Career and Technical Education TEKS Review Draft Recommendations

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

Engineering Foundations Program of Study

Courses: Engineering Design Process, Environmental Sustainability, Fluid Mechanics, Mechanics of Materials, Programming for Engineers, Statics, Engineering Design and Presentation I, Engineering Design and Presentation II, Engineering Design and Problem Solving, Practicum in 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
CD	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 Design Process (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 9-10. Prerequisite: Algebra I; Recommended prerequisite:	9-10, Recommended prereq: Algebra I, Level I Engineering 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 Design Process will transition from teacher given engineering problems to problems that students find independently and creating solutions.	
(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 and how these practices optimize efficiency and results;	
(E)	define work ethic and discuss the characteristics of a positive work ethic, including punctuality, dependability, reliability, and responsibility for reporting for duty and performing assigned tasks;	
(F)	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)	The student explores and develops skills to solve problems, make decisions, and manage a project. The student is expected to:	CCRS SCI I.C.1
(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:	CCRS SCI I.C.2; I.C.3
(A)	explain and discuss the responsibilities of workers and employers to promote safety and health in the workplace and the rights of workers to a secure workplace;	
(B)	explain the role industrial hygiene plays in occupational safety and explain various types of industrial hygiene hazards, including physical, chemical, biological, and ergonomic;	
(C)	identify and explain the appropriate use of types of personal protective equipment used in industry;	
(D)	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;	
(E)	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; and	
(F)	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and discuss how these resources are used to make decisions in the workplace.	

(5)	The student understands the value of maintaining documentation using an engineering notebook. The student is expected to:	CCRS SCI III.A.1
(A)	explain the purpose and legal value of maintaining an engineering notebook as intellectual property;	
(B)	describe the proper implementation of an engineering notebook, including notebook type, documentation, signatures, adding external materials, sealing, and dating;	And purpose
(C)	create and maintain an engineering notebook by recording ideas, notes, decisions, findings, and corrections; including deficiencies in the design process, and decisions throughout the entire design process; and	
(D)	communicate progress during the engineering design process at regular intervals using various methods such as written reports, informal presentations, and formal presentations.	
(6)	The student understands how to conduct research in the engineering design process. The student is expected to:	CCRS SCI III.B.1; III.B.3
(A)	explain the advantages and disadvantages of emerging technologies and practices in the research process;	CCRS SCI IV.B.1
(B)	explain the importance of identifying and synthesizing information from a variety of sources in the research process;	CCRS SCI III.D.2
(C)	explain the ethical acquisition and use of digital information;	CCRS SCI I.D.1; III.D.1; IV.B.1-2
(D)	explain how to use and cite source material ethically and appropriately;	CCRS SCI IV.B.1
(E)	define and discuss intellectual property laws such as patents, copyrights, and proprietary information in the research process; and	
(F)	identify limitations in the research process.	
(7)	The student understands the process of creating and refining a problem statement in the engineering design process. The student is expected to:	Create a problem statement, who/when/where/why/how; details of the problem, real or simulated; Properly formulating questions; include real or simulated budgets; design brief is a live document
(A)	explain the essential components of a problem statement such as who the problem affects, when it is a problem, where the problem happens, and the magnitude of the problem;	
(B)	describe different methods for creating and refining a problem statement such as questioning, observation, and stakeholder needs;	

(C)	create a problem statement that is concise, specific, and measurable;	
(D)	collect, analyze, and interpret information relevant to a problem statement;	CCRS SCI III.D.2
(E)	modify a problem statement as necessary based on information acquired from using processes or various analysis tools such as fishbone charts, root-cause analysis, 80-20 rule, heat maps, survey results, and end-user input;	
(F)	explain the purpose of a technical document that brings together the objectives, constraints, data, alternatives, and design solutions such as a design brief or design basis, in the engineering design process; and	CCRS SCI III.C.1
(G)	compile a technical document that includes a problem statement, constraints, resources, budget, timeline, deliverables, and solution criteria such as quality, risk, and extent to which problem is solved.	CCRS SCI II.A.7; III.A.1; III.C.1
(8)	The student understands the importance of conceptualizing a solution in the engineering design process. The student is expected to:	
(A)	discuss the importance of creativity in engineering, innovation, and problem solving;	
(B)	explain and use various techniques for idea generation such as brainstorming, mapping, storyboarding, sketching, questioning, reverse engineering, natural solutions, to create solution concepts;	
(C)	explain the similarities and differences between designing a solution in the classroom versus a solution in the real world;	
(D)	analyze and evaluate solutions using the criteria established from a technical document;	
(E)	explain the importance of capturing stakeholder feedback to refine solution concepts; and	
(F)	explain and use various techniques for gathering end-user input such as focus groups, interviews, and surveys to refine solution concepts.	
(9)	The student creates technical drawings in the engineering design process. The student is expected to:	Create Materials List for Prototype; Virtual Prototype; Prototype by hand, machine, or both CCRS SCI V.E.1-2
(A)	explain the role of freehand sketching, freehand modeling, technical drawing, and technical modeling in the development of a prototype or solution;	
(B)	create nontechnical representations such as sketches, drawings, or models of a solution with relevant annotations;	

(C)	use a nontechnical representation of a solution to develop a technical model of the solution; and	
(D)	create technical drawings, including single-view projections, multi-view projections, and orthographic views, using industry standards.	
(10)	The student creates prototypes in the engineering design process. The student is expected to:	
(A)	explain the role of prototypes in the development of a solution;	
(B)	identify and describe the steps needed to produce a prototype;	
(C)	identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and	
(D)	present the prototype using presentation software.	CCRS SCI III.C.1
(11)	The student tests and evaluates a prototype or solution using experiments, data, and end-user feedback. The student is expected to:	CCRS SCI III.B.2; V.E.1-2
(A)	explain the purpose of conducting tests on a prototype or solution;	
(B)	design appropriate protocols for testing a prototype or solution;	
(C)	analyze, evaluate, and critique a prototype or solution by using observational and experimental testing, empirical evidence, and statistical analysis;	CCRS SCI I.A.4
(D)	collect end-user feedback using appropriate protocols such as focus groups, interviews, and surveys to evaluate a prototype or solution; and	
(E)	identify the successes and failures of a prototype or solution based on the criteria established in the testing protocols and technical document to determine next steps in the engineering design process.	
(12)	The student understands the iterative nature of the engineering design process to develop a solution. The student is expected to:	CCRS SCI II.A.6-7
(A)	analyze design flaws of a prototype or solution using various tools such as fishbone charts, root-cause analysis, 80-20 rule, heat maps, survey results, and end-user feedback;	
(B)	iterate steps of the design process, as necessary, to improve and optimize a solution; and	
(C)	evaluate the potential impact of a solution on the original problem identified during the design process.	

(13)	The student prepares and delivers a professional presentation detailing the experience of working through each step of the engineering design process to create a viable solution. The student is expected to:	CCRS SCI III.C.1
(A)	prepare and deliver a presentation detailing the experience of working through each step of the engineering design process to create a viable solution;	
(B)	solicit and evaluate feedback on implementation of the design process and the presentation; and	
(C)	present learning experiences such as essential skills gained, areas of personal growth, and challenges encountered throughout the design process.	

§127.XX Environmental Sustainability (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. Environmental Sustainability is recommended for students in Grades 9-12. Recommended Prerequisites: At least one credit in a Level 2 or higher course in engineering or renewable energy. Students successfully completing this course shall be awarded one credit.	
(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)	In Environmental Sustainability, students research, develop, and design solutions related to water, land management, energy, and food supply with consideration to ethics and policy. The student uses technology and the engineering design approach to devise solutions focused on current and future sustainability challenges.	
(4)	Students are encouraged to participate in extended learning experiences, such as career and technical student organizations, leadership or extracurricular organizations, and work-based experiences.	
(5)	Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.	
(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	

(B)	analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;	
(D)	use time-management skills 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)	Sustainability Ethics. The student applies ethical consideration to analyze sustainable and resilient engineered systems. The student is expected to:	
(A)	compare the Texas Engineering Practices Act to the code of ethics of other engineering societies such as the American Society of Civil Engineers and the National Society of Professional Engineers to explain how engineers demonstrate the responsibility they have to serve the public interest, his or her clients, and the profession with a high degree of honesty, integrity, and accountability;	
(B)	research the New London school explosion and explain how this event led to the development of the Texas Engineering Practice Act and other regulations such as odorization of natural gas;	
(C)	assess an engineering ethical dilemma between environmental limitations and the needs and wants of our society;	
(D)	explain how engineering solutions can have significantly different impacts, including environmental, economic, social, political, health, and welfare, on an individual, society, and the natural world; and	
(E)	identify an ethical dilemma that has positive and negative outcomes resulting from an environmental engineering decision or series of decisions.	

(5)	The student builds a model(s) using the appropriate tools, materials, and techniques. The student is expected to:	
(A)	identify and describe the steps needed to produce a model;	
(B)	identify advantages and limitations of models such as size, scale, properties, and materials;	
(C)	identify and use appropriate tools, equipment, and materials to produce a model;	
(D)	describe the use of a model to accurately represent the key aspects of a physical system, including the identification of constraints such as cost, time, or expertise that may influence the selection of a model;	
(E)	present a model using a variety of media; and	
(F)	evaluate the successes and failures of a model(s) in the context of an iterative design process.	
(6)	Critical and Creative Problem-Solving. The student examines environmental challenges and gathers assumptions to synthesize a meaningful, well-defined problem and ideates multiple solutions. The student is expected to:	
(A)	collect, analyze, and interpret information relevant to a problem;	Iterations, SE to gather and analyze assumptions
(B)	document a design process according to best practices in an engineering notebook;	
(C)	identify and define visual, functional, and design requirements with realistic constraints against which solution alternatives can be evaluated;	
(D)	list potential appropriate criteria for a defined problem that may impact the success of a design solution, such as economic, environmental, social, political, ethical, health and safety, manufacturability, technical feasibility, and sustainability;	
(E)	represent concepts using a variety of visual tools such as sketches, graphs, and charts to communicate the details of an idea;	
(F)	develop, design, and test alternatives to generate valid quantitative data to inform decision making and demonstrate solutions; and	
(G)	explain why there are often multiple viable solutions and no obvious best solution.	

(7)	Critical and Creative Problem-Solving. The student selects the optimal design solution for real-world environmental problems based on engineering judgement. The student is expected to:	
(A)	develop and carry out a justifiable scheme to compare and evaluate competing solutions paths using a decision matrix to compare and evaluate competing solutions based on design criteria;	Risk matrix is important
(B)	formulate a risk analysis matrix using a spreadsheet to evaluate threats and opportunities, including cost, time, environmental and social impacts;	Threat or opportunity
(C)	identify the data needed to address an environmental research question and the appropriate tools necessary to collect, record, analyze, and evaluate the data; and	
(D)	evaluate evidence and arguments to identify deficiencies, limitations, and biases for appropriate next steps in the pursuit of a better solution.	
(8)	Engineering Tools and Technology (ETT). The student uses a variety of techniques to measure and report quantities appropriate for an environmental analysis. The student is expected to:	Larger scale surface area calculations (acres, square miles, hectares, etc.) delineation of areas, working at scale is most difficult. Estimate mining or watersheds – calculations, terminology, measuring methodologies, geospatial skills-several free resources available
(A)	research and determine appropriate units of measure, including acres, miles, and hectares, for environmental analysis;	
(B)	measure and estimate a large-scale area such as a wetland, streamline, or floodplain using maps or digital resources;	
(C)	perform dimensional analysis and unit conversions to transform data to units appropriate for a particular purpose or model; and	
(D)	select and effectively use the appropriate tool for accurately measuring specific volumes.	Bathymetric volume, Gas volumes, water volume in a lake. In chemistry, it is tied in to 9C - (C) perform stoichiometric calculations, including determination of mass relationships, gas volume relationships, and percent yield. Learn to identify and select an appropriate unit of measure for area and volumetric calculations based on the scale of an environmental problem.

(9)	Water Resources. The student analyzes environmental factors related to safe drinking water. The student is expected to:	
(A)	analyze the relationship between population growth and water resources;	
(B)	describe how human health is affected by the quality of drinking water sources;	
(C)	explain the characteristics of clean water;	
(D)	explain why clean water is necessary for survival;	
(E)	describe common sources of drinking water contamination, including stormwater runoff;	
(F)	explain contaminant cycling through an ecosystem;	
(G)	describe the types of water found on Earth and the relative amounts of each type;	
(H)	describe and compare the most common sources of drinking water such as desalination, aquifers, surface water, glacial water, reclaimed water in developed and developing countries;	
(I)	describe the infrastructure components of private wells and public drinking water systems; and	
(J)	research and describe the Texas State Water Plan, including the sources of water, floodplain management, and recycling.	Texas Water Plan produced by the Texas Water Development Board Describe the development of water security within Texas (why do we recycle, conserve, aquifer depletion) Scarcity of water in certain regions, reclaimed water from fracking, treat and reuse at other wells.
(10)	Water Quality. The student evaluates water quality and uses a variety of chemical and biological assays to describe water quality. The student is expected to:	
(A)	research and describe Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) surface water quality standards for rivers, lakes, and estuaries;	microplastics
(B)	research and describe annual water quality compliance reports and compare water quality between the different reports;	

(C)	explain how water quality is quantitatively measured using chemical and biologically based testing processes;	
(D)	perform and analyze a culture assay to detect coliform in water;	
(E)	collect a water sample and determine water turbidity and pH;	
(F)	outline the stages of treatment that a typical modern sewage treatment plant uses to treat sewage water;	
(G)	explain the role of bacteria in wastewater treatment;	
(H)	research and describe emerging contaminants such as microplastics and pharmaceuticals in water;	
(I)	describe the interacting roles of bacteria, protozoa, and rotifers in a wastewater treatment ecosystem;	
(J)	describe and provide examples of how physical, chemical and biological processes work in the process of purifying contaminated water;	
(K)	explain how plants remove nitrates from contaminated water;	
(L)	use the engineering design process to design, build, and test a water filtration system;	
(M)	design and perform an experiment to use phytoremediation to remove contaminants from water; and	
(N)	design and conduct a scientific experiment to test a variable affecting the bacteria's ability to decompose oil.	
(11)	Food Security. The student explains the meaning and value of food security and analyzes environmentally and socially sustainable and unsustainable food production methods. The student is expected to:	Research and describe food deserts
(A)	analyze the advantages and disadvantages of genetically modified crops;	
(B)	research and explain the use of genetically modified crops as animal feed such as cottonseed for livestock;	
(C)	list and explain potential ways that crop plants might be improved through genetic modification;	
(D)	explain how transgenic plants could lead to positive and negative consequences to the environment and local ecosystem;	
(E)	describe the economic and socio-political issues associated with genetically modified food crops;	

(F)	investigate and summarize the ethical ramifications of genetic engineering and recombinant DNA technologies;	
(G)	analyze socially sustainable and unsustainable food production methods;	
(H)	describe food deserts and how food security exists with all people; and	
(I)	research and explain the impact to food security when food sources are used as energy sources.	
(12)	Energy. The student demonstrates a working knowledge of various sources of energy and their environmental and economic impact. The student is expected to:	Energy, calculations, sources,
(A)	explain the differences between renewable and non-renewable sources of energy and provide examples of each;	
(B)	identify and measure the amount and types of energy that students use in their daily lives;	Calculate carbon footprint
(C)	calculate the carbon footprint of a household;	
(D)	compare the carbon intensity of fossil fuels and alternative fuel sources terms of the short and long-term effects on the atmospheric carbon cycle;	Geothermal, nuclear, hydro-electrical power generation
(E)	explain the similarities and differences between fossil fuels and alternative sources;	
(F)	explain the differences between renewable and non-renewable sources of energy and provide examples of each;	
(G)	analyze the results of software simulations and models that vary the amounts and types of energy used to predict future energy needs;	
(H)	perform a full life cycle assessment (LCA) of material and energy sources; and	
(I)	identify the variables and the methods for completing an LCA.	

(13)	Climate. The student understands the impacts of human activities on climate. The student is expected to:	Alignment with grade 7 and 8 science standards. Climate, land, policy/Regs
(A)	research and explain net embodied carbon;	8.11.B use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate;
(B)	research and explain greenhouse gas emissions;	Env.10.E distinguish between the causes and effects of global warming and ozone depletion, including the causes, the chemicals involved, the atmospheric layer, the environmental effects, the human health effects, and the relevant wavelengths on the electromagnetic spectrum (IR and UV).
(C)	identify common sources of air pollution and describe the impacts of air pollution to human health;	Earth.12.B analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms;
(D)	describe mitigation techniques for air pollutants;	
(E)	analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms;	Mitigate? How are we resilient regarding severe weather
(F)	research and explain how engineering design can be more resilient to climate change to limit additional impacts to the natural environment;	Design infrastructure to withstand severe weather events/shelters, increase capacities, to mitigate (not having to rebuild structures, therefore, using less resources) impact our built impact. Respect to natural environment resiliency.
(G)	describe and analyze the impacts of climate to renewable energy resources; and	Resilience, infrastructure
(H)	research and explain elements of natural environmental resilience.	

(14)	Land management. The student understands the practice of using land resources to meet needs while also protecting the environment and ensuring the land's long-term productivity. The student is expected to:	
(A)	explain the value of a healthy ecosystem and the impact of biodiversity on the environment;	
(B)	research and explain ecological value of the land and explain how to conserve the ecology of the land;	Environmental studies – what is important about the land? What should be preserved? Coastal, prairie restoration
(C)	develop land conservation and preservation restorative measures using United States Department of Agriculture (USDA) National Resources Conservation Services (NRCS) Conservation Practice Standards;	Develop land conservation and preservation restorative measures using USDA NRCS Conservation Practice Standards.
(D)	research changes in land use and land cover over time using geospatial tools;	
(E)	analyze and report environmental impacts due to changes in land use such as urbanization over time; and	Land use (human impacts), land cover (natural changes)
(F)	explain the role of protected areas and lands to safeguard natural ecosystems.	Area could include areas of water.
(15)	Waste management. The student understands the role and importance of waste management. The student is expected to:	
(A)	analyze the impacts of reduction, reuse, and recycling for environmental sustainability;	
(B)	explain the impact of individual practices of waste reduction on resource management;	
(C)	analyze the waste breakdown cycle of various waste products that enter landfills; and	
(D)	research and describe hazardous waste products and impacts on the environment, including long-term storage needs and pollution.	
(16)	Policy. The student understands the role of global, national, and local policies and regulations in environmental sustainability. The student is expected to:	
(A)	research and analyze the United Nations (UN) sustainability development goals (SDG);	

(B)	research and describe the origins and functions of the EPA;	Purpose of rules and regulations
(C)	describe the relationship between the National Environmental Policy Act (NEPA), the EPA, and TCEQ; and	NEPA (law) 1970, EPA developed to carry out the laws of NEPA. Historical/Cultural resources
(D)	describe how policy can develop, incentivize, and maintain environmentally sustainable practices.	
(17)	Future sustainability challenges. The student discusses and analyzes some of the persistent global engineering challenges to sustain growing populations, the natural environment, and improve quality of life. The student is expected to:	
(A)	explain why some environmental engineering challenges are persistent such as providing access to clean water, providing a sustainable food supply, energy, sanitation, and health care to growing populations;	
(B)	identify and describe the environmental sustainability elements within the "Grand Challenges" defined by the National Academy of Engineering;	
(C)	analyze the environmental sustainability elements within the "Grand Challenges" to determine the potential implications for society;	
(D)	create a sustainable solution to a current challenge to meet the needs of society without compromising the ability of future society;	
(E)	identify principles that help guide development of sustainable solutions with considerations for sustainable development to include people, planet, and profit; and	
(F)	describe the life cycle of a product or service and identify energy consumption, wastes, and emissions that are produced in the process.	

§127.XX ~~Introduction to Fluids~~ Fluid Mechanics (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 11-12. Prerequisite or Corequisite: Algebra II Prerequisite: Geometry and at least one credit from the Engineering Career Cluster. Students shall be awarded one credit for successful completion of this course. This course satisfies a high school science graduation requirement.	
(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 Fluid Mechanics will investigate the behavior and properties of fluids including liquids and gasses. Through hands-on experiments, simulations, and real-world examples, students will learn about concepts such as viscosity, pressure, buoyancy, and flow dynamics. Students will explore how fluids interact with solid objects, understanding phenomena like lift and drag, which are critical to the operation of ships, airplanes, and vehicles. Students will engage in case studies and problem-solving activities to gain insights into how fluid mechanics shape our everyday lives, technological advancements, and industrial applications. This course will prepare students to progress in careers in engineering and scientific disciplines such as aerospace, mechanical, civil, chemical, materials, and physics.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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)	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, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:	Scientific and engineering practices strand
(A)	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	CCRS: ELA.III.A.1

(B)	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	CCRS: ELA.I.A.3; SS IV.B.1,3
(C)	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	CCRS: CD II.C.7; SS IV.B.1
(D)	use appropriate tools such as dial calipers, protractors, scale rulers, tape measures, load cells, micrometers, scales, tensiometer, multimeter, and thermometers;	
(E)	collect quantitative data using the System International (SI) and United States customary units and qualitative data as evidence;	CCRS: CD II.D.2; SS IV.B.3
(F)	organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;	CCRS: CD II.D.1; ELA.I.A.2
(G)	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	CCRS: CD II.C.8
(H)	distinguish between scientific hypotheses, theories, and laws.	CCRS: CD II.C.1; ELA.II.B.1; SS IV.A.4
(3)	The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:	Scientific and engineering practices strand
(A)	identify advantages and limitations of models such as their size, scale, properties, and materials;	CCRS: CD II.A.4; SS IV.A.3
(B)	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	CCRS: CD II.D.1; SS IV.A.3
(C)	use mathematical calculations to assess quantitative relationships in data; and	CCRS: CD II.D.2; SS IV.B.1
(D)	evaluate experimental and engineering designs.	CCRS: CD II.C.4; SS IV.A.3
(4)	The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	Scientific and engineering practices strand
(A)	develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	CCRS: CD II.D.3; SS IV.D.1
(B)	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	CCRS: CD I.A.1; ELA.I.A.3, III.A.1; SS V.A.1

(C)	engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	CCRS: CD I.A.2; ELA.III. A.2; SS V.A.1, B.1
(5)	The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:	CCRS: ELA.II.A.4 Scientific and engineering practices strand
(A)	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;	CCRS: ELA.II.A.5; CD II.A.5; SS IV.A.3
(B)	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and	CCRS: ELA.II.A.4; CD II.C.7; SS I.B.2
(C)	research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.	CCRS: ELA.II.A.8, V.B.1, V.B.3; CD II.C.2; SS I.F.1
(6)	The student explains the application of fluids in historical and modern applications. The student is expected to:	
(A)	describe the efficient transportation and storage of fluids through various means such as gravity flow (aqueducts and water towers), natural phenomena (winds and currents), and compression;	CCRS: SS IV.A.4
(B)	explain the use of fluids in power generation and transmission, including hydraulics, pneumatics, pumps, compressors, and turbomachinery; and	
(C)	explain how lift and drag impacts moving objects.	CCRS: M III.A.1
(7)	The student describes basic concepts of fluid mechanics. The student is expected to:	
(A)	differentiate and compare the properties that distinguish a solid from a fluid;	CCRS: SCI V.A.2; SS IV.A.4
(B)	identify different types of fluids and define the characteristics of a fluid, including gasses, liquids, Newtonian, and non-Newtonian;	CCRS: SCI V.A.2; VII.I.1; SS IV.A.1
(C)	define and list examples of compressible and incompressible (approximately) fluids;	
(D)	explain the properties of fluids, including density, specific weight, specific gravity, viscosity, and compressibility;	CCRS: M I.C.1, I.C.2; SCI VII.I.5
(E)	describe methods to measure and calculate the density, specific weight, specific gravity, viscosity, and compressibility of a Newtonian fluid;	CCRS: M I.C.1, I.C.2; SS IV.A.1

(F)	measure and calculate density, specific weight, and specific gravity for a variety of fluids;	CCRS: M I.C.1, I.C.2
(G)	explain the appropriate use and differences of material and spatial reference frames, including boundary conditions, control surfaces, and control volumes;	CCRS: M III.A.1, III.D.1-3
(H)	identify and explain the variables in the ideal gas law and apply the law to constructed problems;	CCRS: s II.C.3,VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VII.I.3; SS IV.A.1
(I)	explain and demonstrate the laws of conservation of energy and conservation of mass, including the algebraic version of Reynold's Transport theorem; and	CCRS: M II.C.3,VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI V.B.2, VIII.D.1, VIII.D.2; SS IV.A.1
(J)	identify appropriate boundary conditions, including no-slip and ambient pressure boundary conditions in fluid flow.	CCRS: M III.A.1, III.C.1, III.D.1-3; SS IV.A.1
(8)	The student demonstrates an understanding of pressure and hydrostatics and calculates values in a variety of systems. The student is expected to:	
(A)	describe the relationship between force, area, and pressure;	CCRS: M VII.B.1; SCI VIII.F.1, VIII.F.2
(B)	calculate force proportionalities in hydraulic and pneumatic cylinders using Pascal's law and explain the impact of the cylinders' diameter;	CCRS: M VII.B.1; SCI VIII.F.2
(C)	differentiate between atmospheric pressure, gauge pressure, and absolute pressure;	CCRS: SS IV.A.4
(D)	describe the working principles of a pressure gauge and measure fluid pressure with dial gauges and manometers;	
(E)	calculate the buoyant force of floating and submerged objects according to Archimedes' principle; and	CCRS: M II.C.3,VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VIII.F.3; SS IV.A.3
(F)	define and calculate hydrostatic pressure.	CCRS: M II.C.3,VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VIII.F.3

(9)	The student demonstrates an understanding of fluid flows in steady-state pipes, channels, and free jets. The student is expected to:	
(A)	compare developing, fully developed, and steady-state Newtonian fluid flows in pipes and channels;	CCRS: SS IV.A.3
(B)	compare fluid flow profiles, including uniform and parabolic;	CCRS: M VI.A.2; SS IV.A.4
(C)	describe experimental measurements of fluid flow field lines, including stream, streak, and pathlines in fluid flow;	CCRS: SS IV.C.1
(D)	apply the continuity equation and conservation of mass to calculate volumetric flow rate in a steady state system;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VIII.D.2, VIII.F.4
(E)	explain how Bernoulli's equation relates to the total energy of a steady-state system;	CCRS: M III.A.1, VII.D.1, IX.B.2; SCI VIII.D.2, VIII.F.4
(F)	apply Bernoulli's equation and the conservation of energy to calculate unknown variables in varying conditions, including changes in height, velocity, and cross-sectional area of a steady-state system;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VIII.D.2, VIII.F.4
(G)	derive Torricelli's equation from Bernoulli's equation and calculate the exit velocity and mass flow rates of free jets;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2; SCI VIII.D.2, VIII.F.4
(H)	calculate fluid flows in pipes, channels, and free jets using the Reynolds Transport theorem and conservation of mass; and	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(I)	calculate the resultant force of a free jet at the outlet based on the density of the fluid, cross-sectional area, pressure, and velocity of the fluid.	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(10)	The student demonstrates an understanding of the effects of an object moving through a fluid. The student is expected to:	
(A)	differentiate turbulent and laminar flows;	CCRS: SS IV.A.4
(B)	calculate the Reynolds number of given flows to determine if they are turbulent or laminar;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(C)	define lift and drag as applied to fluid flows;	CCRS: SCI VIII.C.2; SS I.F.1
(D)	explain the relationship between viscosity and shear force in a fluid flow;	

(E)	explain the variables of lift and drag formulas and how the variables relate to fluid flow; and	CCRS: M II.B.1
(F)	design an experiment to measure the drag coefficient for a solid body in a fluid flow.	
(11)	The student understands compressible flow and the relationship between sound transmission through a fluid and fluid compression. The student is expected to:	
(A)	differentiate between compressible and incompressible (approximately) fluids and the effect on the speed of sound through a fluid;	
(B)	explain how density impacts the speed of sound through a fluid;	CCRS: M III.A.1, VII.D.1, IX.B.2
(C)	calculate and use the Mach number to model a fluid as compressible or incompressible (approximately); and	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(D)	explain the effects on fluid, including shock waves, when the sound barrier is broken.	
(12)	The student designs and analyzes fluid systems. The student is expected to:	
(A)	explain the function of weirs in an open channel and describe an application such as flow control or flow measurement;	
(B)	calculate the fluid flow in open channels with different shapes, slopes, and weirs;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(C)	design an application of the principle of buoyancy using hydrostatics such as a boat, submarine, floating dock, or hot air balloon;	
(D)	analyze and design a fluid device such as a clepsydra, water tower, pressure regulator, or nozzle using the principles of fluid dynamics;	CCRS: M II.C.3, VII.A.1-5, VII.D.1, VIII.A.1, IX.B.2
(E)	describe applications and processes of different types of pumps, including centrifugal pumps, peristaltic pumps, gear pumps, and positive displacement pumps;	
(F)	describe the operation of a centrifugal pump and explain the data presented in a pump curve, including head, flow rate, efficiency, and power;	
(G)	design a hydraulics system with components, including hydraulic fluid, pump, reservoir, motor, cylinders, valves, and flow controllers;	
(H)	identify and compare different types of turbomachines including pumps and turbines;	CCRS: ELA.V.B.1

(I)	describe and differentiate the applications of turbomachines, including pumps and turbines; and	
(J)	explain the concept of tribology and identify the associated variables such as film thicknesses and pressures.	

§127.XX ~~Introduction to~~ Mechanics of Materials (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, at least one credit from the Engineering Career Cluster. Recommended prerequisite: Geometry.	
(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 Mechanics of Materials describe the mechanical behavior of engineering materials, including metals, ceramics, polymers, composites, welds, and adhesives. Applications of load, deformation, stress and strain relationships for deformable bodies and mechanical elements relevant to engineers. The course will include axially loaded members, buckling of columns, torsional members, beams, and failure.	
(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)	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, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:	Scientific and engineering practices strand
(A)	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	
(B)	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	CCRS: ELA.I.A.3;
(C)	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	CCRS: CD II.C.7
(D)	use appropriate tools such as dial calipers, protractors, scale rulers, tape measures, load cells, micrometers, scales, tensometer, multimeter, and thermometers;	
(E)	collect quantitative data using the System International (SI) and United States customary units and qualitative data as evidence;	CCRS: CD II.D.2
(F)	organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;	CCRS: CD II.D.1

(G)	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	CCRS: CD II.C.8
(H)	distinguish between scientific hypotheses, theories, and laws.	CCRS: CD II.C.1
(3)	The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:	Scientific and engineering practices strand
(A)	identify advantages and limitations of models such as their size, scale, properties, and materials;	CCRS: CD II.A.4
(B)	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	CCRS: CD II.D.1
(C)	use mathematical calculations to assess quantitative relationships in data; and	CCRS: CD II.D.2
(D)	evaluate experimental and engineering designs.	CCRS: CD II.C.4
(4)	The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	Scientific and engineering practices strand
(A)	develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	CCRS: CD II.D.3
(B)	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	CCRS: CD I.A.1
(C)	engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	CCRS: CD I.A.2
(5)	The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:	CCRS: ELA.II.A.4; Scientific and engineering practices strand
(A)	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing to encourage critical thinking by the student;	CCRS: ELA.II.A.5; CCRS: CD II.A.5
(B)	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and	CCRS: ELA.II.A.4; CCRS: CD II.C.7
(C)	research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.	CCRS: ELA.V.B.1, CCRS: ELA.V.B.3; CCRS: CD II.C.2

(6)	The student examines the historical developments that led to the field of mechanics of materials and material science. The student is expected to:	
(A)	describe the contribution of historical scientists to the field of mechanics such as Pascal, Galileo, Euler, Navier, Lame, Poisson, Hooke, and Young;	CCRS: SCI IV.A.1, IV.C.1, IV.C.2; CCRS: CD II.A.8
(B)	describe key historical advancements related to the development of different materials such as bronze, iron, steel, Damascus steel, and Roman concrete;	CCRS: SCI IV.A.1, IV.C.1, IV.C.2; CCRS: CD II.A.4
(C)	explain how materials have influenced historical events or products such as the steel in the Titanic, the space race, and smartphones;	CCRS: SCI IV.A.1, IV.C.1, IV.C.2; CCRS: CD II.A.5
(D)	evaluate the impact of modern development of materials such as composites, nanotechnology, semi-conductors, alloys, and the effects of processes on materials such as subtractive manufacturing, additive manufacturing, and welding; and	CCRS: ELA.V.B.1, CCRS: ELA.V.B.3;
(E)	describe the development of shapes in structures and architecture such as columns, arches, domes, keystones, and suspension bridges.	CCRS: CD II.A.4
(7)	The student identifies and measures different properties of an object them. The student is expected to:	
(A)	classify properties of an object as geometric, structural, or material;	CCRS: SCI V.A.1;
(B)	identify and describe the application of tools used to measure material properties, including rulers, calipers, micrometers, weighing scales, tensile testers (tensometers), and thermometers;	CCRS: SCI V.E.3; CCRS: CD II.A.4,5
(C)	measure common properties of materials, including length, width, height, and mass;	CCRS: SCI V.E.3, II.F.1; CCRS: M I.C.1;
(D)	measure and observe intrinsic properties of materials such as hardness, thermal conductivity, impact resistance;	CCRS: SCI VII.A.1; CCRS: M I.C.1, I.C.2;
(E)	analyze data and calculate density, cross-sectional area, specific gravity, thermal expansion, modulus of elasticity, Poisson's ratio, bulk modulus, yield, and ultimate stress;	CCRS: SCI II.B.1, VII.A.1, VIII.A.3, VIII.A.4; CCRS: M I.C.1, I.C.2, II.C.3, VII.A.1-5, VIII.A.1; CCRS: CD II.D.2
(F)	differentiate material properties, including ductility, malleability, resilience, toughness, and reflectivity;	CCRS: SCI V.D.1, VII.A.1, VIII.A.2;
(G)	classify material properties as geometric (extrinsic), material (intrinsic), or structural; and	

(H)	classify types of materials including metals and alloys, polymers, ceramics, biomaterials, composites, and semiconductors.	Metals and alloys should not be broken out (like rules and regulations)
(8)	The student understands various manifestations of forces acting on solids. The student is expected to:	
(A)	illustrate forces including axial, radial, normal, torsional and shear and identify different units such as newtons, pounds, and KIPS utilized in force measurement;	CCRS: SCI VIII.B.1-3; CCRS: M I.C.1, I.C.2, III.C.1;
(B)	explain force intensity of distributed forces, including forces distributed over a line, area, and volume;	CCRS: CD I.C.1
(C)	calculate and simplify multiple loads to a single combined load;	CCRS: SCI II.A.6, VIII.B.1-3; CCRS: M III.C.1, VI.C.1, IX.B.2;
(D)	distinguish between normal forces and shear forces; and	
(E)	identify and calculate different types of stress, including axial stress, shear stress, and bending stress.	CCRS: M III.C.1, VI.C.1, VII.A.1-5, IX.B.2; CCRS: CD II.A.4
(9)	The student evaluates the effect of temperature on the properties of a material. The student is expected to:	
(A)	describe engineering applications of thermo-mechanical properties such as thermometers, thermocouples, thermistors, thermostatic valves and controllers, and fuses;	CCRS: CD II.A.5
(B)	explain the atomic origin of thermal expansion resulting in measurable effects such as building height change, and material distortion;	
(C)	describe potential failure modes due to thermal expansion for kinematically constrained structures;	
(D)	explain how to accommodate thermal expansion in construction such as buckling of railroad rails, U-runs in piping, and expansion joints; and	
(E)	explain the effect of temperature on the mechanical properties of materials including modulus of elasticity, yield strength, ductility, and toughness.	
(10)	The student determines the material properties from different mechanical material tests and how they are graphically represented. The student is expected to:	
(A)	describe a tensile test, the different possible shapes of tensile testing specimens, and the measurements obtained in a tensile test, including force, elongation, and change in thickness;	CCRS: M I.C.1, I.C.2, II.B.1, VII.B.1; CCRS: CD II.A.2
(B)	analyze data from a tensile test to calculate engineering stress and strain for various materials such as aluminum, brass, cast iron, steel, and nylon at significantly different temperatures;	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, VI.C.1, VII.B.1, IX.B.2; CCRS: CD II.D.2

(C)	plot engineering stress and strain on a two-dimensional graph;	CCRS: M VIII.C.1; CCRS: CD II.D.3
(D)	identify regions of a stress-strain curve, including elastic deformation, plastic deformation, resilience, strain hardening, fracture, and tension toughness;	CCRS: CD II.A.4
(E)	estimate the values from a stress-strain curve, including 0.2% offset, modulus of elasticity, yield stress, ultimate stress, resilience, and tension toughness;	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, VI.C.1, VII.B.1, IX.B.2;
(F)	compare and explain differences in testing plots based on differences in specimen geometry;	
(G)	compare different types of material testing, including compression tests, tensile tests, and three-point bending tests;	
(H)	analyze testing results from compression and three-point bending tests with different specimen geometries, including length, cross-sectional shape, and cross-sectional area; and	CCRS: M VII.D.1, IX.B.2; CCRS: CD II.D.2
(I)	describe modern mechanical testing such as digital image correlation, thermography, acoustic emission, and x-ray diffraction.	CCRS: CD II.A.4
(11)	The student analyzes the impact of the cross-sectional geometry on the second moment of area for beams and shafts. The student is expected to:	
(A)	calculate the area and the second moment of area for primitive shapes, including rectangles, triangles, circles, and semi-circles;	CCRS: M II.B.1, III.A.1, III.A.2, III.C.1, III.D.1, VI.C.1, VII.B.1;
(B)	explain the parallel-axis theorem and use the parallel axis theorem to calculate the second moment of area for complex shapes;	CCRS: M II.B.1, VI.C.1, VII.B.1; CCRS: CD I.C.1
(C)	calculate area, centroid, and second moment of area for complex shapes composed of primitive shapes such as an H-beam, square tubes, round tubes, and angle iron; and	CCRS: M II.B.1, III.A.1, III.A.2, III.C.1, III.D.1, VI.C.1, VII.B.1;
(D)	hypothesize the best cross-sectional shape for different types of loads such as tension, compression, torsion, bending, and combinations of these loads.	
(12)	The student represents point and distributed forces on a sketch and calculates the maximum deflection and factor of safety of bars, cables, columns, beams, and shafts using algebraic equations. The student is expected to:	
(A)	describe the consequences of stresses such as elastic deformation, plastic deformation, and fracture on solid objects with mass;	CCRS: CD II.A.5
(B)	calculate the maximum deflection of various homogenous prismatic beams, including simply supported, cantilever, and overhang beams using algebraic formulas;	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, VI.C.1, VII.A.1-5, VII.B.1, VII.D.1, IX.B.2;

(C)	calculate the factor of safety of various homogenous prismatic beams including simply supported, cantilever, overhang beams, and columns using algebraic formulas;	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, VI.C.1, VII.A.1-5, VII.B.1, VII.D.1, IX.B.2;
(D)	analyze the impact of cross-sectional area and length on the potential for various homogenous prismatic columns to buckle under load;	CCRS: M III.C.1, VII.B.1, VII.D.1;
(E)	explain the impact of or the reason for using a tapered object in structural applications; and	CCRS: M II.B.1, III.C.1, VII.B.1, VII.D.1;
(F)	describe why pre-stress is utilized in applications such as shot-peening, tempered glass, wheel spokes, flatbed trailers, and bridges.	CCRS: CD II.A.4
(13)	Students demonstrate an understanding of stress, strain, and displacement fields throughout a structure, including bars and beams. The student is expected to:	
(A)	identify compression and tension regions in a bent beam;	
(B)	describe the kinematics of a bent member, including elongation due to tension, shortening due to compression, the neutral axis, and the linear displacement profile; and	CCRS: SCI VIII.C.1;
(C)	identify regions of compression and tension in digital image correlation data.	
(14)	The student understands that the mechanics of materials are required to analyze a multi-member structure for strength and stability in real-world applications. The student is expected to:	
(A)	compare permanent and non-permanent joints, including welding, brazing, soldering, adhesives, bolting, screwing, and riveting joints;	
(B)	analyze a bolted connection for pre-stress, load, factor of safety, grade, size, yield stress, and applied torque; and	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, III.D.1, VI.C.1, VII.A.1-5, VII.B.1, VII.D.1, IX.B.2;
(C)	design a structure to support a specified load with materials of adequate properties, size, and geometry and with an appropriate factor of safety.	CCRS: M I.C.1, I.C.2, II.B.1, III.C.1, III.D.1, VI.C.1, VII.A.1-5, VII.B.1, VII.D.1, IX.B.2;

§127.XX Programming for Engineers (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 9-12. Prerequisite: Algebra I and Principles of Applied Engineering, Physics for Engineering, Introduction to Computer-Aided Design and Drafting, Introduction to Engineering Design, or Engineering Essentials. Recommended prerequisite: None.	
(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 Programming for Engineers will focus on understanding, writing, evaluating and troubleshooting code to solve engineering problems. Students will use the engineering process and computational thinking to write computer programs for real-world solutions. Student will explore autonomous systems, sensors, and careers to integrate computational thinking within their engineering mindset. Students will spend at least 40% of the instructional time completing hands-on, real-world projects.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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)	Computational thinking--foundations. The student explores the core concepts of computational thinking related to engineering solutions, a set of problem-solving processes that involve decomposition, pattern recognition, abstraction, and algorithms. The student is expected to:	
(A)	decompose real-world engineering problems into structured parts by using visual representation;	
(B)	analyze and use industry specific symbols, patterns and sequences found in visual representations such as flow-charts, pseudocode, concept maps, or other representations of data;	
(C)	define and practice abstraction in the context of writing a program to solve an engineering problem;	
(D)	design a plan collaboratively using visual representation to document a problem, possible solutions, and an expected timeline for the development of a coded engineering solution;	
(E)	analyze different techniques used in debugging and apply them to an algorithm;	

(F)	analyze the benefits of using iteration (code and sequence repetition) in algorithms, including loops and functions;	
(G)	define and analyze Boolean expressions;	
(H)	define and analyze conditional statements;	
(I)	write code that uses conditional statements such as if, then, while, and else;	
(J)	compare the differences between scripting and programming languages, for example interpretation versus compiling; and	
(K)	define and demonstrate when to use a compiler and editor for programming design.	
(5)	Computational thinking--applications. The student applies the fundamentals of programming within the context of engineering. The student is expected to:	
(A)	analyze how programming parallels the iterative design within the engineering design process such as problem solving and critical thinking illustrated in an engineering notebook;	
(B)	modify and implement previously written code to develop improved programs;	
(C)	solve an engineering problem by creating block-based and text-based programs that include sequences, functions, loops, conditionals, and events;	
(D)	define and label variables that relate to their programming or algorithm;	
(E)	manipulate and rename variables and describe different data types;	
(F)	write comments while coding programs within the context of engineering solutions to enhance readability and functionality, including descriptive identifiers, internal comments, white space, spacing, punctuation, indentation and standardized programming style;	
(G)	write code that uses comparison operators such as greater than, less than, equal to, and modulus to perform mathematical computations;	
(H)	write code that uses strings to sort types of data such as Boolean, floats, and integers; and	
(I)	perform user testing on code to assess and improve their program.	

(6)	The student understands physical computing systems to integrate input and output functions in engineering concepts. The student is expected to:	
(A)	write programming to process data and control physical devices for efficient and optimized solutions;	
(B)	apply coding to demonstrate the correct operation of the output device such as motors, video displays, speakers, rapid prototype machines, and lights;	
(C)	apply coding to demonstrate the correct operation of the input device such as buttons, sensors, and switches;	
(D)	apply critical problem-solving skills to troubleshoot any errors and miscommunication such as wiring, code and physical hardware;	
(E)	demonstrate basic circuit theory as it pertains ground and power systems for input and output devices and use tools such as a multimeters, microcontrollers, sensors, and LEDs; and	
(F)	demonstrate script writing and its importance automating input and output devices to develop engineering solutions such as automatic data collecting, data analysis, programmable logic controllers, power system programming, robotics, and scripting for commercial engineering related software.	
(7)	The student understands the roles of sensors and programming sensors in engineering. The student is expected to:	
(A)	identify and describe how sensors were used in past and used currently in real-world engineered products, including new and innovative methods for sensors;	
(B)	identify and describe the proper input sensors to measure light, distance, sound, and color such as photoresistors, thermistors, sonar, switches, and buttons;	
(C)	identify and analyze the specifications of sensors and other input devices used in engineering problems, including units of measurement, upper limits, lower limits, and errors;	
(D)	differentiate the proper sensor and defend their choice in developing a solution to an engineering problem;	
(E)	write code that will control the sensors and accurately collect information pertaining to the function of the sensor;	
(F)	debug, asses, and test code to evaluate and improve sensor performance; and	
(G)	document the steps of sensor integration in an engineering notebook such as flowcharts and technical drawings.	
(8)	The student understands how automation plays a role in engineering and manufacturing. The student is excepted to:	

(A)	research and define how automated machines are used in engineering and manufacturing;	
(B)	define and present on the different job roles and required level of education in the field of automation;	
(C)	compare the roles of engineers, technicians, and technologists in automation;	
(D)	describe the role of safety and ethics among automation within engineering; and	
(E)	convert a manual mechanical system to an automated system using code and hardware.	
(9)	The student uses appropriate tools and demonstrates safe work habits. The student is expected to:	
(A)	master relevant safety tests;	
(B)	follow lab safety guidelines as prescribed by instructor in compliance with local, state, and federal regulations;	
(C)	recognize the classification of hazardous materials and wastes;	
(D)	dispose of hazardous materials and wastes appropriately;	
(E)	maintain, safely handle, and properly store laboratory equipment;	
(F)	describe the implications of negligent or improper maintenance;	
(G)	demonstrate the use of precision measuring instrument;	
(H)	identify areas where quality, reliability, and safety can be designed into a circuit;	
(I)	identify governmental and organizational regulations for health and safety in the workplace related to electronics; and	
(J)	identify areas where quality, reliability, and safety can be designed into a product.	

§127.XX ~~Introduction to~~ Statics (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 11-12. Prerequisite: Algebra II. Recommended prerequisite: Physics.	
(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)	Introduction to Statics is a gateway course into most engineering majors such as aerospace, mechanical, civil, and biomedical engineering. Students will learn the elements of statics that include the forces in structures that are in equilibrium and usually not moving. This includes forces calculated in two dimensions, free-body diagrams, distributed loads, centroids, and friction as applied to cables, trusses, beams, machines, gears, and mechanisms. Students will explore scenarios where objects remain stationary, emphasizing the importance of balance and stability in engineering design. This course not only equips students with theoretical knowledge but empowers them with practical skills that are indispensable in real-world engineering scenarios.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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)	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 describes milestones in structural design and construction throughout history. The student is expected to:	
(A)	research and evaluate the contribution of pioneering historical structures such as the Eiffel Tower, Pyramids, Roman Aqueducts, Ferris Wheel, Sydney Opera House, and St. Louis Bridge to the field of structural design;	CCRS: SCI IV.C.1; ELA V.B.1; CD II.C.2, II.C. 4

(B)	analyze how locally available materials and technology have impacted the construction of structures through time;	CCRS: SCI IV.C.1; ELA V.B.1, V.B.3; CD II.A.5; SS I.A.2
(C)	identify the contributions of historical pioneers to the field of structural design such as Archimedes, Leonardo DaVinci, Galileo, René Descartes, and Albert of Saxony; and	CCRS: SCI IV.C.2; ELA.V.A.1; CD II.A.8;
(D)	identify careers that use the field of statics and predict the future application of statics.	CCRS: ELA II.A.4; CD I.C.1
(3)	The student measures and converts units in the System International (SI) units and United States (US) customary systems of measurement. The student is expected to:	
(A)	measure objects using different units of measurement such as feet, inches, centimeters, meters, pounds force, Newtons, slugs, and kilograms in decimal and fractional measurements;	CCRS: SCI II.F.1; M I.C.1, VII.B.1; CD II.D.3
(B)	apply prefixes to units of measure and convert between units in U.S. customary and SI systems such as kgs and kips; and	CCRS: M I.C.2
(C)	identify physical examples of different units of measurement including one Newton, one pound, and one kip.	CCRS: M I.C.1
(4)	The student develops an understanding of point and distributed forces and moments, including torque and couples and their respective units. The student is expected to:	
(A)	explain how Newton's third law of motion applies to static systems;	CCRS: SCI VIII.C.2; CD I.B.2
(B)	explain the purpose and operation of mechanical components, including gears, sprockets, pulleys, and simple machines;	CCRS: CD II.A.4
(C)	explain how mechanical components, including gears, sprockets, pulley systems, and simple machines are used in mechanisms;	CCRS: CD II.A.5
(D)	explain distributed loads and simplify distributed loads to point loads;	CCRS: SCI VIII.C.2; M III.A.2, III.C.1, VII.B.1; CD II.A.5
(E)	compare a two-dimensional distributed load applied over a line to a distributed load applied over an area and a volume;	CCRS: M III.A.2, III.C.1; CD II.A.5
(F)	calculate and use applicable units for forces, torque, distances, and mechanical advantages related to levers, gears, and pulleys;	CCRS: SCI VIII.E.2; M I.X.1, II.B.1, VII.A.1-5, VII.B.1, VIII.A.1, VIII.A.3

(G)	define and calculate the efficiency of mechanical systems; and	CCRS: M II.B.1, VII.B.1, IX.B.2
(H)	identify and explain couples in a static system.	CCRS: CD II.D.I
(5)	The student applies vector algebra to calculate the equivalent force and moment vectors. The student is expected to:	
(A)	differentiate between scalar and vector quantities;	CCRS: SCI VIII.B.1; CD II.A.5
(B)	identify properties of a vector, including magnitude and direction;	CCRS: SCI VIII.B.1; CD II.A.4
(C)	convert forces represented graphically to vector notation;	CCRS: SCI VIII.B.2; M III.C.1
(D)	represent a force vector in its horizontal and vertical components;	CCRS: SCI VIII.B.3; M III.A.3
(E)	calculate resultant vectors from multiple vectors using a strategy including vector addition and the parallelogram rule;	CCRS: M III.C.1
(F)	simplify free-body diagrams by using strategies including the principle of transmissibility, couples, and the summation of moments;	CCRS: M III.C.1
(G)	calculate moments of a rigid body system using strategies, including the product of force and perpendicular distance to a specified axis and the right-hand rule;	CCRS: M II.B.1, VI.C.1
(H)	calculate moments from component forces using Varignon's principle; and	CCRS: M III.C.1
(I)	apply equivalent transformation to simplify external loads in a structural system.	CCRS: M III.C.1
(6)	The student locates and applies the geometric centroid and the center of mass of homogenous and heterogeneous objects. The student is expected to:	
(A)	explain the difference between geometric centroid and center of mass;	CCRS: SCI VIII.A.3; M III.C.1; ELA.I.A.2
(B)	locate the geometric centroid of simple and complex shapes using the composite parts method; and	CCRS: M III.C.1, III.D.2
(C)	locate the center of mass for two-dimensional and three-dimensional homogeneous and heterogeneous objects.	CCRS: M III.A.1, III.C.1, III.D.2, VII.A.1-5

(7)	The student determines the stability of simple and complex objects with a variety of applied forces. The student is expected to:	
(A)	identify potential pivot points at which objects could potentially rotate leading to a tip-over;	CCRS: CD II.D.1
(B)	use the relative location of the center of mass and object pivot point to determine the stability of simple and complex objects with only frictional force;	CCRS: M III.A.1, III.C.1, VI.C.1, VII.A.1-5
(C)	calculate the stability of simple and complex objects with external forces applied at different locations on the object and a reaction force caused by friction; and	CCRS: M III.A.1, III.C.1, VI.C.1, VII.A.1-5
(D)	describe how the friction reaction forces when combined with applied forces at different locations affect the stability of an object and how to stabilize unstable systems.	CCRS: CD II.A.4
(8)	The student differentiates supports, including fixed, pin, and roller supports for structures. The student is expected to:	
(A)	define and compare the applications of different structural supports, including fixed, pin, and roller supports;	CCRS: CD II.A.4
(B)	explain the degrees of freedom for fixed, pin, and roller supports;	CCRS: CD II.A.5
(C)	describe how fixed, pin, and roller supports affect a structural system; and	CCRS: CD II.A.4
(D)	describe and sketch the different reaction forces and moments for structural supports, including fixed, pin, and roller supports.	CCRS: CD II.A.4
(9)	The student constructs free-body diagrams of particles and rigid bodies around various supports and determines the reaction forces of the static body. The student is expected to:	
(A)	sketch a complete free-body diagram which includes applied and reaction forces for a structure;	CCRS: SCI VIII.C.2; CD II.D.3
(B)	define static equilibrium;	CCRS: CD II.A.4
(C)	formulate translational and rotational static equilibrium equations into a system of algebraic equations; and	CCRS: SCI VIII.C.1, VIII.E.1; M II.B.1, VII.A.1-2

(D)	solve for unknown forces in a structure using equations of equilibrium.	CCRS: SCI VIII.A.5; M II.B.1, II.C.3, VII.A.3-5
(10)	The student analyzes statically determinant plane trusses. The student is expected to:	
(A)	test if a plane truss is statically determinant;	CCRS: M II.C.3; CCRS: CD II.C.4
(B)	use the method of sections and method of joints to calculate the internal forces of a statically determinant plane truss;	CCRS: M II.C.3, III.A.3, III.C.1, VII.A.1-5, VII.D.1, IX.B.2
(C)	explain the difference between tension and compression forces;	CCRS: CD II.A.5
(D)	describe capabilities of members including beams, cables, ropes, bars, and columns to bear tension, compression, or both;	CCRS: CD II.A.4
(E)	identify internal members as being in tension or compression, the members bearing the maximum loads, and the member most likely to fail; and	CCRS: CD II.A.4
(F)	design structures such as bridges, tensegrity structures, or trusses to support external loads.	CCRS: M IX.B.2
(11)	The student recognizes the limitations of a two-dimensional model. The student is expected to:	
(A)	identify the differences between a two-dimensional and three-dimensional system;	CCRS: M III.A.1
(B)	explain the implications of adding a third dimension to a structure and how a two-dimensional analysis is insufficient to model a three-dimensional structure; and	CCRS: M III.A.2
(C)	describe how a third dimension can cause instability in a structure.	CCRS: M III.A.2

§127.783. Engineering Design and Presentation I (One Credit), Adopted 2025 ~~Adopted 2022~~.

	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 ~~2024-2025~~ school year.	
(b)	General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Algebra I and at least one credit in a course from the ~~science, technology,~~ engineering~~, and mathematics~~ career cluster. Recommended prerequisite: Principles of Applied Engineering. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining ~~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. ~~The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.~~	
(3)	Students enrolled in Engineering Design and Presentation I ~~will~~ demonstrate knowledge and skills of the design process as it applies to engineering fields and project management using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Through implementation of the design process, students ~~will~~ transfer advanced academic skills to component designs. Additionally, students ~~will~~ explore career opportunities in engineering, technology, and drafting and what is required to gain and maintain employment in these areas.	Need to create the course introduction
(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)	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.	
~~(1)~~	~~The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:~~	Replaced with new employability strand KS(1)
~~(A)~~	~~demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;~~	
~~(B)~~	~~cooperate, contribute, and collaborate as a member of a group to attain agreement and achieve a collective outcome;~~	

~~(C)~~	~~present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;~~	
~~(D)~~	~~use time-management skills in prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that optimizes efficiency and results; and~~	
~~(E)~~	~~demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed.~~	
(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 strand
(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 understands the value of maintaining documentation using an engineering notebook. The student is expected to:	Engineering notebook strand
(A)	explain the legal value of maintaining an engineering notebook as intellectual property;	CCRS SCI III.A.1; III.C.1
(B)	describe the proper implementation of an engineering notebook, including notebook type, documentation, signatures, adding external materials, sealing, and dating; and	
(C)	create and maintain an engineering notebook by recording ideas, notes, decisions, findings, and corrections.	
(4)	The student explores the methods and aspects of project management in relation to projects. The student is expected to:	Project management strand CCRS SCI I.C.1
(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.	
(5)~~(2)~~	The student gains knowledge of and demonstrates the skills necessary for success in the engineering workplace. The student is expected to:	Employability related skills specific to engineering
(A)	describe and compare the roles of an industry technician, engineering technologist, and engineer; ~~distinguish between an engineering technician, engineering technologist, and engineer;~~	Clarity
(B)	identify employment and career opportunities in engineering and describe the educational requirements for each;	
(C)	research and describe the various engineering disciplines such as mechanical, civil, aerospace, biomedical, chemical civil, computer, electrical, petroleum, and other related and emerging fields;	It's important for students to understand the variety of careers within engineering
(D)~~(C)~~	investigate and describe the requirements of engineering licensure and industry-based certifications; ~~in engineering;~~	Added licensure
(E)~~(D)~~	investigate and describe elements ~~demonstrate the principles~~ of teamwork critical for success in ~~related to~~ the engineering and technology industries;	Note: Engineering and technology referred to as one industry CCRS SCI IV.C.2
(F)~~(E)~~	research and describe industry standards and governmental regulations~~,~~ such as ~~including~~ health and safety and environmental regulations; and	Clarifying terminology
(G)~~(F)~~	analyze ethical issues related to engineering and technology. ~~and incorporate proper ethics in submitted projects;~~	CCRS SCI IV.C.1
~~(G)~~	~~demonstrate respect for diversity in the workplace;~~	Replaced by employability strand KS(1)(A)&(B)
~~(H)~~	~~identify consequences relating to discrimination, harassment, and inequality;~~	Replaced by employability strand KS(1)(F)

~~(I)~~	~~demonstrate effective oral and written communication skills using a variety of software applications and media; and~~	Replaced by employability strand KS(1)(C)
~~(J)~~	~~investigate and present on career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training.~~	Update terminology to be consistent with state directives
(6)~~(3)~~	The student understands the roles and responsibilities of individual team members, how successful teams function, and how to constructively contribute to the team. ~~The student participates in team projects in various roles.~~ The student is expected to:	CCRS SCI I.C.1
(A)	describe the various roles and responsibilities of a project ~~on an engineering~~ team ~~and discuss characteristics of how effective teams function~~;	Clarify
(B)	describe and demonstrate how the knowledge and skills of individual team members are used to assign roles and distribute tasks within a team ~~apply teamwork to solve problems~~; and	Not observable and measurable
(C)	describe and demonstrate appropriate behaviors such as active listening and clear communication while serving as a team leader and member on projects.	
~~(C)~~	~~serve as both a team leader and member and demonstrate appropriate attitudes behaviors such as active listening, and clear communication while participating in team projects.~~	Clarify
~~(4)~~	~~The student develops skills for managing a project. The student is expected to:~~	Replace with new project management strand KS(3)
~~(A)~~	~~implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;~~	Items listed are not methodologies. Methodologies should be introduced in a more advanced class.
~~(B)~~	~~develop a project schedule and complete work according to established criteria;~~	
~~(C)~~	~~participate in the organization and operation of a real or simulated engineering project.; and~~	Too vague
~~(D)~~	~~develop a plan for production of an individual product.~~	Redundant to SE(B)
(7)~~(5)~~	The student practices safe and proper work habits. The student is expected to:	CCRS SCI I.C.2-3
(A)	identify and explain the appropriate use of types of personal protective equipment (PPE) used in industry;	
~~(A)~~	~~master relevant safety tests;~~	Too specific; combine with SE(B)

(B)	explain and comply with safety guidelines and procedures as described in relevant~~ various~~ manuals, instructions, and regulations;	Guidelines and procedures are two distinct things
(C)	discuss the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	It is necessary to be explicit with safety. Safety has to be the #1 concern when working with students.
(D)	describe the various types of electrical hazards in the workplace and the risks associates with these hazards;	It is necessary to be explicit with safety. Safety has to be the #1 concern when working with students.
(E)	describe the various control methods to prevent electrical hazards in the workplace;	
(F)~~(C)~~	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and explain how these resources are used to make decisions in the workplace; ~~identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;~~	By being more general, teachers can adjust to their particular needs
(G)~~(D)~~	describe the appropriate disposal of selected hazardous materials and wastes ~~appropriately~~;	Appropriate used twice
(H)~~(E)~~	perform routine maintenance on selected tools, equipment, and machines;	
(I)~~(F)~~	handle, use, and store tools and materials correctly; and	
(J)~~(G)~~	research and describe the consequences ~~results~~ of negligent or improper equipment maintenance.	
(8)	The student understands how visual and spatial reasoning applies to engineering design. The student is expected to:	Before students can successfully use CADD, they need to understand how to visualize geometric shapes in both 2d and 3d CCRS SCI II.C.1-4
(A)	compare characteristics and dimensional changes of two- and three- dimensional figures;	CCRS M III.A.1
(B)	draw and manipulate geometric shapes in three dimensions;	CCRS M III.A-D
(C)	create two-dimensional views of a three-dimensional object; and	
(D)	explain the symmetry of figures through the proportionate transformation of objects.	

(9)~~(6)~~	The student uses sketching and ~~applies skills associated with~~ computer-aided drafting and design to represent three-dimensional (3D) objects in a two-dimensional (2D) format needed for manufacturing an object. The student is expected to:	Clarify and add CCRS SCI V.E.1-2
(A)	use single and multi-view projections to represent 3D objects in a 2D format;	
(B)	use appropriate line types in engineering drawings to represent 3D objects in a 2D format;	
(C)~~(B)~~	use orthographic and pictorial views to represent 3D objects in a 2D format;	
(D)~~(C)~~	use auxiliary views to represent 3D objects in a 2D format;	
(E)~~(D)~~	use section views to represent 3D objects in a 2D format;	
~~(E)~~	~~use advanced construction techniques to generate engineering drawings;~~	Unclear and not specific
(F)	prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards;	
(G)	apply best practices for ~~effective~~ file structure and management to efficiently retrieve and edit files;	clarification
(H)	use advanced dimensioning techniques, including annotation scale; and	clarification
(I)	construct and use basic 3D parametric drawings to develop a 3D model or prototype for presentation. ~~; and~~	clarification
~~(J)~~	~~develop and use prototype drawings for presentation.~~	Combined above
~~(7)~~	~~The student uses engineering design methodologies. The student is expected to:~~	Replace KS and SEs with Design Process strand
~~(A)~~	~~describe principles of ideation and apply ideation techniques for to an engineering project;~~	
~~(B)~~	~~demonstrate critical thinking, identify and analyze the solution constraints, and make fact-based decisions;~~	
~~(C)~~	~~develop or improve a product using rational thinking;~~	
~~(D)~~	~~apply decision-making strategies when developing solutions;~~	
~~(E)~~	~~use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and~~	

~~(F)~~	~~use an engineering notebook or portfolio to record the final design, construction, and manipulation of finished projects.~~	
~~(8)~~	~~The student applies concepts of engineering to specific problems. The student is expected to:~~	Redundant to KS 12
~~(A)~~	~~*design components using a variety of technologies;*~~	Moved to KS(10)(A)
~~(B)~~	~~*investigate the applications of different types of computer-aided drafting and design software for various engineering problems; and*~~	Moved to KS(10)(B)
~~(C)~~	~~*use multiple software applications for concept presentations.*~~	Moved to KS(10)(G)
(10)~~(9)~~	The student designs products using appropriate engineering design processes and techniques. The student is expected to:	
(A)	*design* product *components using a variety of technologies;*	CCRS SCI I.D.2
(B)	research and analyze ~~investigate~~ *the applications of different types of computer-aided drafting and design software for various engineering problems;*	CCRS SCI II.C.1-4
~~(A)~~	~~interpret engineering drawings;~~	Repetitive with below (D)
(C)~~(D)~~	produce and interpret engineering drawings using ~~to~~ industry standards; ~~and~~	
(D)~~(B)~~	describe how ~~identify areas where~~ *quality, reliability, and safety can be designed into* specific products ~~a product~~*;*	
(E)~~(C)~~	modify a product design to meet a specified need such as considering a broader audience of users or users with special needs;	Universal design is an important concept for engineering students to learn
(F)~~(E)~~	research and explain the patenting process and analyze opportunities for potential patents related to a project; and ~~describe potential patents and the patenting process.~~	
(G)	*use multiple software applications for concept presentations.*	moved for clarity
(11)~~(10)~~	The student builds a prototype(s) using the appropriate tools, materials, and techniques. The student is expected to:	CCRS SCI IV.E.1-2
(A)	identify and describe the steps needed to produce a prototype;	
(B)	identify and use appropriate tools, equipment, machines, and materials to produce the prototype; ~~and~~	

(C)	present the prototype and explain how it meets the project requirements ~~using a variety of media.~~; and	
(D)	evaluate the successes and failures of the prototype(s) in the context of an iterative design process.	The entire point of a prototype is to discover and learn from mistakes
(12)~~(11)~~	The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:	
(A)	identify and define an engineering problem;	
(B)	formulate goals, objectives, and requirements to solve an engineering problem;	
(C)	investigate and select materials appropriate to the use of a particular product to be designed;	
(D)	explain the importance of manufacturability;	
(E)~~(C)~~	determine the design parameters such as ~~materials,~~ personnel, resources, funding, ~~manufacturability~~, feasibility, and time associated with an engineering problem;	Repetitive. These items are mentioned above.
(F)~~(D)~~	identify ~~establish and evaluate~~ constraints ~~of systems engineering~~, including health, safety, social, environmental, ethical, political, regulatory, and legal constraints, defining an engineering ~~pertaining to a~~ problem;	
(G)~~(E)~~	identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;	
(H)~~(F)~~	test and evaluate proposed solutions using tools such as models, prototypes and mockups and methods such as ~~models, prototypes, mock-ups,~~ simulations, critical design review, statistical analysis, and ~~or~~ experiments; and	clarity
(I)~~(G)~~	apply structured techniques such as a decision tree, design matrix, or cost-benefit analysis to select and justify a preferred solution to a problem.	CCRS SCI I.D.2
(13)	The student presents a solution derived through the engineering design process. The student is expected to:	
(A)	present the solution in a professional manner;	CCRS SCI III.C.1
(B)	solicit and evaluate feedback on the solution and presentation; and	
(C)	present learning experiences such as essential skills gained, areas of personal growth, and challenges and solutions encountered throughout the design process.	

§127.784. Engineering Design and Presentation II (Two Credits), Adopted 2025 ~~Adopted 2022~~.		
	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 ~~2024-2025~~ school year.	
(b)	General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Principles of Applied Engineering or Engineering Design and Presentation I, Algebra I, and Geometry. Students shall be awarded two credits for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, 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. ~~The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.~~	New engineering career cluster introduction from engineering foundations program of study framework
(3)	Engineering Design and Presentation II is a continuation of knowledge and skills learned in Engineering Design and Presentation I. Students enrolled in this course will demonstrate advanced knowledge and skills of a system design process as it applies to engineering fields and project management using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Students will expand on the use of a variety of computer hardware and software applications to complete assignments and projects. Through implementation of a system design process, students will transfer advanced academic skills to component designs and engineering systems. Emphasis will be placed on transdisciplinary and integrative approaches using skills from ideation, prototyping, and project management methods.	Introduction needs to be updated
(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)	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.	
~~(1)~~	~~The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:~~	Replaced by new KS(1) employability strand
~~(A)~~	~~distinguish between an engineering technician, engineering technologist, and engineer;~~	
~~(B)~~	~~identify employment and career opportunities in engineering and describe the educational requirements for each;~~	

~~(C)~~	~~investigate and describe the requirements of industry-based certifications in engineering;~~	
~~(D)~~	~~demonstrate the principles of teamwork related to engineering and technology;~~	
~~(E)~~	~~research and describe governmental regulations, including health and safety;~~	
~~(F)~~	~~analyze ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;~~	
~~(G)~~	~~demonstrate respect for diversity in the workplace;~~	
~~(H)~~	~~identify consequences relating to discrimination, harassment, and inequality;~~	
~~(I)~~	~~demonstrate effective oral and written communication skills using a variety of software applications and media; and~~	
~~(J)~~	~~investigate and present on career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training.~~	
(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 strand
(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)~~(6)~~	The student practices safe and proper work habits. The student is expected to:	Move safety KS/SEs here CCRS SCI I.C.2-3
(A)	identify and explain the appropriate use of types of personal protective equipment (PPE) used in industry;	
~~(A)~~	~~master relevant safety tests;~~	Too specific; Combined with SE below
(B)	explain and comply with safety guidelines and procedures as described in relevant ~~various~~ manuals, instructions, and regulations;	Guidelines and procedures are two different things
(C)	explain the importance of Lock Out Tag Out (LOTO) procedures in preventing the release of hazardous energy;	
(D)	explain the importance of safe walking and working surfaces in the workplace and best practices for preventing or reducing slips, trips, and falls in the workplace;	Necessary to be explicit with safety
(E)	describe the various types of electrical hazards in the workplace and the risks associated with these hazards;	Necessary to be explicit with safety
(F)	describe the various control methods to prevent electrical hazards in the workplace;	
(G)~~(C)~~	identify workplace health and safety resources, including emergency plans and Safety Data Sheets, and explain how these resources are used to make decisions in the workplace; ~~identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;~~	Allow flexibility for instructors
(H)~~(D)~~	describe the appropriate disposal of selected hazardous materials and wastes ~~appropriately~~;	clarification
(I)~~(E)~~	perform routine maintenance on selected tools, equipment, and machines;	clarification
(J)~~(F)~~	handle, use, and store tools and materials correctly; and	clarification

(K)~~(G)~~	research and describe the consequences ~~results~~ of negligent or improper equipment maintenance.	clarification
(5)~~(2)~~	The student understands the roles and responsibilities of individual team members, how successful teams function, and how to constructively contribute to the team ~~participates in team projects~~. The student is expected to:	CCRS SCI I.C.1
(A)	describe the various roles and responsibilities of a project ~~on an engineering~~ team; ~~and discuss characteristics of how effective teams function;~~	Clarify and align with EDP1
(B)	describe and demonstrate how the knowledge and skills of individual team members are used to assign roles and distribute tasks within a team; ~~demonstrate teamwork to solve problems; and~~	Not observable and measurable
(C)	describe and demonstrate appropriate behaviors such as active listening and clear communication while serving as a team leader and member on projects; and ~~serve as team leader and member and demonstrate appropriate attitudes while participating in team projects.~~	Clarify and align with EDP1
(D)	describe and demonstrate the roles and responsibilities specific to team leaders, such as assigning roles and responsibilities, facilitating decision making, tracking progress, and soliciting and providing timely feedback to team members. ~~when serving as team leader.~~	Differentiate between serving as team leader and team member
(6)~~(7)~~	The student uses and documents engineering design processes ~~methodologies~~. The student is expected to:	Process versus methodologies is the correct word CCRS SCI III.A.1; III.C.1
(A)	use ~~describe principles of~~ solution ideation ~~and evaluate ideation~~ techniques for an engineering project; ~~including systems-based engineering and advanced prototyping;~~	
(B)	analyze and evaluate ~~demonstrate critical thinking, identify the~~ solution constraints;~~, and make fact-based decisions;~~	Critical thinking difficult to measure, clarification
(C)	develop or improve a solution using fact-based decision-making ~~rational thinking~~;	clarification
(D)	compare solutions using analysis tools such as a decision matrix or paired comparison analysis ~~apply decision-making strategies when developing solutions~~;	
~~*(E)*~~	~~*identify quality-control issues in engineering design and production;*~~	Move to KS about prototypes KS(9)
~~*(F)*~~	~~*describe perceptions of the quality of products and how they affect engineering decisions;*~~	Move to KS about prototypes KS(9)

(E)~~(G)~~	create and maintain an organized engineering notebook to record ~~use an engineering notebook to record~~ findings and corrections, including deficiencies in the design process, and decisions throughout the entire design process ~~prototypes, corrections, and/or mistakes in the design process~~; and	Clarify the list CCRS SCI III.A.1
(F)~~(H)~~	use an engineering notebook or portfolio to record and justify the final design, construction, and manipulation of finished projects.	In this instance, we like the use of the engineering notebook or portfolio because at this level both are important and complementary, particularly for a final product
~~(3)~~	~~The student develops applies project management skills for managing to a complex, multi-phase, multi-system project. The student is expected to:~~	Replace with project management strand KS(3)
~~(A)~~	~~create, implement, and evaluate project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;~~	Break into smaller steps
~~(B)~~	~~develop a project schedule and complete projects according to established criteria;~~	Included above
~~(C)~~	~~use strategies such as decision matrices, flow charts, or Gantt charts to maintain the project schedule and quality of project;~~	
~~(D)~~	~~participate in the organization and operation of a real or simulated engineering project; and~~	
~~(E)~~	~~develop a plan for production of an individual product.~~	
~~(4)~~	~~The student demonstrates principles of project documentation, workflow, and evaluated results. The student is expected to:~~	Replaced by project management strand KS(3)
~~(A)~~	~~complete work orders and related documentation;~~	Clarify types of related documentation
~~(B)~~	~~identify and defend factors affecting cost and strategies to minimize costs;~~	Moved above to another SE
~~(C)~~	~~formulate a project budget;~~	Moved to another SE
~~(D)~~	~~develop a production schedule;~~	redundant
~~(E)~~	~~identify intellectual property and other legal restrictions; and~~	Redundant
~~(F)~~	~~read and interpret technical drawings, manuals, and bulletins.~~	redundant

(7)~~(9)~~	The student understands how systems impact the design, integration, and management of engineering solutions. ~~The student addresses a need or problem using appropriate systems engineering design processes and techniques.~~ The student is expected to:	Rewrite KS
(A)	explain systems in engineering;	
(B)	explain reverse engineering;	
(C)	reverse engineer a multi-system product and explain how the systems work in the product; and	
~~(A)~~	~~create and interpret engineering drawings;~~	Redundant with SEs in KS(8)
~~(B)~~	~~identify areas where quality, reliability, and safety and multidisciplinary optimization and stakeholder analysis can be designed into a solution such as a product, process, or system;~~	redundant
(D)~~(C)~~	improve a system design, including properties of materials selected, to meet a specified need.~~;~~	
~~(D)~~	~~produce engineering drawings to industry standards; and~~	Redundant with SE in KS(8)
~~(E)~~	~~*describe potential patents and the patenting process.*~~	Moved to KS(9)(J)
(8)~~(5)~~	The student uses ~~applies the concepts and skills of~~ computer-aided drafting and design software as part of the engineering design process ~~to perform the following tasks.~~ The student is expected to:	CCRS SCI I.D.2; II.C.1-4
(A)	*research different types of computer-aided drafting and design software and evaluate* ~~their~~ *applications for use in design systems and problem solving;* ~~and~~	Moved from KS(8)(C)
(B)~~(A)~~	identify industry standards such as ~~prepare drawings to~~ American National Standards Institute (ANSI) and International Organization for Standardization (ISO) graphic standards, and create drawings that meet industry standards;	
(C)~~(B)~~	customize software user interface options such as buttons, tabs, and ribbons to match different work environments;	clarification
(D)~~(C)~~	prepare and use advanced views such as auxiliary, section, and break-away;	
(E)~~(D)~~	draw detailed parts, assembly diagrams, and sub-assembly diagrams;	
(F)~~(E)~~	indicate tolerances and standard fittings using appropriate library functions;	
(G)~~(F)~~	establish and apply annotation styles and setup by defining units, fonts, dimension styles, notes, and leader lines;	

(H)~~(G)~~	identify and incorporate the use of advanced layout techniques and viewports using paper-space and modeling areas;	
(I)~~(H)~~	create and use layers to organize objects in drawings; ~~use management techniques by setting up establish properties to define and control individual layers by using software management features;~~	clarification
(J)~~(I)~~	create and use custom templates for advanced project management;	
~~(J)~~	~~prepare and use advanced development drawings such as assembly and subassembly drawings;~~	Redundant with KS(8)(E)
(K)	use advanced polar tracking and blocking techniques to increase drawing efficiency;	
(L)	create drawings that incorporate external referencing;	
(M)	create and render objects using parametric modeling tools; and	
(N)	model individual parts or assemblies and produce rendered or animated output.	
~~(8)~~	~~The student applies demonstrates knowledge of how concepts of engineering are applied to specific problems. The student is expected to:~~	Vague and broad KS; SEs moved to better locations or removed
~~(A)~~	~~design solutions from various engineering disciplines such as electrical, mechanical, structural, civil, or biomedical engineering;~~	redundant
~~(B)~~	*~~experiment with the use of tools, laboratory equipment, and precision measuring instruments to develop prototypes;~~*	Move to KS(9)
~~(C)~~	*~~research different types of computer-aided drafting and design software and evaluate their applications for use in design systems and problem solving; and~~*	Move to KS(8)
~~(D)~~	*~~use multiple software applications for concept presentations.~~*	Moved to KS(11)
(9)~~(10)~~	The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:	Add SEs regarding quality to this section CCRS SCI IV.E.1-2
(A)	delineate and implement ~~and delineate~~ the steps needed to produce a prototype such as defining the problem and generating concepts;	
~~(B)~~	~~identify industry-appropriate tools, equipment, machines, and materials;~~	Combined with SE below

(B)	develop prototypes using tools, equipment, machines, or precision measuring instruments; ~~experiment with the use of tools, laboratory equipment, machines, and precision measuring instruments to develop prototypes;~~	Added SE above
(C)	select and justify the use of materials for prototyping and manufacturing;	Address the use of specific materials
(D)	describe how design quality concepts including performance, usability, accessibility, reliability, and safety affect product development;	Brought over from Introduction to Engineering Design
(E)	identify quality-control issues in engineering design and production;	CCRS SCI I.A.4; I.B.1
(F)	describe perceptions of ~~the~~ product quality ~~of products~~ and how these perceptions ~~they~~ affect engineering decisions;	
(G)~~(C)~~	fabricate the prototype using a systems engineering approach to compare the performance and use of materials; ~~and~~	
(H)~~(D)~~	present the prototype and explain how it meets the project requirements; and ~~present and validate the prototype using a variety of media and defend engineering practices used in the prototype.~~	Clarify CCRS SCI III.C.1
(I)	describe potential patents related to the prototype and the patenting process.	Moved from KS(9)(E)
(10)~~(11)~~	The student creates justifiable solutions to open-ended real-world problems within a multitude of engineering disciplines such as aerospace, bio, civil, electrical, mechanical, or structural engineering ~~mechanical, electrical, civil, structural, bio, or aerospace~~ using engineering design practices and processes. The student is expected to:	
(A)	identify and define engineering problems from different engineering disciplines such as aerospace, bio, civil, electrical, mechanical, or structural ~~civil, mechanical, civil, structural, electrical, bio, or aerospace~~ engineering;	Changed order of disciplines
(B)	formulate and document goals, objectives, and requirements to solve an engineering problem;	
(C)	determine the design parameters such as materials, personnel, resources, funding, manufacturability, feasibility, and time associated with an engineering problem;	
(D)	identify ~~establish and evaluate~~ constraints ~~of systems engineering~~, including health, safety, social, environmental, ethical, political, regulatory, and legal constraints, defining an engineering ~~pertaining to a~~ problem;	
(E)	identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;	

(F)	test and evaluate proposed solutions using tools such as models, prototypes and mockups and methods such as ~~models, prototypes, mock-ups,~~ simulations, critical design review, statistical analysis, and ~~or~~ experiments; and	
(G)	apply a structured technique problem such as a decision tree, design matrix, or cost-benefit analysis to select and justify a preferred solution to a problem.	CCRS SCI I.D.2
(11)	The student presents a solution derived through the engineering design process. The student is expected to:	CCRS SCI III.C.1
(A)	present the solution in a professional manner to an appropriate audience, such as peers, educators, potential clients, potential employers, community members, or engineering professionals;	
(B)	solicit and evaluate feedback from the audience on the solution and presentation; and	
(C)	present learning experiences such as essential skills gained, areas of personal growth, and challenges and solutions encountered throughout the design process.	

§127.785. Engineering Design and Problem Solving (One Credit), Adopted 2025 ~~Adopted 2021~~.

	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 ~~2022-2023~~ school year.	
(b)	General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: Algebra I, Geometry, and at least one credit in a Level 2 or higher course in the science, technology, engineering, and mathematics career cluster. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The 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. ~~The STEM Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.~~	New engineering career cluster introduction from engineering foundations program of study framework
(3)	The Engineering Design and Problem Solving course teaches ~~is~~ the creative process of solving problems by identifying needs and then devising solutions using scientific and engineering practices. The solution may be a product, technique, structure, or process depending on the problem. Science aims to understand the natural world, while engineering seeks to shape this world to meet human needs and wants. *Various engineering disciplines address a broad spectrum of design problems using specific concepts from the sciences and mathematics to derive a solution.* Engineering design takes into consideration limiting factors or "design under constraint." ~~*Various engineering disciplines address a broad spectrum of design problems using specific concepts from the sciences and mathematics to derive a solution*~~. The design process and problem solving are inherent to all engineering disciplines.	Consider a definition for “engineering” similar to the definition of “science” used below.
~~(4)~~	~~Engineering Design and Problem Solving reinforces and integrates skills learned in previous mathematics and science courses. This course emphasizes solving problems, moving from well-defined toward more open-ended, with real-world application. Students will apply critical-thinking skills to~~	Too many introductions. Needed to be more concise.

	~~justify a solution from multiple design options. Additionally, the course promotes interest in and understanding of career opportunities in engineering.~~	
~~(5)~~	~~This course is intended to stimulate students' ingenuity, intellectual talents, and practical skills in devising solutions to engineering design problems. Students use the engineering design process cycle to investigate, design, plan, create, and evaluate solutions. At the same time, this course fosters awareness of the social and ethical implications of technological development.~~	
(6)	Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not currently scientifically testable.	
(7)	Scientific hypotheses and theories. Students are expected to know that:	
(A)	hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and	
(B)	scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.	
(8)	Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.	
(A)	Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.	
(B)	Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.	

(9)	Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).	
(10)	Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide a tool for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.	
(11)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(12)	Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative 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)	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; and	

(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.	
~~(1)~~	~~The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:~~	Replaced by new KS1 – employability strand
~~(A)~~	~~demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession;~~	
~~(B)~~	~~show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;~~	
~~(C)~~	~~present written and oral communication in a clear, concise, and effective manner;~~	
~~(D)~~	~~demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and~~	
~~(E)~~	~~demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed.~~	
(2)	The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:	Scientific and engineering practices strand
(A)	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	
(B)	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	
(C)	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	

(D)	use appropriate tools such as dial caliper, micrometer, protractor, compass, scale rulers, multimeter, and circuit components;	
(E)	collect quantitative data using the International System of Units (SI) and United States customary units and qualitative data as evidence;	
(F)	organize quantitative and qualitative data using spreadsheets, engineering notebooks, graphs, and charts;	
(G)	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	
(H)	distinguish between scientific hypotheses, theories, and laws.	
(3)	The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:	Scientific and engineering practices strand
(A)	identify advantages and limitations of models such as their size, scale, properties, and materials;	
(B)	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	
(C)	use mathematical calculations to assess quantitative relationships in data; and	
(D)	evaluate experimental and engineering designs.	
(4)	The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	Scientific and engineering practices strand
(A)	develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	
(B)	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	
(C)	engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	

(5)	The student knows the contributions of scientists and engineers and recognizes the importance of scientific research and innovation on society. The student is expected to:	Scientific and engineering practices strand
(A)	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing so as to encourage critical thinking by the student;	
(B)	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists and engineers as related to the content; and	
(C)	research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a STEM field.	
(6)	The student 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.	
(7)	The student explores and implements the methods and aspects of project management for complex, multi-phase, multi-system projects. The student is expected to:	Project management strand modified CCRS SCI I.C.1
(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;	
(G)	describe the importance of management of change (MOC) and how it applies to project planning; and	
(H)	create and implement a project management plan for an engineering project.	
(8)	The student conducts research, analyzes data, and creates a problem statement in the engineering design process. The student is expected to:	Research/Problem Statement CCRS SCI I.A.3
(A)	create and maintain an organized engineering notebook to record research, findings and corrections, including deficiencies in the design process, and decisions throughout the entire design process prototypes, corrections, and/or mistakes in the design process;	CCRS SCI III.A.1; III.C.1
(B)	identify and select an open-ended real-world problem that can be solved using scientific and engineering practices and the engineering design process;	
(C)	collect, organize, analyze, and summarize scientific and technical articles, data, and information to support the development of a problem statement;	CCRS SCI III.B.1
(D)	identify relevant scientific and technical vocabulary;	CCRS SCI III.B.3
(E)	evaluate information from sources for quality, accuracy, completeness, and reliability and conduct additional research as appropriate in the context of an iterative design process; and	CCRS SCI III.D.2
(F)	create a problem statement that is concise, specific, and measurable.	
(9)	The student identifies potential solutions and uses structured techniques to select and justify a preferred solution using scientific and engineering practices and the engineering design process. The student is expected to:	Conceptualization and Solution Selection
(A)	*identify or create alternative solutions to a problem using a variety of techniques such as* sketching, *brainstorming, reverse engineering, and researching engineered and* nature-based ~~natural~~ *solutions;*	CCRS SCI I.A.4; III.B.1-3
(B)	*select* ~~and justify~~ *a preferred solution to a problem by apply*ing *structured techniques such as a decision tree, design matrix, or cost-benefit analysis;*	
(C)	evaluate whether the preferred solution meets the requirements of the problem statement in the context of an iterative design process;	

(D)	identify material properties that are important to the solution design such as physical, mechanical, chemical, electrical, and magnetic properties and explain how material properties impact material selection;	
(E)	explain how different engineering solutions can have significantly different impacts on individuals, society, and the natural world; and	
(F)	document concepts, solutions, findings, and structured decision-making techniques in the engineering notebook.	CCRS SCI III.A.1
(10)	The student creates technical drawings, models, and prototypes using the appropriate tools, materials, and techniques. The student is expected to:	Technical Drawing, Modeling, Prototype CCRS SCI II.C.1-4; V.E.1-2
(A)	determine and explain the type of technical drawing that will best represent the solution;	Technical drawings
(B)	create a technical drawing(s) that includes dimensions, scale, views, annotations, tolerances, legends, symbols, and material specifications;	
(C)	create a mathematical or physical model(s)to make predictions, identify limitations, and optimize design criteria;	CCRS SCI V.E.1
(D)	create a prototype for physical testing;	CCRS SCI I.B.1
(E)	evaluate the successes and failures of the prototype(s) in the context of an iterative design process; and	
(F)	revise technical drawings, models, and prototypes as the solution evolves to better meet objectives.	
(11)	The student develops, implements, and documents experiments and tests using scientific and engineering practices to determine whether a prototype meets design requirements. The student is expected to:	Test and Experiment Experimental and observational testing Experimental investigations
(A)	design and conduct experiments and tests to determine whether the prototype meets the requirements of the problem statement;	CCRS SCI I.B.1
(B)	document quantitative and qualitative data obtained through experiments and tests in the engineering notebook;	CCRS SCI I.D.1-3
(C)	create charts, data tables, or graphs to organize information collected in an experiment;	

(D)	identify sources of random error and systematic error and differentiate between both types of error;	
(E)	analyze data using statistical methods to recognize patterns, trends and proportional relationships; and	CCRS SCI II.E.1; V.C.1
(F)	evaluate and determine whether the prototype meets the requirements of the problem statement by analysis of data collected in the context of an iterative design process.	
(12)	The student develops and presents a comprehensive report that describes the problem, research and information collected and analyzed, concepts and solutions considered, prototypes developed and tested, and final results. The student is expected to:	Formal Report CCRS SCI III.C.1
(A)	create and present the comprehensive report in a professional manner to an appropriate audience, such as peers, educators, potential clients, potential employers, community members, or engineering professionals;	
(B)	solicit and evaluate feedback from the audience on the comprehensive report and presentation;	
(C)	present learning experiences such as essential skills gained, areas of personal growth, and challenges and solutions encountered throughout the design process; and	
(D)	predict the local and global impacts or risks of an engineering solution to segments of the society, such as the economy or the environment.	CCRS SCI IV.A.1; IV.B.1-2
~~(6)~~	~~The student uses critical thinking, scientific reasoning, scientific and engineering practices, engineering design processes, and problem solving to make informed decisions. within and outside the classroom. The student is expected to:~~	Expanded and embedded into new engineering design process, KS9, KS10, KS11 to better support and align to scientific and engineering practices
~~(A)~~	~~communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials; and~~	
~~(B)~~	~~draw inferences based on data related to promotional materials for products and services.~~	
~~(7)~~	~~The student applies knowledge of science and mathematics and the tools of technology to solve engineering design problems. The student is expected to:~~	Expanded and embedded into new engineering design process, KS9, KS10, KS11 to better support and align to scientific and engineering practices

~~(A)~~	~~select appropriate mathematical models to develop solutions to engineering design problems;~~	
~~(B)~~	~~integrate advanced mathematics and science skills as necessary to develop solutions to engineering design problems;~~	
~~(C)~~	~~judge the reasonableness of mathematical models and solutions;~~	
~~(D)~~	~~investigate and apply relevant chemical, mechanical, biological, electrical, and physical properties of materials to engineering design problems;~~	
~~(E)~~	~~identify the inputs, processes, outputs, control, and feedback associated with open and closed systems;~~	
~~(F)~~	~~describe the difference between open-loop and closed-loop control systems;~~	
~~(G)~~	~~evaluate different measurement tools such as dial caliper, micrometer, protractor, compass, scale rulers, and multimeter, make measurements with accuracy and precision, and specify tolerances; and~~	
~~(H)~~	~~use conversions between measurement systems to solve real-world problems.~~	
~~(8)~~	~~The student communicates through written documents, presentations, and graphic representations using the tools and techniques of professional engineers. The student is expected to:~~	Rewritten for clarity and moved to new KS about formal report and presentation
~~(A)~~	~~communicate visually by sketching and creating technical drawings using established engineering graphic tools, techniques, and standards;~~	
~~(B)~~	~~read and comprehend technical documents, including specifications and procedures;~~	
~~(C)~~	~~prepare written documents such as memorandums, emails, design proposals, procedural directions, letters, and technical reports using the formatting and terminology conventions of technical documentation;~~	
~~(D)~~	~~organize information for visual display and analysis using appropriate formats for various audiences, including technical drawings, graphs, and tables such as file conversion and appropriate file types, in order to collaborate with a wider audience;~~	
~~(E)~~	~~evaluate the quality and relevance of sources and cite appropriately; and~~	
~~(F)~~	~~defend a design solution in a presentation.~~	

~~(9)~~	~~The student recognizes the history, development, and practices of the engineering professions. The student is expected to:~~	Similar to KS5 and too elementary for level 4 course. Possibly delete and/or create a KS on ethics in science/engineering.
~~(A)~~	~~identify and describe career options, working conditions, earnings, and educational requirements of various engineering disciplines such as those listed by the Texas Board of Professional Engineers;~~	
~~(B)~~	~~recognize that engineers are guided by established codes emphasizing high ethical standards;~~	
~~(C)~~	~~explore the differences, similarities, and interactions between engineers, scientists, and mathematicians;~~	Too elementary for level 4 course
~~(D)~~	~~describe how technology has evolved in the field of engineering and consider how it will continue to be a useful tool in solving engineering problems;~~	Similar to 5B
~~(E)~~	~~discuss the history and importance of engineering innovation on the U.S. economy and quality of life; and~~	
~~(F)~~	~~describe the importance of patents and the protection of intellectual property rights.~~	
~~(10)~~	~~The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to:~~	Reworded this KS as an SE in new research and problem statement KS(7)
~~(A)~~	~~identify and define an engineering problem;~~	
~~(B)~~	~~formulate goals, objectives, and requirements to solve an engineering problem;~~	
~~(C)~~	~~determine the design parameters associated with an engineering problem such as materials, personnel, resources, funding, manufacturability, feasibility, and time;~~	
~~(D)~~	~~establish and evaluate constraints pertaining to a problem, including health, safety, social, environmental, ethical, political, regulatory, and legal;~~	
~~(E)~~	~~*identify or create alternative solutions to a problem using a variety of techniques such as brainstorming, reverse engineering, and researching engineered and natural solutions;*~~	Moved to KS(8)(A) "nature-based solutions"
~~(F)~~	~~test and evaluate proposed solutions using methods such as creating models, prototypes, mock-ups, or simulations or performing critical design review, statistical analysis, or experiments;~~	

~~(G)~~	~~*apply structured techniques to select and justify a preferred solution to a problem such as a decision tree, design matrix, or cost-benefit analysis;*~~	Moved to KS(8)(B) "select and justify a preferred solution to a problem using a structured technique such as..."
~~(H)~~	~~predict performance, failure modes, and reliability of a design solution; and~~	
~~(I)~~	~~prepare a project report that clearly documents the designs, decisions, and activities during each phase of the engineering design process.~~	Strike "clearly"
~~(11)~~	~~The student manages an engineering design project. The student is expected to:~~	KS11 replaced by Project Management Strand-workgroup recommends modifying verbs to reflect students are "creating" project management
~~(A)~~	~~participate in the design and implementation of a real-world or simulated engineering project using project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;~~	
~~(B)~~	~~develop a plan and project schedule for completion of a project;~~	
~~(C)~~	~~work in teams and share responsibilities, acknowledging, encouraging, and valuing contributions of all team members;~~	
~~(D)~~	~~compare and contrast the roles of a team leader and other team member responsibilities;~~	
~~(E)~~	~~identify and manage the resources needed to complete a project;~~	
~~(F)~~	~~use a budget to determine effective strategies to meet cost constraints;~~	
~~(G)~~	~~create a risk assessment for an engineering design project;~~	
~~(H)~~	~~analyze and critique the results of an engineering design project; and~~	
~~(I)~~	~~maintain an engineering notebook that chronicles work such as ideas, concepts, inventions, sketches, and experiments.~~	

§127.XX Practicum in 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 Grade 12. Prerequisite: Recommended prerequisite:	
(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 Practicum in Engineering	
(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)	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 a professional engineer serves the local and global community. The student is expected to:	
(A)	research and identify student and professional engineering organizations and the benefits of membership such as networking platforms, training and educational opportunities, and participating in community initiatives;	
(B)	explain an engineer's role and how various engineering roles serve the organization, community, and society; and	
(C)	evaluate how the work of student or professional engineering organizations impact the local or global community such as recommended practices and issuing standards.	
(3)	The student uses critical thinking and problem solving in the work-based learning experience. The student is expected to:	
(A)	conduct technical research to gather information, identify gaps, and make decisions in the work-based learning experience;	

(B)	develop creative and innovative solutions to problems in the work-based learning experience;	
(C)	analyze and compare alternative designs for an effective solution to a problem in the work-based learning experience; and	
(D)	evaluate and present solutions to problems in the work-based learning experience.	
(4)	The student understands and demonstrates how effective leadership and teamwork skills enable the accomplishment of goals and objectives. The student is expected to:	Teamwork – leadership and teamwork within an engineering work setting and contract work setting
(A)	analyze leadership characteristics such as trustworthiness, positive attitude, integrity, and work ethic;	
(B)	explain and demonstrate effective characteristics of teamwork;	
(C)	explain and demonstrate responsibility for shared group and individual work tasks in the work-based learning experience;	
(D)	describe and analyze how to use effective working relationships such as meeting deadlines, showing respect for all individuals, and clear and timely communication, to accomplish objectives; and	
(E)	research and identify opportunities to participate in extracurricular engineering activities.	Added to match paragraph 4 in intro
(5)	The student demonstrates oral and written communication skills in delivering and receiving information and ideas. The student is expected to:	
(A)	apply appropriate content knowledge, technical concepts, and vocabulary to analyze information and follow directions;	
(B)	use professional communication skills such as using technical terminology, email etiquette, and following the organization or team communication plan and hierarchy when delivering and receiving information in the work-based learning experience;	
(C)	identify and analyze information contained in informational texts, internet sites, or technical materials in the work-based learning experience;	
(D)	describe and analyze verbal and nonverbal cues and behaviors such as body language, tone, and interrupting to enhance communication in the work-based learning experience; and	
(E)	apply active listening skills to receive and clarify information in the work-based learning experience.	

(6)	The student reflects on the work-based learning experience to prepare for postsecondary and employment success. The student is expected to:	
(A)	assess and evaluate personal strengths and weaknesses in knowledge and skill proficiency and contributions to a project related to the work-based learning experience;	
(B)	develop and maintain a professional portfolio to include:	
(i)	attainment of technical skill competencies;	
(ii)	licensures or certifications;	
(iii)	recognitions, awards, and scholarships;	
(iv)	extended learning experiences such as community service and active participation in career and technical student organizations and professional organizations;	
(v)	abstract of key points of the practicum;	
(vi)	resume;	
(vii)	samples of work; and	
(viii)	evaluation from the practicum supervisor; and	
(C)	present the professional portfolio to interested stakeholders.	
(7)	The student develops a presentation describing the culmination of skills and knowledge gained from the work-based learning experience. The student is expected to:	
(A)	develop a professional presentation to display and communicate the work-based learning experience, including goals and objectives, levels of achievement, skills and knowledge gained, areas for improvement and personal growth, challenges encountered throughout the experience, and a plan for future goals;	
(B)	identify an appropriate audience and coordinate the presentation of findings related to the work-based learning experience;	
(C)	present findings in a professional manner using concise language, engaging content, relevant media, and clear speech; and	
(D)	analyze feedback received from a presentation.	

(8)	The student compares engineering work-based learning project budget documents and processes to project budget documents and processes learned in engineering courses. The student is expected to review and interpret a budget for a project from the work-based learning experience.	Could consider explanation of employment contracts