: IV.A, D; V.A; ELA: II, III
(B)	identify and explain symbols found on survey drawings; and	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: II
(C)	identify and describe software used to create drawings and analyze survey data.	CCRS: SCI: III.C.1; SS: I.A.1; F; IV.A, D; V.A; ELA: II
(9)	The student develops and communicates visual representations of topographical data used in civil engineering and construction documentation and presentations. The student is expected to:	
(A)	generate a topography map using collected field data;	CCRS: CDS: I.C.1-3; I.D.1; I.E.I-2; II.B.1-3; II.C.5-8; II.D.2-3; II.E.1-4; SCI: III.C.1; SS: I.A.1; IV.A; ELA: II
(B)	create a surface profile from a baseline drawn on a topographic map;	CCRS: CDS: I.C.1-3; I.D.1; I.D.3-4; I.E.1; II.B.1-3; II.C.1; II.C.5-8; II.D.2-3; II.E.1-4; SCI: III.C.1; SS: I.A.1; IV.A; ELA: II, III, IV
(C)	stake out points from design files, maps, or real-property descriptions;	CCRS: CDS: I.C.1-3; I.D.1; I.D.3-4; I.E.2; II.D.2-3; II.E.1-4; SS: I.A.1; IV.A; ELA: II
(D)	explain how a boundary survey can create and delineate real-property lines, and legally protects project stakeholders; and	CCRS: CDS: I.B.3-4; I.C.1; II.B.1-3; II.C.1-3 the public is a stakeholder in some engineering projects
(E)	create a real-property boundary drawing using collected field data.	CCRS: CDS: I.C.1-3; I.E.1; II.B.1-3; II.C.1; II.C.5-8; II.D.2-3; II.E.1-4; SCI: III.C.1; SS: I.A.1; IV.A; ELA: II

(10)	The student explores how a practicing surveyor follows in the footsteps of the original surveyor. The student is expected to:	
(A)	define boundary monumentation;	CCRS: CDS: II.C.1-2; ELA: II
(B)	research and explain natural and artificial monuments;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; II.C.1-5; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(C)	explain the methods to adjust real-property boundaries for the change in natural monuments over time, including riparian and littoral boundaries;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; II.C.1-5; SS: IV.A, D; V.A; ELA: II, III
(D)	interpret a legal description of a real property; and	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; C.1-5; II.D.1-3; ELA: II
(E)	identify an original survey boundary by conducting land record research using the Texas General Land Office (GLO).	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.C.1-5; SS: IV.A, B, D; ELA: II, V
(11)	The student understands the different methods of measurements and associated errors. The student expected to:	CCRS: SS: IV.A, B, D; ELA: II
(A)	define the different units of linear measurement, including us feet, international feet, chains, rod, mile, fathom, furlong, varas, and metric units commonly used in the surveying and civil engineering industry;	CCRS: SS: IV.A, B, D; ELA: I, II
(B)	define the different units of angular measurement, including vertical angles, horizontal angles, bearings, azimuths, degrees-minutes-seconds, decimal degrees, seconds of arc, and gradians;	CCRS: SS: IV.A, B, D; ELA: I, II
(C)	define the different units of volumetric measurement, including cubic feet, cubic yards, tons, and acre-feet;	CCRS: SS: IV.A, B, D; ELA: I, II
(D)	calculate and define area measurements such as acre, hectare, square feet, square mile, league, or sitio;	CCRS: SS: IV.A, B, D; ELA: I, II
(E)	convert linear, angular, and area measurements between different units;	CCRS: CDS: I.C.1-3; SCI: II.D.1; ELA: I, II
(F)	determine a change in elevation between two or more points by performing a differential level loop;	CCRS: SCI: II.D.1; ELA: I, II
(G)	measure the distance between two or more points using industry acceptable methods such as taping, electronic distance meter, total station, pacing, odometer, tacheometry, global positioning system, and stadia;	CCRS: CDS: I.C.1-3; I.D.1-4; I.E.1-2; II.E.1-3; SCI: I.D.3; ELA: I, II

(H)	compare the errors from two or more methods of calculating the distance between two or more points; and	CCRS: CDS: I.C.1-3; I.D.1-4; I.E.1-2; II.D.1-3; II.E.1-4; ELA: II
(I)	calculates various types of errors associated with survey data.	CCRS: CDS: I.C.1-3; I.D.1-4; I.E.1-2; II.D.1-3; II.E.1-4; ELA: I, II
(12)	The student researches and understands surveying and geomatics throughout history. The student is expected to:	SS: IV.A, B, C, D; V.A; ELA: I, II, III, V
(A)	explain how Eratosthenes first derived the circumference of the Earth;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; I.F.1-3; II.A.2; II.A.4; II.A.8; II.B.1; II.C.1-5
(B)	research and describe the evolution of geomatics used to calculate the circumference of the Earth;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; I.F.1-3; II.A.2; II.A.4; II.A.8; II.B.1; II.C.1-5
(C)	compare the historical and current methods used to calculate the circumference of the Earth;	CCRS: CDS: I.B.2-4; I.D.1; I.E.1; I.F.1-3; II.A.2; II.A.4; II.A.8; II.B.1; II.C.1-5
(D)	describe the surveying that contributed to great works of civil engineering before the Age of Exploration; and	CCRS: CDS: I.B.2-4; I.D.1; I.E.1; I.F.1-3; II.A.2; II.A.4; II.A.8; II.B.1; II.C.1-5
(E)	describe the surveying that contributed to great works of civil engineering after the Age of Exploration.	CCRS: CDS: I.B.2-4; I.D.1; I.E.1; I.F.1-3; II.A.2; II.A.4; II.A.8; II.B.1; II.C.1-5
(13)	The student researches and understands the code of ethics pertaining to civil engineering and surveyors. The student is expected to:	SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(A)	research and identify the legal definitions and descriptions surveyors use to delineate and report survey data;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; II.C.1-5; II.D.1-3
(B)	research and identify engineering ethics established by organizations such as the American Society of Civil Engineers, the National Society of Professional Engineers, the Texas Board of Professional Engineers and Land Surveyors, the National Council of Examiners for Engineering and Surveying, and the National Institute of Engineering Ethics; and	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; I.F.1-4; II.A.4; II.A.6; II.A.8; II.B.1; II.C.1-5; II.D.1-3
(C)	analyze root causes and lessons learned from historical examples or case studies involving instances of ethical misconduct in surveying.	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; I.F.1-4; II.A.4; II.A.6; II.A.8; II.B.1; II.C.1-5; II.D.1-3

(14)	The student researches real-property descriptions for real-property derived from surveying work. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(A)	identify and explain effective terminology to describe real-property boundaries, including monument, bearings, and distances;	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; II.C.1-5; II.D.1-3
(B)	draw a real-property boundary using a written boundary description such as a metes-and-bounds, and colonial descriptions; and	CCRS: CDS.I.C.1-3; I.E.1; II.B.1-3; SCI: III.C.1
(C)	write an effective real-property boundary description based on given monuments, bearings, and distances of a closed figure.	CCRS: CDS: I.B.2-3; I.D.1; I.E.1; II.A.4; II.B.1; II.C.1-8; II.D.1-3; SCI: III.C.1

§127.XX Civil Engineering I (One Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. Prerequisite: Algebra I or Principles of Applied Engineering. Recommended prerequisite: Geometry. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students in Civil Engineering I will be introduced to the basic principles and practices essential to the field of Civil Engineering. Throughout this course students will investigate different career paths in civil engineering, explore the various specializations within the field and understand the phases and life cycle of civil engineering projects. They will also delve into the functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of effective project document structure and project management, ethical considerations, and the impact of civil engineering on the natural and built environment.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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.	

(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	New employability strand
(A)	explain the importance of dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	
(B)	describe teamwork, group dynamics, and conflict resolution and how they can impact the collective outcome;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences;	
(D)	identify time-management skills such as prioritizing tasks, following schedules, and tending to goal-relevant activities how these practices optimize efficiency and results;	
(E)	define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;	
(F)	discuss the importance of professionalism and ethics in engineering design as defined by professional organizations such as the National Society of Professional Engineers;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	identify and discuss elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers;	
(J)	discuss the importance of safety in the workplace and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	describe the roles and responsibilities of managers.	
(2)	The student understands that there are different stages of the engineering design process and the importance of working through each stage as part of an iterative process. The student is expected to:	Engineering design process strand
(A)	explain the importance of defining an engineering problem as an initial step in the engineering design process;	CCRS: SCI: I.A.3

(B)	describe the research stage of the engineering design process;	CCRS: SCI: III.B.1; III.B.3; III.D.1; III.D.2; IV.B.1
(C)	define ideation and conceptualization and discuss the role these processes play in innovation and problem solving;	
(D)	explain the processes of selecting an idea or concept for detailed prototype design, development, and testing;	
(E)	describe the purpose of non-technical drawings, technical drawings, models, and prototypes in designing a solution to an engineering problem;	
(F)	describe the process of relevant experimental design, conducting tests, collecting data, and analyzing data to evaluate potential solutions;	CCRS: SCI: I.A.4; I.B.1; III.B.2;
(G)	explain how the engineering design process is iterative and the role reflection plays in developing an optimized engineering solution; and	
(H)	describe the purpose of effective communication of the engineering solution as obtained through the engineering design process to various audiences.	CCRS: SCI: I.E.1; III.C.1
(3)	Students explore and develop skills to solve problems, make decisions, and manage a project. The student is expected to:	
(A)	discuss strategies for managing time, setting deadlines, and prioritizing to accomplish goals;	
(B)	identify constraints and describe the importance of planning around constraints, including budgets, resources, and materials;	
(C)	define milestones and deliverables and explain the advantages of dividing a large project into smaller milestones and deliverables;	
(D)	identify different types of communication and explain how different types of communication lead to successful teamwork on a shared project in a professional setting; and	
(E)	identify strategies to solve problems and describe how problem-solving is utilized to accomplish personal and team objectives.	

(4)	The student understands the foundations of occupational safety and health. The student is expected to:	
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	
(B)	explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;	
(C)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	
(D)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(E)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	
(F)	describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;	
(G)	analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;	
(H)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;	
(I)	describe the elements of a safety and health program, including management leadership, worker participation, and education and training;	
(J)	explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;	
(K)	explain the components of a hazard communication program; and	
(L)	explain and give examples of safety and health training requirements specified by standard setting organizations.	
(5)	The student investigates different career paths in civil engineering. The student is expected to:	
(A)	explain the licensing requirements for a civil engineer in training and a professional engineer;	CCRS: SS: I.E.1,3; IV.B.1-3,4; C; V.A-B; ELA: II.A; III.A; V.A-C

(B)	identify various career options related to civil engineering such as surveyors, architects, construction contractors, urban and regional planners, inspectors, and regulators;	CCRS: SS: I.E.1,3; IV.C; V.A-B; ELA: II.A; III.A, V.A-C
(C)	identify and explain the requirements to obtain professional credentials such as certified flood plain manager (CFM), project management professional (PMP), professional engineer (PE), Autodesk certifications, SolidWorks certifications, certified surveying technician (CST), registered professional land surveyor (RPLS), certified quality engineer (CQE), and certified quality inspector (CQI) associated with civil engineering; and	CCRS: SS: I.E.1,3; IV.C; V.A-B; ELA: II.A; III.A; V.A-C
(D)	describe civil engineering sub-disciplines, including water resources, environmental, geotechnical, structural, transportation, material sciences, coastal, land development, urban development, and infrastructure.	CCRS: CDS: II.C.2; SS: V.A-B; ELA: II.A; III.A; V.A-C
(6)	The student examines the functional mathematics of civil engineering. The student is expected to:	
(A)	calculate the mean, median, and mode of a given data set;	CCRS: SCI: II.A.4; II.C.2; ELA: I, II.A-B
(B)	calculate the standard deviation of a given data set;	CCRS: SCI: II.B.1; ELA: I, II.A-B
(C)	identify parts of a normal distribution curve;	CCRS: SCI: II.C.2; ELA: I, II.A-B
(D)	define the Empirical Rule and analyze the distribution of a data set using the Empirical Rule;	CCRS: CDS: II.D.2.
(E)	define systematic, gross, random error;	CCRS: ELA: I, II.A-B
(F)	define accuracy and precision in a data set;	CCRS: ELA: I, II.A-B
(G)	analyze the accuracy and precision of a data set;	CCRS: ELA: I, II.A-B
(H)	identify the types and properties of various polygons;	CCRS: SCI: II.C.3; ELA: I, II.A-B
(I)	solve for the parts of a triangle using Pythagorean theorem, the law of sines, and the law of cosines;	CCRS: SCI: II.C.4; ELA: I, II.A-B
(J)	identify the properties of circles;	CCRS: SCI: II.D.1; ELA: I, II.A-B
(K)	solve for the measurements of a circle, including diameter, radius, circumference, area, cord, arclength, delta, and tangent;	CCRS: ELA: I, II.A-B

(L)	solve linear functions on a Cartesian Coordinate System using standard form, slope-intercept form, point-slope form, and the distance between two points; and	CCRS: ELA: I, II.A-B
(M)	identify cylinders, spheres, and rectangular, trapezoidal, and triangular prisms and calculate the volumes of three-dimensional shapes.	CCRS: ELA: I, II.A-B
(7)	The student understands methods of measurement and associated errors. The student is expected to:	
(A)	define units of linear measurement, including U.S. feet, international feet, chains, rods, miles, fathoms, furlongs, varas, and other metric units commonly used in the surveying and civil engineering industry;	CCRS: SCI: II.F.1; ELA: I, II.A-B
(B)	define the different units of angular measurement, including vertical angles, horizontal angles, bearings, azimuths, degrees-minutes-seconds, decimal degrees, seconds of arc, and gradians;	CCRS: ELA: I, II.A-B
(C)	define the different units of volumetric measurement, including cubic feet, cubic yards, tons, and acre-feet;	CCRS: SCI: II.F.1; ELA I, II.A-B
(D)	calculate and define area measurements such as acre, hectare, square feet, square mile, league, or sitio;	CCRS: ELA: I, II.A-B
(E)	convert linear, angular, and area measurements between different units;	CCRS: ELA: I, II.A-B
(F)	determine a change in elevation between two or more points by performing a differential level loop;	CCRS: ELA: I, II.A-B
(G)	measure the distance between two points on a plane using methods such as taping, electronic distance meter, total station, pacing, odometer, tacheometry, and stadia;	CCRS: ELA: I, II.A-B
(H)	compare the errors from two or more methods of calculating distance between two points such as comparing pacing and taping; and	CCRS: ELA: I, II.A-B
(I)	identify and analyze various types of errors associated with survey data.	CCRS: ELA: I, II.A-B
(8)	The student researches civil engineering throughout history. The student is expected to:	
(A)	describe the significance and development of historic civil engineering projects such as the Panama Canal, Roman aqueducts, and Hadrian's wall;	CCRS: CDS: II.B.1; II.C.2; SS: I.A.6, B.2; IV.A-D; V.A-B; ELA: II; V
(B)	describe the significance and development of a major Texas civil engineering project; and	CCRS: CDS: II.B.1; II.C.2; SS: I.A.2,6; F.2; II.B.4,6; III.A.2-3; IV.A-D; V.A-B; ELA: II; III; V

(C)	describe the significance and development of a major us civil engineering project.	CCRS: CDS: II.B.1; II.C.2; SS: I.A.2,6; F.2; II.B.4,6; III.A.2-3; IV.A-D; V.A-B; ELA: II; III; V
(9)	The student understands a civil engineering project life cycle. The student is expected to:	"Life Cycle" is a commonly used term for describing the engineering process in Civil Engineering
(A)	explain the civil engineering project conception, scope, proposal, contract, design planning and development, construction documents, bid and specifications, construction, and closeout phase; and	CCRS: SCI: III.A.1; SS: IV.A-B, D; V.A-B; ELA: III; V
(B)	sequence the phases of a project life cycle.	CCRS: CDS: II.C.5; II.D.3.
(10)	The student understands and develops a civil engineering project scope of work and proposal. The student is expected to:	
(A)	describe the importance of a feasibility report and identify potential components, including soil analysis, existing land entitlements, existing topography, federal emergency management agency (FEMA) floodplain location and elevation, existing utility and locations, environmental studies, and adjacent rights-of-way;	CCRS: CDS: I.B.3; I.A.1; SS: IV.A-B, D; V; ELA: II; III; V
(B)	develop a feasibility report for a small civil engineering project;	CCRS: CDS: II.C.5; SCI: III.A.1; III.C.1; SS: IV.A-B, D; ELA: I; II; IV
(C)	identify and quantify costs and benefits associated with a proposed civil engineering project, including initial investment, operational expenses, and anticipated returns;	CCRS: CDS: I.A.1; I.B.2; SS: IV.A-B, D; ELA: I; II; IV
(D)	conduct a cost-benefit analysis for a small civil engineering project;	CCRS: CDS: II.C.5; SS: IV.A-B, D; ELA: I; II; IV
(E)	identify common risks associated with civil engineering projects, including technical, financial, environmental, and regulatory risks;	CCRS: CDS: 1.A.1; SS: IV.A-B, D; ELA: I; II; IV
(F)	describe methodologies for conducting risk analysis such as probability assessment, impact analysis, and risk prioritization;	CCRS: CDS: II.D.2; SCI: III.C.1; SS: IV.A-B, D; ELA: I; II; IV
(G)	explain the purpose of a request for qualifications (RFQ);	CCRS: SS: IV.A-B, D; V.A; ELA: I; II; IV
(H)	evaluate RFQs based on a project's scope;	CCRS: SS: IV.A, B.3; ELA: II

(I)	identify relevant codes and regulations impacting civil engineering projects;	CCRS: SS: I.A.1, 6; II.B.3, 4; III.A.1; IV.A, B, D; ELA: II, V
(J)	define the fundamental components of a scope of work document, including project description, stakeholders, objectives, deliverables, scope exclusions, milestones, schedule, and signature block; and	CCRS: SS: IV.A-B, D; ELA: II
(K)	develop a scope of work document for a small civil engineering project.	CCRS: CDS: II.B.1; SS: IV.A-B, D; ELA: I; II; IV
(11)	The student understands and develops the components of civil engineering designs. The student is expected to:	
(A)	identify and generate conceptual schematic design drawings, sketches, and diagrams to explore alternative design solutions and communicate design concepts effectively;	CCRS: CDS: II.D.3; II.E.3; SCI: III.C.1; SS: IV.A
(B)	explain the purpose and application of common civil engineering calculations such as superelevation, flow line, beam analysis, cost amortization, concrete testing, plasticity index, and differential leveling;	CCRS: SS: IV.2, 3; V.A.1; ELA; III
(C)	create and maintain project development plans using relevant data from design calculations and specifications;	CCRS: CDS: I.C.1; SS: IV.B.1, 3; ELA: I
(D)	evaluate engineering plans and specifications using quality control and quality assurance (QCQA) processes; and	CCRS: CDS: II.B.3; SS: IV.A; B.1, 3; D; ELA: II
(E)	prepare a design quantity take-off and estimate of probable construction cost.	CCRS: CDS: II.D.3; II.E.2; SS: IV.A; B.1, 3; D; ELA: II
(12)	The student researches the use and application of technology in civil engineering. The student is expected to:	
(A)	identify the tools and technology used in civil engineering throughout history such as an abacus, compass, scale, measuring tape, slide rule, calculator, computer-aided drafting and design, level, auto-level, grade rod, plumb bob, transit, theodolite, total station, GPS, lidar, and drones;	Thread of technology advancements CCRS: SCI: IV.A.1; SS: IV.A, B, D; ELA: II
(B)	explain the evolution of technology used in civil engineering;	CCRS: CDS: 1.A.1; II.C.1; II.C.2; II.C.3; SS: III.A.1; IV.A, B, D; V.A.1
(C)	compare design analysis software;	CCRS: SCI: I.D.1; I.D.2; SS: I.F.1; IV.A, B, D; ELA: II
(D)	compare computer-aided drafting software; and	CCRS: SCI: I.D.2; SS: I.F.1; IV.A, B, D; ELA: II

(E)	explain the uses of design analysis and computer-aided drafting software.	CCRS: SCI: I.D.2; SS: I.F.1; IV.A, B, D; V.A.1; ELA: III
(13)	The student understands and researches the components of project closeout processes. The student is expected to:	
(A)	identify the main stakeholders involved in final inspections;	CCRS: CDS: I.A.1; I.B.2; SS: I.A.6, C.3, E.2; II.A.2, III.A.3; ELA: V
(B)	develop a punch list that identifies deficiencies in a completed project;	CCRS: CDS: I.B.3; I.C.1; II.B.1; II.D.1; II.D.3; II.E.2; ELA: I
(C)	organize and maintain the punch list by trade, area, or priority; and	CCRS: CDS: II.B.1; II.B.3; II.D.1; II.E.2.
(D)	evaluate the completed project.	QA CCRS: CDS: I.A.2; I.F.2; ELA: V.A.
(14)	The student understands and navigates civil engineering construction documents. The student is expected to:	
(A)	identify the sections of a construction document set, including plat, existing conditions, site plan, fire protection plan, dimensional control plan, grading plan, drainage plan, utility plan, paving plan, erosion control plan, and project detail sheets;	CCRS: SS: IV.B.3; ELA: V.A
(B)	research and describe the purpose of a fire protection plan;	CCRS: CDS.II.C.2.
(C)	describe the components of a paving plan, including pavement sections, material types, and design details;	CCRS: SS: V.B.2; ELA: V.B
(D)	identify and locate construction specification documents relevant to a given project;	CCRS: ELA: I, II.A-B; V.B
(E)	explain and locate the fundamental components of a construction document's legend, including symbols, line types, and typical abbreviations;	CCRS: ELA: II.A-B; V.B
(F)	explain the process of drafting a construction document to scale;	CCRS: SCI: V.E.2; ELA: II.A-B; V.B
(G)	determine and demonstrate which scale best fits a standard size drawing sheet;	CCRS: ELA: I, II.A-B; V.B

(H)	explain the relationship among a construction document's specifications, plans, legend, and scale; and	CCRS: ELA: II.A-B; V.B
(I)	identify and explain the differences between design drawings and record drawings.	CCRS: ELA: I, II.A-B; V.B
(15)	The student applies best practices for effective project document structure and management. The student is expected to:	
(A)	develop and implement a systematic organizational structure for project documents that considers factors such as project phase, discipline, and document type; and	CCRS: CDS.II.D.1; II.E.2; ELA: I, II.A-B; V.B
(B)	develop and apply a consistent naming convention to project documents and explain its necessity.	CCRS: CDS.I.E.2.
(16)	The student describes and exhibits characteristics that lead to a successful civil engineering team. The student is expected to:	
(A)	research and describe time management techniques such as Gantt charts, scheduling, critical path, and man-power projections used in project management;	CCRS: SS: IV.A.2,3,5; B.3; D,1; ELA: V.B
(B)	demonstrate effective communication skills, including active listening and clear articulation of ideas, in written and oral formats, to facilitate collaboration in a project team;	CCRS: CDS.II.B; II.D.3; II.E.3; SS: IV.C.1, V.A; ELA: I, II, III, IV
(C)	prepare effective communications, technical reports, and presentations; and	CCRS: CDS: I.E; II.B.1-4; II.D.3; II.E.3; SS: V.A; SCI: III.A.1; ELA: II, III
(D)	explain how project team dynamics impact project outcomes and member morale.	CCRS: CDS.I.A.1; I.B.1; I.B.2.
(17)	The student researches and describes ethics pertaining to civil engineering. The student is expected to:	
(A)	research and identify the fundamental engineering ethics established by the American Society of Civil Engineers, the National Society of Professional Engineers, the Texas Board of Professional Engineers and Land Surveyors, the National Council of Examiners for Engineering and Surveying, and the National Institute of Engineering Ethics; and	CCRS: SCI: IV.B.1; IV.B.2; SS: I.F; IV.A.5,6; B.3,4; C; ELA: II, IV
(B)	analyze root causes and lessons learned from historical examples or case studies involving ethical misconduct in civil engineering projects.	With reverence to historical examples of Civil Engineering Failures CCRS: CDS.I.A.1; I.B.2; I.C.3; I.F.2-4; II.B.3; II.C.2; SS: I.A.2, E.4; II.A.2; ELA: III; SS: I.E.4; F; II.B.4; ELA: II

(18)	The student explores the impact of engineering in the natural world and built environment. The student is expected to:	
(A)	describe the effects of sustainable practices on local and global communities, environments, and economies;	CCRS: SS: I.A.2,3-6; E.2; F; III.A-B; ELA: I, II
(B)	describe sustainability standards used throughout the project life cycle;	CCRS: ELA: I, II
(C)	describe governmental agencies that regulate environmental impact at the federal, state, and local level;	CCRS: ELA: I, II
(D)	describe the effects of construction on the natural world, including flora, fauna, groundwater, surface water, soil, earth's atmosphere, air quality, and waterways; and	CCRS: SCI: X.A.2; ELA: I, II
(E)	describe methods used by engineers to mitigate and remediate the effects of construction on the natural world.	CCRS: SCI: X.A.2; ELA: I, II
(19)	The student understands the methods environmental engineers use to supply water, dispose of waste, and control pollution. The student is expected to:	
(A)	describe methods of population projection for sizing water and wastewater facilities;	CCRS: ELA: I, II
(B)	describe water quality standards using prescribed units of measure;	CCRS: ELA: I, II
(C)	research and explain the different regulations for water quantity design requirements by jurisdiction;	CCRS: SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V
(D)	research and explain the different regulations for wastewater quantity design requirements by jurisdiction;	CCRS: SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V
(E)	research and describe methods of water and wastewater treatment;	CCRS: SCI: X.A.4; X.E.4; SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V
(F)	research and describe methods of solid waste management;	CCRS: SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V
(G)	research and describe methods of controlling hazardous waste; and	CCRS: SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V
(H)	research and describe methods of measuring and managing air quality.	CCRS: SCI: X.A.3; X.E.5; SS: I.A.2, 6; II.A, IV.A-B; ELA: I, II.A-B, V

§127.XX Civil Engineering II (Two Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades 11-12. Prerequisite: Civil Engineering I. Students shall be awarded two credits for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students in Civil Engineering II will apply the principles and practices essential to various subdisciplines within Civil Engineering. Throughout this course, students will develop knowledge and skills essential to the design development and construction of a civil engineering project. The students will explore the impacts and constraints on the design of a project. They will also delve into the functional mathematics crucial to the profession. Additionally, the course emphasizes the importance of effective project document structure and project management, ethical considerations, and the impact of civil engineering on the natural and built environment.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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.	

(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	
(B)	analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;	
(D)	use time-management skills in prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that optimizes efficiency and results independently and in groups;	
(E)	describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;	
(F)	explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers applies to engineering practice;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;	
(J)	identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	compare skills and characteristics of managers and leaders in the workplace.	
(2)	The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:	
(A)	describe and implement the stages of an engineering design process to construct a model;	

(B)	explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, and technology, impact stages of the engineering design process;	
(C)	explain how stakeholders impact an engineering design process; and	
(D)	analyze how failure is often an essential component of the engineering design process.	
(3)	The student explores the methods and aspects of project management in relation to projects. The student is expected to:	
(A)	research and explain the process and phases of project management, including initiating and planning; executing; and closing;	
(B)	explain the roles and responsibilities of team members, including project managers and leads;	
(C)	research and evaluate methods and tools available for managing a project;	
(D)	discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;	
(E)	describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;	
(F)	explain how a project budget is developed and maintained, including materials, equipment, and labor; and	
(G)	describe the importance of management of change (MOC) and how it applies to project planning.	
(4)	The student understands the foundations of occupational safety and health. The student is expected to:	
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	
(B)	explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;	
(C)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	

(D)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(E)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	
(F)	describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;	
(G)	analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;	
(H)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;	
(I)	describe the elements of a safety and health program, including management leadership, worker participation, and education and training;	
(J)	explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;	
(K)	explain the components of a hazard communication program; and	
(L)	explain and give examples of safety and health training requirements specified by standard setting organizations.	
(5)	The student recognizes project stakeholders, industry organizations, and common business practices in civil engineering. The student is expected to:	
(A)	identify and describe the roles and objectives of project stakeholders, including engineer, owner, architect, contractor, subcontractors, project manager, end users, regulatory agencies, and the public; and	CCRS: SS: I.A.1-3,6; E.4; II.A.2, B.1, 4,6; III.A.1, 3; ELA: I, II
(B)	describe the mission and membership benefits of industry organizations such as the American Society of Civil Engineers, the National Society of Professional Engineers, and the Society of Women Engineers.	CCRS: SS: I.A.1-3,6; E.4; II.A.2, B.1, 4,6; III.A.1, 3; ELA: I, II
(6)	The student explores various disciplines within civil engineering. The student is expected to:	
(A)	describe the knowledge requirements and essential functions of an engineer in a variety of civil engineering disciplines, including environmental, geotechnical, transportation, structural, water resources, and construction;	

(B)	explain how different types of projects, including public works, transportation, urban development, water resources, and utilities, within civil engineering subdisciplines impact the built environment; and	
(C)	explain types of civil engineering projects.	
(7)	The student explores how codes, regulations, and plats impact a civil engineering project. The student is expected to:	Codes/Regulations/Subdivision ordinances/Plat
(A)	research and describe the regulations established by the American Disabilities Act relevant to site design; and	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(B)	define and describe the purpose of a plat and easements for a civil engineering project.	Define plat Define easement Describe the purpose of a plat Describe the purpose of an easement CCRS: SS: IV.A, D; ELA: II
(8)	The student develops a proposal for a civil engineering project such as a park, a parking lot, or a storm drain. The student is expected to:	
(A)	analyze or develop a feasibility report for a civil engineering project;	CCRS: SS: IV.A, D; ELA: I, II, V
(B)	develop and analyze the scope of work for a civil engineering project;	CCRS: SS: IV.A, D; ELA: I, II, V
(C)	calculate monetary value for engineering efforts on a given project;	CCRS: SS: IV.A, D; ELA: I, II, V Establish engineering fees
(D)	revise and archive the draft project proposal as the scope of work changes;	QC CCRS: ELA: I, II
(E)	generate a client deliverable package that contains a fee proposal, project schedule, organizational chart, exclusions, and an engineering contract;	CCRS: ELA: I, II
(F)	present a final proposal for a civil engineering project; and	CCRS: SS: V; ELA: I, II, III
(G)	identify lessons learned from the project proposal process.	CCRS: SS: IV.A, D; ELA: I, II QA

(9)	The student develops a civil engineering project schedule. The student is expected to:	
(A)	identify and prioritize project tasks to determine the critical path of a project;	CCRS: SS: IV.A, D; ELA: I, II
(B)	create a project critical path diagram;	CCRS: SS: IV.A, D; ELA: I, II
(C)	evaluate project tasks and the critical path to develop the project schedule;	CCRS: SS: IV.A, D; ELA: II
(D)	create a Gantt chart for all project activities; and	CCRS: SS: IV.A, D; ELA: I, II
(E)	assess project schedule for opportunities to improve project efficiencies.	CCRS: SS: IV.A, D; ELA: II
(10)	The student develops a civil engineering design for a project site. The student is expected to:	
(A)	create a concept site plan using existing schematics, survey data, and regulatory design manuals;	CCRS: SS: IV.A, D; ELA: II
(B)	identify existing and proposed utility providers, including electric, water, sewer, gas, and telecommunications, at a project site;	CCRS: SS: IV.A, D; ELA: II
(C)	research and identify existing plats and easements for a project site; and	CCRS: SS: I.A.1; B.2, F; IV.A, B, D; V.B; ELA: II
(D)	revise and finalize a project site plan to reflect analyzed site data, including utilities, geotechnical, right-of-way, water resources, environmental, and transportation data.	CCRS: SS: I.A.1; F; IV.A, D; ELA: II QA
(11)	The student explores concepts and calculations used by water resources engineers. The student is expected to:	
(A)	describe storm event probability;	
(B)	describe methods used, including Rational method, Natural Resources Conservation Service (NRCS) and Soil Conservation Service (SCS), and unit hydrograph, to calculate flow rate;	
(C)	analyze existing topography at the project site to determine drainage patterns;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(D)	delineate existing and proposed drainage areas impacting a project site to determine the change in stormwater runoff generated by a project design;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(E)	research and describe methods of stormwater mitigation and water quality treatment;	SS: IV.A, B, D; V.B; ELA: II, V

(F)	calculate the existing flow rates for a 5-year and a 100-year storm event for a project site using the Rational method;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(G)	analyze and calculate the proposed flow rates for a 5-year and a 100-year storm event for a project design;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(H)	determine the required stormwater remediation techniques for a 100-year storm event by comparing existing and proposed runoff quantities;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(I)	research and describe methods of stormwater conveyance, including channel, culvert, and pipe;	
(J)	calculate the hydraulics of a stormwater conveyance using the continuity equation, energy equation, and Bernoulli's equation;	CCRS: SS: IV.A, B, D; V.B; ELA: II, V
(K)	design a conveyance system such as a pipe, culvert, or open-channel to convey stormwater runoff for a 100-year storm event using the calculated data;	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(L)	create a plan and profile sheet of a drainage system, including surface elevations, slopes, conveyance system dimensions, material, and pipe invert elevations; and	Industry term: plan and profile sheet: (sheet is a page in a set of construction documents.) CCRS: SS: I.A.1; F; IV.A, D; ELA: II
(M)	describe the impact of a drainage analysis for a project.	
(12)	The student explores concepts and calculations used by geotechnical engineers. The student is expected to:	
(A)	identify and explain the components of a geotechnical report, including boring samples and logs, soil types and classifications, pavement recommendations, foundations recommendations, and soil preparations;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III
(B)	identify and determine the soil classifications at a project site using the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (WSS);	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: II
(C)	calculate the plasticity index of the soil from a project site;	CCRS: SS: I.A.1; F; IV.A, D; ELA: II
(D)	research and explain methods of soil preparation;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(E)	research and explain how geotechnical results impact pavement recommendations used in civil engineering projects;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III. V

(F)	research and select the most effective pavement section for a project; and	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(G)	describe the impact of a geotechnical analysis for a project.	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(13)	The student explores concepts and calculations used by structural engineers. The student is expected to:	
(A)	research and explain different types of foundations used in civil engineering projects;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(B)	identify and describe the various types of building foundations, including raft, monolithic slab, slab on grade, pier and beam, spread footing, mat footing, drilled piers, pylons, waffle slab, and post-tension slab;	
(C)	describe the forces common to structural engineering calculations, including gravity, tension, compression, flexure, and torsion;	
(D)	describe the loads common to structural engineering calculations, including dead load, live load, environmental, and other load paths such as lateral and concentrated;	
(E)	diagram and explain how applied loads and forces are resisted in a structure and transferred to the earth;	
(F)	diagram a simply supported beam subjected to loading conditions to determine reaction forces;	
(G)	sketch shear and moment diagrams to determine the maximum shear and moment resulting in the beam;	
(H)	calculate beam deflection of a simply supported beam subjected to a given loading;	
(I)	identify and describe the different types of trusses, including simple truss, planar, and space frame;	
(J)	diagram a truss subjected to loading conditions to determine reaction forces and identify the zero force members;	
(K)	explain why design loads are dictated by building codes;	
(L)	determine the size of a spread footing for a given load condition for a specified building foundation; and	
(M)	describe the impact of a structural analysis for a project.	

(14)	The student explores concepts and calculations used by transportation engineers. The student is expected to:	
(A)	identify and describe various types of transportation engineering specializations such as rail, aviation, roadway, highway, and marine;	
(B)	research and explain the benefits of having a professional transportation engineering certification;	
(C)	research and explain the benefits of membership in a transportation engineering organization such as Institute for Transportation Engineers (ITE), American Society of Highway Engineers (ASHE), American Association of State Highway and Transportation Officials (AASHTO), and WTS;	
(D)	determine stopping sight distance of a roadway given design speed and grade;	
(E)	research and describe the impacts of transportation design elements, including grades, superelevation, design speed, friction factor, lane widths, vertical curves, horizontal curves, roadway classification, acceleration, and deceleration;	
(F)	analyze the level of service of a roadway to determine if operating conditions are adequate;	
(G)	identify and explain the components of a traffic impact analysis (TIA), including data collection summary, trip analysis, turn lane analysis, project phasing, and sight visibility analysis;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: II
(H)	research and identify methods of traffic data collection;	CCRS: SS: I.F; IV.A, D; ELA: II, V
(I)	collect traffic count data at a project site and calculate and analyze the results of the traffic count to determine peak hour trips and traffic mitigation;	CCRS: SS: I.F; IV.A, D; ELA: II, V
(J)	determine the peak hour trips generated by a given land use from a ITE Trip Generation Manual;	
(K)	research and describe traffic level of service for various roadways;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(L)	determine if a turn lane is warranted based on peak hour trips and traffic volume;	

(M)	research and select the most effective pavement cross-section for a roadway; and	CCRS: SS: I.A.1; F; IV.A, B, D; ELA: II
(N)	describe the impact of a transportation analysis for a project.	
(15)	The student develops construction documents for a civil engineering project. The student is expected to:	
(A)	develop project construction documents that includes a design plan, specifications, and cost estimate for a civil engineering project;	(PS&E) plans, specifications, and estimates
(B)	develop the analysis reports for a civil engineering project;	
(C)	generate an existing condition and demolition sheet that contains existing topography, property lines, easements, utilities, rights-of-way, drainage infrastructure, and structures, and identifies items to be demolished;	Condition and demolition sheet is ONE SHEET CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(D)	develop a fire protection plan for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(E)	generate a paving plan that shows the extents and types of pavements necessary for a project;	"Paving extents" is an industry term CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(F)	generate a site plan that labels proposed improvements for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(G)	generate a site dimensional control plan containing measurements for all site improvements for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(H)	generate a grading plan that documents proposed elevations and topography in comparison to existing topography for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(I)	generate drainage plans to document the existing drainage plan, proposed drainage plan, and drainage infrastructure for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(J)	generate a utility plan that documents existing and proposed utility types, locations, and materials for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(K)	generate an erosion control plan that identifies erosion control best management practices (BMP) defined by the Texas Commission on Environmental Quality (TCEQ) for a project;	CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II

(L)	review and revise draft construction documents for stakeholder compliance and project objectives; and	Stakeholder compliance = owner, regulatory, government, ethical, and technical QC CCRS: SS: I.A.1; F; IV.A, D; ELA: I, II
(M)	explain the importance of a quality control review and complete a quality control review of the construction documents of the project.	QA CCRS: SS: IV.A, D; V.A; ELA: II, III
(16)	The student develops documents for support of the construction bid. The student is expected to:	
(A)	identify components of a bid tabulation, including item description, material quantity, unit measure, unit price, and total price;	CCRS: SS: I.F; IV.A, D; ELA: II
(B)	compare a project bid tabulation and corresponding construction documents to verify all items are included;	CCRS: SS: I.F; IV.A, D; ELA: II
(C)	create a project bid tabulation; and	CCRS: SS: I.F; IV.A, D; ELA: I, II
(D)	research and identify the parts of civil engineering project manual.	CCRS: SS: I.F; IV.A, D; ELA: II
(17)	The student works as an individual and a team member to complete projects. The student is expected to:	
(A)	identify and define team member roles for civil engineering projects;	CCRS: SS: II.B.4; ELA: I, II
(B)	track team goals to contribute constructively and positively to the project team;	CCRS: ELA: I, II
(C)	explain various methods to resolve conflict within a project team;	
(D)	explain how leadership impacts project outcomes and team members;	CCRS: SS: I.E.4; II.B.4; ELA: I, II, III
(E)	evaluate team member performance and effectiveness in a project; and	CCRS: SS: I.E.4; F; II.B.4; IV.C; ELA: I, III, IV
(F)	prepare and present a civil engineering project overview.	CCRS: SS: V.A; ELA: I, II, III

(18)	The student researches and understands the code of ethics pertaining to civil engineering. The student is expected to:	
(A)	research and describe the impact of the State of Texas Engineering Practice Act and Rules;	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(B)	analyze and discuss ethical case studies using Texas Administrative Code, Title 22, Part 6, Chapter 137, Subchapter C, Professional Conduct and Ethics; and	CCRS: SS: I.A.2; E.4; F.1; II.B,4; V.A, D; V.A; ELA: I, II, III, V
(C)	research and describe the ethical considerations and obligations of an engineer.	CCRS: SS: IV.A, B, D; V.B; ELA: II, V
(19)	The student understands the fundamental sustainable design approaches and practices in civil engineering projects. The student is expected to:	
(A)	research and describe sustainable building materials;	
(B)	research and describe sustainable building methods;	
(C)	identify and explain the programs and certifications that establish sustainability criteria for engineering projects such as Leadership in Energy and Environmental Design (LEED) and the Institute for Sustainable Infrastructure Envision (ISI Envision);	
(D)	describe how construction materials selection is influenced by sustainable programs and certifications;	
(E)	assess the sustainability of construction materials used in a civil engineering project;	
(F)	describe how sustainable programs and certifications influence the selection of design elements in a project;	
(G)	explain how sustainable design reduces the impacts on the environment and human health; and	
(H)	document elements of the construction process to comply with sustainable design criteria.	

§127.XX Architectural Engineering (Two Credits), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades 11-12. Prerequisite: Civil Engineering I. Students shall be awarded two credits for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students enrolled in Architectural Engineering will use principles of engineering and design tools to create innovative, functional, and sustainable buildings. Students will develop cursory knowledge and essential skills to understand the design of buildings, including the mechanical, electrical, plumbing, and structural systems while also planning the construction process. They will engage in project planning, building and system analysis, site investigation, and the integration of sustainable design and construction practices for an architectural engineering project.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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.	

(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	
(B)	analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;	
(D)	use time-management skills in prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that optimizes efficiency and results independently and in groups;	
(E)	describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;	
(F)	explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers applies to engineering practice;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;	
(J)	identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	compare skills and characteristics of managers and leaders in the workplace.	
(2)	The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:	Engineering design process stand
(A)	describe and implement the stages of an engineering design process to construct a model;	
(B)	explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, and technology, impact stages of the engineering design process;	

(C)	explain how stakeholders impact an engineering design process; and	
(D)	analyze how failure is often an essential component of the engineering design process.	
(3)	The student explores the methods and aspects of project management in relation to projects. The student is expected to:	Project management strand
(A)	research and explain the process and phases of project management, including initiating and planning; executing; and closing;	
(B)	explain the roles and responsibilities of team members, including project managers and leads;	
(C)	research and evaluate methods and tools available for managing a project;	
(D)	discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;	
(E)	describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;	
(F)	explain how a project budget is developed and maintained, including materials, equipment, and labor; and	
(G)	describe the importance of management of change (MOC) and how it applies to project planning.	
(4)	The student understands the foundations of occupational safety and health. The student is expected to:	
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	
(B)	explain and discuss the importance of Occupational Safety and Health Administration (OSHA) standards and OSHA requirements for organizations, how OSHA inspections are conducted, and the role of national and state regulatory entities;	
(C)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	
(D)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(E)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	

(F)	describe types of electrical hazards in the workplace and the risks associated with these hazards and describe control methods to prevent electrical hazards in the workplace;	
(G)	analyze the hazards of handling, storing, using, and transporting hazardous materials and identify and discuss ways to reduce exposure to hazardous materials in the workplace;	
(H)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace;	
(I)	describe the elements of a safety and health program, including management leadership, worker participation, and education and training;	
(J)	explain the purpose and importance of written emergency action plans and fire protection plans and describe key components of each such as evacuation plans and emergency exit routes, list of fire hazards, and identification of emergency personnel;	
(K)	explain the components of a hazard communication program; and	
(L)	explain and give examples of safety and health training requirements specified by standard setting organizations.	
(5)	The student explores the origin and application of basic building types. The student is expected to:	CCRS: SS: I.A.1; F; IV.A, D; V.A; ELA: II
(A)	identify and describe the fundamental parts of a building, including foundation, floor, walls, roof, utility systems;	
(B)	identify and describe the visual design element of various building types, including residential, commercial, institutional, and industrial; and	
(C)	research and describe the evolution of the built space and development of building forms.	CCRS: CDS: II.C.1-3; SS: I.A.1; F; IV.A, D; V.A; ELA: I, II, III, V
(6)	The student understands the properties of common building materials and construction methods. The student is expected to:	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(A)	identify and describe common building materials, including wood, masonry, metal, glass, aggregate, and plastic;	
(B)	identify and describe common roofing materials, including thatch, wood, metal, sod, and asphalt;	
(C)	explain traditional construction methods such as wood framing, tilt-wall, masonry, and steel;	

(D)	research and describe contemporary construction methods such as prefabricated, modular, additive construction (3D printing);	CCRS: CDS: II.C.1-3
(E)	identify and describe standard building methods such as casting, cutting, drilling, driving, and fastening for the construction of buildings;	
(F)	research and describe sustainable building materials;	CCRS: CDS: II.C.1-3
(G)	research and describe sustainable building methods;	CCRS: CDS: II.C.1-3
(H)	describe how building material selection is influenced by sustainable programs and certifications such as Leadership in Energy and Environmental Design (LEED); and	CCRS: CDS: I.C.1-3
(I)	assess the sustainability of materials used in a civil engineering project.	CCRS: CDS: I.C.1-3
(7)	The student will understand the application of codes and regulations to building projects. The student is expected to:	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(A)	explain the purpose of building and construction codes, including public health and safety, structure, locations, utilities, construction, and landscape;	CCRS: CDS: I.C.1-3
(B)	research and describe land use regulations to identify zoning, ordinances, and allowable uses of real property;	CCRS: CDS: I.C.1-3; II.C.1-3
(C)	describe how zoning regulations are used to control land use and development;	
(D)	research and identify standard accessibility features such as ramps, elevators, parking, handrails, and fire alarm horn strobe, stemming from codes and regulations such as the American Disability Act (ADA), the Texas Accessibility Standards (TAS);	
(E)	identify and explain codes applicable to a building project;	
(F)	examine how codes and building regulations define and constrain all aspects of building design and construction, including the structure, site design, utilities, and building usage;	CCRS: CDS: I.C.1-3; II.C.1-3; SS: I.E.2
(G)	classify a building according to its use, occupancy, and construction type using the International Building Code; and	
(H)	describe the conservation of natural resources, reduction of operational costs, environmental protections, and development of healthier built spaces that result from the application of energy codes.	CCRS: CDS: I.C.1-3

(8)	The student will explore the various building systems. The student is expected to:	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(A)	identify and describe the purposes and types of various building envelops such as tilt-wall, glazing, brick, Exterior Insulation Finishing System (EIFS);	
(B)	identify and describe the components of building envelopes, including foundation, walls, wall openings, roofs, roof penetrations, insulation, and building membranes;	
(C)	research and describe different types of insulating materials;	CCRS: CDS: I.C.1-3
(D)	research and describe different types of windows and doors;	CCRS: CDS: I.C.1-3
(E)	identify and describe the purpose and main components of mechanical systems within a building, including heating ventilation and air conditioning (HVAC), air handler, boilers, fire protection and suppression, lifts, chilled water equipment, and emergency power;	
(F)	describe how sustainable programs and certifications such as LEED influences the selection of mechanical systems in a building project;	CCRS: CDS: I.C.1-3; II.C.1-3
(G)	identify and describe the purpose and main components of electrical systems within a building, including meter, electrical panel, branch circuits, lighting, receptacles, switches, transformers, generators, switch gears, solar voltaic cells, power storage, voltage regulators, and low-voltage systems;	
(H)	describe how sustainable programs and certifications such as LEED influences the selection of electrical systems in a building project;	CCRS: CDS: I.C.1-3; II.C.1-3
(I)	identify and describe the purpose and main components of plumbing systems within a building, including water meter, gas meter, main supply lines, branch lines, pumps, sewer lines, traps, risers, water service, fire suppression, appurtenances, and fixtures;	
(J)	describe how sustainable programs and certifications such as LEED influences the selection of plumbing systems in a building project; and	CCRS: CDS: I.C.1-3; II.C.1-3
(K)	interpret engineering drawings related to the design and construction of a building project, including HVAC, electrical, and plumbing systems.	
(9)	The student examines building foundations and structures. The student is expected to:	
(A)	identify and describe the various types of building foundations, including raft, monolithic slab, slab on grade, pier and beam, spread footing, mat footing, drilled piers, pylons, waffle slab, and post-tension slab;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V

(B)	explain the appropriate use cases for the various foundation types based on soil conditions, load requirements, and building type;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(C)	classify a soil sample according to grain size and plasticity;	CCRS: SS: IV.A, B, D; V; ELA: I, II, V
(D)	calculate the plasticity index of a soil sample;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(E)	determine the united soil classification system designation from a site soil sample analysis;	CCRS: SS: IV.A, B, D; V; ELA: I, II, V
(F)	describe the forces common to structural engineering calculations, including gravity, tension, compression, flexure, and torsion;	CCRS: SS: IV.A, B, D; V; ELA: I, II, III, V
(G)	describe the loads common to structural engineering calculations, including dead load, live load, environmental, and other load paths such as lateral and concentrated;	CCRS: SS: IV.A, B, D; V; ELA: I, II, III, V
(H)	diagram and explain how applied loads and forces are resisted in a structure and transferred to the earth;	CCRS: SS: IV.A, B, D; V; ELA: I, II, III, V
(I)	diagram a simply supported beam subjected to loading conditions to determine reaction forces;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(J)	sketch shear and moment diagrams to determine the maximum shear and moment resulting in the beam;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(K)	calculate beam deflection of a simply supported beam subjected to a given loading;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(L)	identify and describe the different types of trusses, including simple truss, planar, and space frame;	CCRS: SS: IV.A, B, D; V; ELA: I, II, III, V
(M)	diagram a truss subjected to loading conditions to determine reaction forces and identify the zero force members;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(N)	explain why design loads are dictated by building codes;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(O)	identify and describe the composition of different concrete mixtures and ratios of ingredients;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(P)	identify and describe the purpose of various concrete admixtures, including air entrainer, water reduce, retarder, hydration controller, accelerator, super plasticizer, and fly ash;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(Q)	explain why various admixtures are selected for a project such as curing time, ambient climate, and permeability;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V

(R)	conduct concrete compression and splitting-tension tests and compare strength and failures;	CCRS: SS: IV.A, B, D; ELA: I, II, V
(S)	analyze a concrete mixture by performing a slump test; and	CCRS: SS: IV.A, B, D; ELA: II, V
(T)	determine the size of a spread footing for a given load condition.	CCRS: SS: IV.A, B, D; ELA: I, II
(10)	The student designs and develops plans for building systems. The student is expected to:	
(A)	identify and describe various site constraints, including utilities, grading, drainage, transportation access, environmental conditions, regulatory requirement, and rights-of-way;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(B)	identify and explain the purpose of Low Impact Development techniques in site development such as to reduce the impact on stormwater runoff quantity and quality;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(C)	develop building design and engineering plans that integrate site constraints as appropriate;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; ELA: I, II
(D)	describe how soil characteristics impact the building design;	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(E)	develop a stormwater management system for a building to include roof drainage calculations, roof drain design, and downspout sizing and location;	CCRS: SS: I.A. F; IV.A, D; ELA: I, II, V
(F)	apply local, state, and federal codes and regulations to design ingress and egress for a building;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; ELA: I, II, V
(G)	apply codes to determine the type, sizing, and placement of site features, including parking lots, entrance and exits road, pedestrian and handicap access, and storm water facilities;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; ELA: I, II, V
(H)	evaluate a site to appropriately locate and orient the building or structure;	CCRS: SS: I.A. F; IV.A, D; ELA: I, II, V
(I)	apply sustainable building materials, construction methods, and utility systems to a building design;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; ELA: I, II, V
(J)	develop building design and engineering plans that incorporate energy conservation techniques;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; ELA: I, II, V
(K)	recommend and defend an appropriate foundation design for a building type;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; V.A, B; ELA: I, II, III, V

(L)	design, modify, and plan structures using 3D software;	CCRS: CDS: II.E.1-4; SS: IV.A; ELA: II This lends the course to being 2 credits. It is an industry standard to use CADD in Engineering
(M)	construct building drawings using advanced computer-aided design drafting skills;	CCRS: CDS: II.E.1-4; SS: IV.A; ELA: II
(N)	create three-dimensional views of a building design;	CCRS: CDS: II.E.1-4; SS: IV.A; ELA: II
(O)	create three-dimensional solid models;	CCRS: CDS: II.E.1-4; SS: IV.A; ELA: II
(P)	create and modify building drawings;	CCRS: CDS: II.E.1-4; SS: IV.A; ELA: II
(Q)	plot engineered drawings for presentation;	CCRS: CDS.II.E.1-4; II.C.8; SS: IV.A; ELA: II
(R)	design and present a final effective building design for critique;	CCRS: CDS.II.E.1-4; II.C.8; SS: IV.A; V.A; ELA: II, III
(S)	develop preliminary sketches of a building or structural design;	CCRS: CDS.II.E.1-4; SS: IV.A; ELA: II
(T)	develop drawings to demonstrate the maximum efficiency of circulation within a building;	CCRS: CDS: I.C.1-3; SS: IV.A; ELA: I, II, V
(U)	develop a site plan using maximum orientation of the building relative to views, sun, and wind direction;	CCRS: CDS: I.C.1-3; SS: IV.A; ELA: I, II, V
(V)	draw schematic site plans, floor plans, roof plans, building elevations, sections, and perspectives, using design development techniques;	CCRS: CDS.II.E.1-4; SS: IV.A; ELA: I, II, V
(W)	draw scaled wall thickness plans, interior elevations, and sections;	CCRS: CDS.II.E.1-4; SS: IV.A; ELA: I, II, V
(X)	develop details, sections, floor and wall sections, ceiling and roof sections, door and window sections, and other sections as required;	CCRS: CDS.II.E.1-4; SS: IV.A; ELA: I, II, V

(Y)	assemble a building design in three dimensions;	CCRS: CDS.II.E.1-4; SS: IV.A; ELA: I, II, V
(Z)	explain how sustainable design reduces the impacts on the environment and human health;	CCRS: CDS: I.C.1-3; SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(AA)	use sustainable design criteria such as those outlined in LEED for the design of building systems;	CCRS: CDS: I.C.1-3; SS: IV.A; ELA: I, II, IV
(BB)	review and revise draft construction documents to incorporate results from structural analysis such as beam, truss, and foundation calculations conducted for the project;	CCRS: CDS: I.C.1-3; II.B.1-3; SS: IV.A; ELA: I, II, IV
(CC)	review and revise draft construction documents to incorporate results from building system analysis such as mechanical, electrical, and plumbing calculations conducted for the project; and	CCRS: CDS: I.C.1-3; II.B.1-3; II.E.1-4; SS: IV.A; ELA: I, II, IV
(DD)	organize and monitor project progress using organizational charts, Gantt charts, and regularly scheduled team meetings.	CCRS: CDS: II.B.1-3; II.E.1-4; SS: IV.A; ELA: I, II
(11)	The student explores construction phase processes for a building design project. The student is expected to:	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(A)	determine surface area and volume of building components;	CCRS: SS: IV.A; ELA: I, II, V
(B)	develop a material quantity take-off for a building project;	CCRS: CDS: II.D.1-3; SS: IV.A; ELA: I, II, V
(C)	develop an Opinion of Probably Cost (OPC) for a building project;	CCRS: CDS: II.D.1-3; SS: IV.A; ELA: I, II, V
(D)	document elements of the building construction to comply with sustainable design criteria such as those outlined in LEED;	CCRS: CDS: II.D.1-3; SS: IV.A; ELA: I, II, V
(E)	identify components of a bid tabulation, including item description, material quantity, unit measure, unit price, and total price;	CCRS: SS: IV.A; ELA: I, II, V
(F)	compare a project bid tabulation and corresponding construction documents to verify all items are included;	CCRS: CDS: I.C.1-3; II.B.1-3; II.D.1-3; SS: IV.A; ELA: I, II, V

(G)	create a project bid tabulation;	CCRS: CDS: II.B.1-3; SS: IV.A; ELA: I, II, V
(H)	identify and describe the parts of a construction project manual, including, invitation to bidders, instruction for bidders, project information, construction contracts, bid tabulation, maintenance bonds, performance bonds, payment bonds, specifications, insurance certificates, and legal requirements; and	CCRS: SS: I.A. F; IV.A, D; V.A; ELA: I, II, III, V
(I)	develop an organizational chart and Gantt chart for the construction of a project.	CCRS: CDS: I.C.1-3; II.B.1-3; II.E.1-4; SS: IV.A; ELA: I, II, V