Career and Technical Education TEKS Review Draft Recommendations

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

Mechanical and Aerospace Engineering Program of Study

Courses: Mechanical Design I, Mechanical Design II, Aerospace Design I, Aerospace Design II

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

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

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

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

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§127.XX Mechanical Design I (One Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades10-12. Prerequisite: Algebra 1 Recommended corequisite: Geometry. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	Students enrolled in Mechanical Design I, demonstrate knowledge and skills associated with design and manufacture of mechanical systems. Fundamental mechanisms are introduced such as gears, belts, threaded elements, and four-bar mechanisms. Basic manufacturing processes such as stamping, injection molding, casting, machining, and assembly are explored through reverse engineering. The mechanisms encountered through reverse engineering enable the exploration of product functionality. Students compare engineering choices made for components, materials, and manufacturing processes. Emphasis is placed on team collaboration and professional documentation.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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 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)	Collaboration. The student develops teamwork skills. The student is expected to:	CCRS SCI I.B.1; CDS I.A.2, I.B.1, I.E.2
(A)	discuss principles of critique such as describing, analyzing, interpreting and evaluating;	CCRS CDS I.A.2, I.B.1, I.E.2; SCI III.A.1
(B)	demonstrate sensemaking skills such as recognizing team members who require additional clarity and addressing team members to provide clarity;	CCRS CDS I.E.2; SCI III.C.1
(C)	identify methods for structuring projects such as Gantt charts, Work Breakdown Structure, Agile, Critical Path Method; and	CCRS CDS I.E.2; SCI I.B.1
(D)	discuss the importance of contributing to positive and productive group dynamics to enhance teamwork.	CCRS CDS I.E.2; SCI I.B.1
(5)	Documentation. The student documents information gathered and interpretation developed throughout engineering processes. The student is expected to:	CCRS ELA I.A.1, I.A.5, II.A.7, II.A.8; CDS II.B.1, II.B.2, II.B.3; SCI III.C.1
(A)	create documents such as executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages aligned with professional industry standards;	CCRS ELA I.A.1; CDS II.B.1, II.B.2, II.B.3; SCI III.C.1

(B)	identify the audience and their needs for technical documents; and	CCRS ELA I.A.5; CDS II.B.1, II.B.2, II.B.3; SCI III.C.1
(C)	explain and justify the structure and sequence of how information is presented in engineering documents.	CCRS ELA II.A.7; II.A.8; CDS II.B.1, II.B.2, II.B.3
(6)	Mechanisms. The student investigates and understands mechanisms that convert motion such as gears, belts, threaded elements, linkages, or linear actuators. The student is expected to:	CCRS SCI I.A.1; M III.A.1-2, III.B.1-2, VIII.B.1, VIII.C.2; CDS I.A.1, I.C.1, I.D.3, I.E.1, II.C.5, II.C.6, II.C.8
(A)	create virtual models of physical mechanisms using appropriate tools;	CCRS M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2; CDS I.D.3., I.E.1, II.C.6, II.C.8, II.E.4
(B)	predict how different inputs will affect the motion of a mechanism such as gears and linkages and compare the predictions with physical models;	CCRS M III.A.1-2, III.B.1-2, VIII.B.1, VIII.C.2; CDS I.C.1, I.D.3, I.E.1, II.C.5, II.C.6, II.C.8
(C)	classify types of mechanisms such as gears, belts, threaded elements, linkages, or linear actuators; and	CCRS SCI I.A.1, M III.A.1-2, III.B.1-2; CDS I.A.1, I.C.1, I.D.3, I.E.1, II.C.5, II.C.6, II.C.8
(D)	explain how changes in the dimensions of a mechanism influence the relationship between input to output.	CCRS SCI I.A.1; M III.A.1-2, III.B.1-2; CDS I.A.1, I.C.1, I.D.3, I.E.1, II.C.5, II.C.6, II.C.8
(7)	Reverse Engineering. The student systematically disassembles and analyzes a system to identify the concepts involved in function and manufacture. The student is expected to:	CCRS M I.C.1-2, III.D.1, III.D.3, V.C.1, VII.A.1; CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.1, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, I.E.2, , II.C.2, II.C.5, II.C.6, II.C.8, II.E.1, II.E.4
(A)	use appropriate simple tools and methods to disassemble consumer products such as can openers, mixers, or drills;	CCRS CDS I.C.1, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, I.E.2, II.E.4
(B)	document the reverse engineering process using appropriate documentation tools and methods;	CCRS CDS II.A.1, II.A.3, II.A.4, II.A.6, II.B.1, II.B.2 II.B.3, II.E.3, II.E.4
(C)	identify mechanisms of a product such as drive systems and gears and how their function contributes to the overall function of the product;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.4, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8

(D)	identify elements of a product such as housings, covers, controls and how their attributes contribute to the product;	
(E)	use appropriate measurement tools and methods to capture and document information about the sub-assemblies and components in a product;	CCRS M I.C.1-2, III.D.1, III.D.3, V.C.1, VII.A.1; CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.4, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI I.C.3
(F)	identify and evaluate the choice of particular materials in the elements of a product;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI I.B1
(G)	identify and evaluate the choice of the manufacturing process of the element of a product; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI I.B1
(H)	identify and evaluate the choice of the assembly process of a product.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI I.E.2
(8)	Manufacturing. The student identifies different manufacturing processes such as stamping, injection molding, casting, sintering, and machining and assembly. The student is expected to:	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; SCI IV.D.1
(A)	explain and compare manufacturing processes such as stamping, casting, injection molding, and machining;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.B.1., II.B.3, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI III.A.1
(B)	identify and explain the elements such as press, tool, and blank, and related process steps such as shearing, bending, and perforating, used in the stamping manufacturing process;	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI I.E.2

(C)	identify and explain the elements such as hopper, heater, platen, and mold, and related process steps such as heating, injecting, used in the injection molding manufacturing process;	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI I.E.2
(D)	identify and explain the elements such as mold, furnace, parting plane, sprue, and gate and related process steps such as, heating, pouring, cooling, and removal in casting manufacturing processes such as sand casting, investment casting, or die casting;	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI I.E.2
(E)	identify and explain the elements such as mold, furnace, binder, and powder, and related process steps, such as heating, pressing, cooling, and post-processing, used in the sintering manufacturing process;	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; I I.E.2
(F)	identify and explain the elements such as workpiece, tool, jigs and fixtures, and the machine, and related process steps such as holding, locating, and cutting used in material removal processes such as milling, turning, drilling, and grinding;	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI I.E.2
(G)	identify and explain the elements, such as jigs and fixtures, tolerances, fasteners, and tools and related process steps such as locating, holding, joining, and automating used in the assembly process; and	CCRS M I.C.1, III.A.1-2, III.B.1-2, III.D.1-3; CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8
(H)	explain which material types are appropriate for manufacturing processes such as stamping, injection molding, casting, sintering, material removal, and assembly.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI VII.I.5

(9)	Assembly. The student explores the assembly process. The student is expected to:	CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI IV.D.1
(A)	explain joining methods such as welding, adhesive bonding, fastening, riveting, and snap fitting;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI III.B.2
(B)	evaluate the choice of joining methods found in a consumer product and generate requirements to justify the selected methods; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI II.D.1
(C)	compare different assembly strategies such as assembly line, automation versus manual, or batch versus pull.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.2, I.C.3, I.D.3, I.D.4, I.E.1, II.C.1, II.C.2, II.C.5, II.C.6, II.C.8; SCI IV.D.1
(10)	Design. The student applies appropriate professional design tools. The student is expected to:	CCRS SCI III.C.1
(A)	define industry relevant terminology including Failure Modes Effects Analysis (FMEA), Design for Manufacturing (DFM), Design for Assembly (DFA), Lean Manufacturing, Design of Experiments (DOE), benchmarking, reverse engineering, and Life Cycle Analysis (LCA);	CCRS ELA I.A.1, I.A.5, II.A.7, II.A.8; CDS II.B.1, II.B.2, II.B.3; SCI I.E.2
(B)	use design tools such as Failure Modes Effect Analysis (FMEA), Quality Functional Deployment (QFD), root cause analysis, five whys, or decision matrices to extract information about a reverse engineered product;	CCRS CDS I.C.1, I.C.2, I.C.3; SCI I.E.2
(C)	generate engineering requirements to justify the selection of materials, processes, parts, and features from a reverse engineered product;	CCRS CDS I.C.1, II.B.1, II.B.2, IIB.3; SCI II.D.1, Si: III.B.2
(D)	identify opportunities for manufacturing and assembly improvement in reverse engineered consumer products; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, II.C.1; SCI III.C.1
(E)	design and conduct tests to collect information needed to understand the engineers' design decisions, including material, manufacturing process, and mechanism choices, during a reverse engineering project.	CCRS CDS: I.C.1, I.C.3, II.B.1, II.B.3, II.D.1, II.D.2, II.D.3, II.E.1, II.E.2, II.E.3, II.E.4; SCI I.B.1

§127.XX Mechanical Design II (Two Credits), Adopted 2025.

	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades. Prerequisite: Mechanical Design I. Students shall be awarded two credits for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining 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 Mechanical Design II, demonstrate knowledge and skills associated with the design development and validation of a prototype solution to meet a given set of requirements. Students identify project stakeholders; manage projects; evolve requirements; model system solutions; develop, test, and refine prototypes; and validate project solutions. Emphasis is placed on budget management, professional documentation, conducting project status updates, critiquing design reviews, and team collaboration.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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 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)	Collaboration. The student develops teamwork skills. The student is expected to:	CCRS SS I.B.1; CDS I.A.2, I.B.1, I.E.2
(A)	apply sensemaking skills such as recognizing team members who require additional clarity and addressing team members to provide clarity;	CCRS CDS I.E.2; SS III.C.1
(B)	apply methods for structuring projects such as Gantt charts, Work Breakdown Structure, Agile, Critical Path Method;	CCRS CDS I.E.2; SS I.B.1
(C)	apply principles of critique such as describing, analyzing, interpreting and evaluating;	CCRS CDS I.E.2; SS I.B.1
(D)	develop and execute actions to positively support the team's work relationships;	CCRS CDS I.E.2; SS I.C.1
(E)	explain and model how to provide an effective critique of team members on topics such as team performance, test performance, project development, or presentation;	CCRS CDS I.A.2, I.B.1, I.E.2; SS III.A.1
(F)	explain and model how to provide an effective critique of other teams on topics such as presentation, problem definition, schedule, and solution justification;	CCRS CDS I.A.2, I.B.1, I.E.2; SS III.A.1
(G)	analyze and evaluate critique received from team members and other teams; and	CCRS CDS I.A.2, I.B.1, I.E.2; SS III.A.1
(H)	develop a design review presentation to provide status and solicit feedback on the design problem and solution.	CCRS CDS I.A.2, I.B.1, I.E.2; SS III.A.1

(5)	Documentation. The student documents information gathered and interpretations developed throughout the applied engineering process. The student is expected to:	CCRS ELA I.A.1, I.A.5, II.A.7, II.A.8; CDS II.B.1, II.B.2, II.B.3; SS III.C.1
(A)	generate documents such as executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages by applying professional standards and templates;	CCRS ELA I.A.1; CDS II.B.1, II.B.2, II.B.3; SS III.C.1
(B)	select the appropriate document format for the information being communicated based on the audience;	CCRS ELA I.A.5; CDS II.B.1, II.B.2, II.B.3; SS III.C.1
(C)	explain and justify the structure and sequence of how the information is presented in the engineering documents;	CCRS ELA II.A.7; II.A.8; CDS II.B.1, II.B.2, II.B.3
(D)	create assembly and user manuals for peer review; and	CCRS CDS I D.3, I E.2, II B.1-3
(E)	generate a final design report that focuses on the project scope and solution with appendices to capture all relevant design information such as the design process used, requirements compliance matrix, concept reports, and test reports.	CCRS CDS I D.3, I E.2, II B.1-3, CDS II D.2-3
(6)	Project Management. The student reviews and applies basic project management strategies following a proposal-justification-approval process for each significant model considered. The student is expected to:	
(A)	generate a project management plan that includes time and deliverable estimates;	CCRS CDS II B.1-3
(B)	review and update periodically the project management plan and appropriate industry standard tools such as stage-gate and agile; team structure and formation; and project modeling such as flow charts, Gantt charts, Program Evaluation Review Technique (PERT), critical path method, and work breakdown structures;	CCRS CDS II B.1-3
(C)	create model or test proposals for review; and	CCRS CDS II C.6
(D)	compare project management approaches such as stage-gate and agile.	CCRS CDS II C.2
(7)	Stakeholder. The student understands how to engage stakeholders including end user, consumer, fabricator, maintenance, and others. The student is expected to:	
(A)	describe how an engineer's professional responsibility applies to stakeholders;	CCRS CDS I E.2, II C.2
(B)	develop a journey map or equivalent tool to model how the stakeholder interacts with the product; and	CCRS CDS I E.2, II C.2
(C)	explain the importance of maintaining engagement with the stakeholder throughout the project.	CCRS CDS I A.1

(8)	Requirements. The student understands the importance of requirements to mechanical engineering design. The student is expected to:	
(A)	create a requirement in correct format with appropriate standards such as, NASA, Mil-Standard, and INCOSE;	CCRS CDS I A.1, I C.1-2
(B)	generate and refine requirements throughout the project;	CCRS CDS II B.1-3
(C)	relate requirements to stakeholders;	CCRS CDS II C.1-2
(D)	discuss the importance of the relation between requirements and respective stakeholders; and	CCRS CDS II C.1-2
(E)	explain how requirements drive the project.	CCRS CDC II C.2
(9)	System Modeling. The student generates multiple abstract models of mechanical systems using representations such as schematic diagramming and function structure modeling. The student is expected to:	CCRS M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(A)	create models of various mechanical system concepts;	CCRS CDS I C.1, I D.3, I E.2, II C.6; M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(B)	compare different models against the appropriate requirements;	CCRS CDS I C.1, I D.3, I E.2, II C.6; M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(C)	extract new system requirements from the models;	CCRS CDS I C.1, I D.3, I E.2, II B.1-3, II C.6; M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(D)	create models to communicate engineering design solutions to stakeholders for a project;	CCRS CDS II B.1-3; M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(E)	discuss conservation principles of energy, matter, and motion; and	CCRS CDS II C.1-2
(F)	apply conservation principles throughout the system model.	CCRS CDS II C.1-2; M III.A.1, III.D.1-3, VIII.B.1, VIII.C.2
(10)	Design Space Modeling. The student models conceptual design spaces through the use of morphological matrices. The student is expected to:	
(A)	select the key requirements for the problem;	CCRS CDS II.C.1-2
(B)	generate multiple means to address each key requirement to populate a morphological matrix;	CDS II.C.1-2
(C)	generate multiple integrated solutions by selecting means from each requirement for further modeling and refinement; and	CDS II B.1-3, II.C.1-2
(D)	calculate the total number of possible solutions captured in the generated morphological matrix.	CDS II.D.3

(11)	Concept Generation. The student generates systematic multiple concepts using appropriate ideation tools. The student is expected to:	
(A)	explain the rules of ideation tools such as brainstorming, 6-3-5, Gallery Method, C-Sketch, and concept mapping;	CCRS CDC II C.1-8
(B)	apply ideation tools to generate multiple concepts for a problem; and	CCRS CDS I.C.2
(C)	compare the ideation tools based on the rules, number of people, representation, and purpose.	
(12)	Concept Pruning. The student prunes sets of concepts using design tools such as decision matrices, pair-wise comparison, and pro-con lists. The student is expected to:	CCRS CDS II C.1-8
(A)	use and explain absolute or relative decision matrices to prune concepts;	
(B)	use and explain pair-wise comparisons to prune concepts;	
(C)	use and explain pro-con lists to prune concepts;	
(D)	explain why it is important to use multiple pruning tools in design; and	
(E)	explain why the pruning tools are not for selecting concepts.	
(13)	Prototyping and Testing. The student fabricates multiple physical prototypes ranging from parts to sub-systems to final integrated prototypes to gather information needed to support mechanical engineering design decision making. The student is expected to:	
(A)	develop prototyping proposals that include cost, time, and effort estimates; desired information; and testing plans;	CCRS CDS I E.2
(B)	use appropriate tools and materials to fabricate prototypes;	CCRS CDS I E.2, II.C.6
(C)	evaluate and execute testing plans for each prototype to gather information or check requirement satisfaction;	CCRS CDS I E.2, II.C.6,8
(D)	extract and document new requirements from prototyping and testing; and	CCRS CDS I.E.2, II B.1-3
(E)	justify the purpose for each physical or virtual model constructed against the cost of making the model.	CCRS CDS II C.1-8

(14)	Embodiment and Refinement. The student refines design solutions by selecting and sizing components appropriately. Students will justify material choices based on the requirements defined. The student is expected to:	
(A)	construct geometric models and drawings to represent designed system;	CCRS CDS I E.2
(B)	justify and use appropriate analytical and simulation tools to correlate the changes in parameters of the models with changes in the performance of the modeled system;	CCRS CDS I E.2, II D.1-3
(C)	justify design decisions using the requirements such as functional, cost, performance or time;	CCRS CDS I.C.3
(D)	use appropriate tools and materials to fabricate a final prototype;	
(E)	develop final product documents such as Bill of Materials, assembly models, user manual, and assembly instructions; and	CCRS CDS I E.1-3, II B.1-3
(F)	explain the evolution of requirements between earlier and final prototypes.	CCRS CDS I C.1-3
(15)	Solution Validation. The student tests and verifies requirements throughout the project. The student understands the importance of discovering new requirements through testing and simulation. The student is expected to:	
(A)	analyze information gained from testing and simulation to document new or refined requirements;	CCRS CDS II B.1-3
(B)	document simulations or tests using an appropriate report template;	CCRS CDS I E.2, II B.1-3
(C)	design and execute simulations or tests to validate functional requirements are met;	CCRS M IV.A.1
(D)	explain why engineering design processes are iterative; and	CCRS CDS I E.2, II B.1-3
(E)	discuss how continuous improvement and design iteration are related.	CCRS CDS I E.2, II B.1-3
(16)	Budget. The student plans, monitors, and updates project budgets throughout the design project. The student is expected to:	CCRS M I.A.2, IX.A.1-2, IX.B.3
(A)	create budgets for initial project costs such as raw materials, purchased parts, salvaged parts, hardware, taxes, shipping, and handling categories;	CCRS CDS I E.2, II B.1-3; M I.A.2, IX.A.1-2, IX.B.3
(B)	create a Bill of Materials cost report for the final build;	CCRS CDS I E.2, II B.1-3
(C)	compare and explain any differences between the final product build cost to the project budget;	CCRS CDS I E.2, II B.1-3; M I.A.2, IX.A.1-2, IX.B.3

(D)	monitor and update the project budget throughout the duration of the project;	CCRS CDS I E.2, II B.1-3; M I.A.2, IX.A.1-2, IX.B.3
(E)	prepare budget status reports that include explanations of spenddown rates and changes to the budget; and	CCRS CDS I E.2, II B.1-3; M I.A.2, IX.A.1-2, IX.B.3
(F)	explain the importance of budget tracking in design projects.	CDS I E.2, II B.1-3; M I.A.2, IX.A.1-2, IX.B.3

§127.XX Aerospace Design I (One Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades10-12. Prerequisite: Algebra 1 Recommended corequisite: Geometry. Students shall be awarded one credit for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining 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 Aerospace Design I, demonstrate knowledge and skills associated with the design evolution and emerging trends of aircraft and systems. Fundamental concepts such as forces of flight, structures, aerodynamics, propulsion, stability and control, and orbital mechanics are introduced as related to design decisions for atmospheric and space flight. These concepts are related to mission requirements and solution approaches.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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 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)	Collaboration. The student engages in multiple team projects and activities. The student is expected to:	
(A)	demonstrate how to provide and receive critical feedback;	
(B)	develop sensemaking skills, learning to recognize when team members require additional clarity;	
(C)	demonstrate how to structure a project;	
(D)	synthesize appropriate team responses for different challenges; and	
(E)	support the team's positive social climate.	
(5)	Documentation. The student documents information and interpretation developed throughout engineering processes. The student is expected to:	
(A)	use professional standards and templates such as executive summaries, test reports, failure documents, system black box models, engineering notebooks, and drawing packages;	CCRS SCI III.A.1; SS V.A.I, V.A.II, V.B.I
(B)	identify the stakeholder and appropriately select the document format for the information being communicated; and	CCRS SCI III.A.1; SS V.A.I, V.A.II, V.B.I
(C)	explain and justify the structure and sequence of how the information is presented in the engineering documents.	CCRS SCI III.A.1; SS V.A.I, V.A.II, V.B.I

(6)	History of Flight. The student understands the history and evolution of human flight to include within and outside the earth's atmosphere. The student is expected to:	CCRS CDS I.A.1-2, I.B.2-4, I.D.1-4, I.E.1-2, II. A. 1-8, II.C.1-8; SS 2.A.II
(A)	discuss human efforts prior to powered flight;	CCRS CDS II. A. 1-8, II.C.1-8; SS 2.A.II
(B)	discuss innovations in aircraft prior to the jet age and explain how world events impacted these innovations;	CCRS CDS II. A. 1-8, II.C.1-8; SS 2.A.II
(C)	discuss innovations in aircraft after the beginning of the jet age and explain how world events impacted these innovations;	CCRS CDS II. A. 1-8, II.C.1-8; SS 2.A.II
(D)	discuss innovations in rockets prior to human spaceflight and explain how world events impacted these innovations; and	CCRS CDS II. A. 1-8, II.C.1-8; SS 2.A.II
(E)	discuss innovations in rockets after the first human spaceflight and explain how world events impacted these innovations.	CCRS CDS II. A. 1-8, II.C.1-8; SS 2.A.II
(7)	Introduction to Aircraft. The student explains the Federal Aviation Agency categories for aircraft and categorize the different types of aircraft such as airplanes, rotorcraft, Lighter-than-air or aerostats, glider, powered-lift, powered parachutes, Weight-shift aircraft, Ground-effect Vehicles (GEV), Air-cushion vehicles (ACV), and Rockets. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.D.1-4, I.E.1-2,I.F1-4, II.C.1-8
(A)	identify and describe classes of aircraft such as Single-Engine Land (SEL), Gyroplane, Powered-lift, and Glider using the Federal Aviation Agency (FAA) categories;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8
(B)	categorize aircraft by attributes such as piston engine, turboprop, powered or unpowered, drones or piloted;	CCRS CDS I.B.1-4, I.C.1-3, I.E.1-2, I.F.1-4, II.C.1-8
(C)	compare and contrast aircraft categories and use cases for each category; and	CCRS CDS I.B.1-4, I.C.1-3, I.E.1-2, I.F.1-4, II.C.1-8
(D)	research and discuss emerging trends in aircraft such as airships, rotary powered aircraft, and alternative energy powered aircraft.	CCRS CDS I.B.1-4, I.C.1-3, I.E.1-2, I.F.1-4, II.C.1-8
(8)	Atmospheric Flight. The student identifies and relates the three axes of an aircraft, the four forces of flight, and the components used for stability and control the aircraft. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(A)	research and discuss the relationships between atmospheric temperature, pressure and density with altitude;	CCRS CDS I.B.1-4, I.C.1-3, I.E.1-2, I.F.1-4, II.C.1-8; M I.C.1, VII.A.1-2, VIII.A.1-3, VIII.B.1, VIII.C.1, IX.A.2 SCI I.A.2

(B)	identify and describe the motion about the three axes of an aircraft, including yaw, pitch, and roll;	CCRS CDS: I.A.1-2, I.B.1-4, II.C.1-8; M VII.A.1-2, VIII.A.1-3, VIII.C.1, IX.A.2; SCI VIII.C.1
(C)	identify and describe ways to control motion about the three axes;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8 M I.C.1, VII.A.1-2, VIII.A.1-3, VIII.B.1, VIII.C.1I, X.A.2; SCI VIII.C.1
(D)	identify and explain the four forces acting on aerospace vehicles in flight, including lift, drag, thrust, and weight;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8 M VII.A.1-2, VIII.A.1-3, VIII.C.1 IX.A.2; SCI VIII.D.3
(E)	explain the relationship between weight, mass, gravity, and acceleration and identify their corresponding units such as pounds-force, pound-mass, kilogram, and Newton;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8; M I.C.1, VII.A.1-2, VIII.A.1-3, VIII.B.1, VIII.C.1I, X.A.2, SI: I.A.2
(F)	discuss the difference between g-force and weight;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8; M I.C.1, VII.A.1-2, VIII.A.1-3 VIII.B.1, VIII.C.1I, X.A.2; SCI VIII.C.2
(G)	draw the forces of flight for a straight and level flight and a level banked turn;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, II.C.1-8. II.E.1-4; M VII.A.1-2; VIII.A.1-3; VIII.C.1 IX.A.2
(H)	identify different ways to control the forces that change the pitch, roll and yaw of an aircraft;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(I)	identify and explain the major fixed and movable components of various aircraft to enable stability and control within the atmosphere; and	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8. II.E.1-4
(J)	define and discuss aerodynamics.	CCRS CDS I.A.1-2, I.B.1-4, II.A.1-8, II.C.1-8. II.E.1-4
(9)	Lift and Drag. The student explains how lift and drag are generated by an aircraft and how they change during flight. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(A)	explain how an airfoil generates lift;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; SCI VIII.F.4
(B)	explain how the angle of attack (AoA) influences lift;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; SCI VIII.F.4
(C)	explain how to interpret a "Lift Coefficient (CL) versus Angle of Attack (AoA)" chart;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; M VIII.B.2; VIII.C.1-2; IX.A.2 IX.B.1-3
(D)	define and discuss stall for an airfoil;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4

(E)	explain the types of drag, including profile/form, skin friction, interference, trim, and induced;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(F)	explain how the angle of attack (AoA) influences drag;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(G)	explain how to interpret a “Drag Coefficient (CD) versus Angle of Attack (AoA)” chart;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; M VIII.B.2; VIII.C.1-2; IX.A.2; IX.B.1-3; SCI I.A.2
(H)	explain how changes in drag during flight impact performance such as range, altitude, and power requirements;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; SCI I.A.2
(I)	define and Discuss Lift-to-Drag (L/D) ratio;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(J)	explain how to interpret a Lift-to-Drag (L/D) chart;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; M VIII.B.2; VIII.C.1-2; IX.A.2 IX.B.1-3; SCI I.A.2
(K)	identify the maximum Lift-to-Drag (L/D) ratio from a chart to determine the optimal glide speed for maximum range;	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; SCI I.A.2
(L)	research and discuss other systems that use airfoils such as windmills, fans, and propelling aircraft; and	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4; SCI VIII.F.4
(M)	discuss how a plane can fly without engine power and in some cases can gain altitude to stay aloft for extended time and distance.	CCRS CDS I.A.1-2, I.B.1-4, II.C.1-8, II.E.1-4
(10)	Weight and Balance. The student recognizes components have mass, weight, and location resulting in moments that are balanced by control surfaces. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, II.C.1-8, II.E.1-4
(A)	identify and calculate moments created by the forces of flight;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, II.C.1-8, II.E.1-4; M I.C.1; VII.A.1-2; VIII.A.1-3; VIII.B.1; VIII.C.1; IX.A.2 SCI VIII.C.1
(B)	define and discuss Center of Gravity (CG);	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, II.C.1-8, II.E.1-4
(C)	define and discuss Center of Pressure (CP);	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, II.C.1-8, II.E.1-4; SCI VIII.F.4
(D)	research and discuss how the locations of the Center of Pressure (CP) and Center of Gravity (CG) influence the stability of an aircraft; and	CCRS SCI VIII.F.4

(E)	create a model of an aircraft with variable configurations for Center of Gravity (CG) and Center of Pressure (CP) to determine stability of an aircraft.	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-3, I.E.1-2, II.C.1-8, II.E.1-4; M VII.A.1-2; VIII.A.1-3; VIII.C.1 IX.A.2; SCI VIII.F.4
(11)	Mission Requirements. The student understands how mission requirements influence the type and form of aircraft. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(A)	analyze a mission to generate a list of atmospheric mission requirements such as payload, range, cruise, take-off length, landing length, climb gradient, altitude, land or sea;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(B)	analyze a mission to generate a list of space mission requirements such as payload, altitude, vibration sensitivity, launch conditions, environmental conditions, recovery;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(C)	explain how the mission requirements are interrelated;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(D)	discuss how the mission requirements relate to the aircraft and spacecraft categories;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(E)	discuss how mission requirements relate to the overall aircraft design; and	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(F)	interpret a mission profile and explain how it impacts mission requirements.	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, II.B.1-3, II.C.1-8, II.E.1-4
(12)	Propulsion. The student explains and evaluates different types of propulsion systems such as piston engine, turboprop, jet, and rocket. The student is expected to:	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(A)	identify and explain how a piston powered aircraft delivers thrust, with respect to considerations such as cost, operation cost, reliability, power, altitude limits, and speed limitations;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(B)	identify and explain how a turboprop powered aircraft delivers thrust, with respect to considerations such as cost, operation cost, reliability, power, altitude limits, and speed limitations;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(C)	identify and explain how a jet powered aircraft delivers thrust, with respect to considerations such as cost, operation cost, reliability, power, altitude limits, and speed limitations;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4; SCI VIII.C.1
(D)	explore and explain how a rocket engine is different from a jet engine;	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(E)	discuss the applications for solid-fuel rockets; and	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4

(F)	discuss the applications for liquid-fuel rockets.	CCRS CDS I.A.1-2, I.B.1-4, I.C.1-4, I.E.1-2, I.F.1-4, II.C.1-8, II.E.1-4
(13)	Material Selection. The student explains why a particular material is used in an aircraft application taking into account cost, density, strength, and mission requirements. The student is expected to:	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(A)	research and discuss material classes used in aerospace design such as woods, composites, metals, and plastics;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(B)	discuss appropriate materials for various aircraft components;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(C)	discuss methods for manufacturing various aircraft components;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(D)	explain the impact of material and manufacturing costs on design decisions; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(E)	explain how material requirements relate to mission requirements.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(14)	Aerospace Structures. The student explains and compares and contrasts types of structures such as truss, semi-monocoque, monocoque. The student is expected to:	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(A)	identify and discuss truss, semi-monocoque, and monocoque structures;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(B)	explain why different structure types are used in various aircraft categories;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(C)	discuss how mission requirements impact the selection of the structural types for an aircraft;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(D)	identify structural components in the fuselage such as stringers, bulkheads, skin;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4

(E)	identify structural components in the wings and empennage such as ribs, spars, stringers, and skin; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(F)	compare structures used in atmospheric flight to space flight.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(15)	Space Flight and Orbital Mechanics. The student knows properties of orbital mechanics as they relate to space flight and the impact of the space environment on design. The student is expected to:	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI: VIII.E.1, VIII.E.4
(A)	identify and describe orbits based on the six Keplerian Elements;	CCRS CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI VIII.E.1, VIII.E.4
(B)	explain how changes in Keplerian Elements change the orbit;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI VIII.E.1, VIII.E.4
(C)	explain how mission requirements determine specific orbit types;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SCI VIII.E.1, VIII.E.4
(D)	describe the unique environmental conditions of operating in space for human or autonomous missions;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(E)	research methods to reach and recover a spacecraft from space; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4
(F)	research and discuss emerging trends in space flight.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4

(16)	Alternate Applications for Aerospace Design. The student identifies and discusses alternate applications for aerospace design techniques including automotive, naval, commercial and home products. The student is expected to:	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(A)	research and discuss how aerospace engineers contribute to automotive and naval applications to improve performance;	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(B)	research and identify commercial applications for aerospace design such as heating and cooling systems, building design, and wind turbines; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(C)	identify and discuss items at home that are impacted by aerodynamics such as fans, convection ovens, and heating and cooling systems.	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(17)	Aircraft Systems. The student explores and discusses other aircraft systems such as navigation, communication, entertainment, flight control, and propulsion. The student is expected to:	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS: IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(A)	explain basic functionality for aircraft systems such as navigation, communication, entertainment, flight control, propulsion; and	CCRS CDS I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV
(B)	research and discuss different implementations for aircraft systems such as navigation, communication, entertainment, flight control, propulsion.	CCRS CDS: I.A.1, I.B.2, I.B.3, I.B.4, I.C.3, I.C.3, I.D.3, I.D.4, I.E.1, II.C.2, II.C.6, II.C.8, II.E.1, II.E.4; SS IV.A.V, IV.A. VI, IV.B.I, IV.B.III, IV.B.IV

§127.XX Aerospace Design II (Two Credits), Adopted 2025.

	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. This course is recommended for students in Grades 11-12. Prerequisite: Geometry, Aerospace Design I. Students shall be awarded two credits for successful completion of this course.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining 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 Aerospace Design II, demonstrate knowledge and skills associated with the design and prototyping of aerospace systems. Through aerospace projects, students apply fundamental concepts such as managing an engineering project to meet mission requirements, prototyping, testing, and validating requirements. Students explore choices made for propulsion, material, and structural design as well as various ways aircraft can navigate. Emphasis is placed on team collaboration and professional documentation.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other 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 to implement an engineering design process to develop a product or solution. The student is expected to:	Engineering design process stand
(A)	describe and implement the stages of an engineering design process to construct a model;	
(B)	explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, and technology, impact stages of the engineering design process;	

(C)	explain how stakeholders impact an engineering design process; and	
(D)	analyze how failure is often an essential component of the engineering design process.	
(3)	The student explores the methods and aspects of project management in relation to projects. The student is expected to:	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.	
(4)	Collaboration. The student engages in multiple team projects and activities. The student is expected to:	CCRS CDS I.A.2
(A)	demonstrate how to provide and receive critical feedback;	CCRS CDS I.A.2
(B)	develop sensemaking skills, learning to recognize when team members require additional clarity;	CCRS CDS I.E.2
(C)	demonstrate how to structure a project;	
(D)	synthesize appropriate team responses for different challenges; and	
(E)	support the team's positive social climate.	

(5)	Documentation. The student documents information and interpretation developed throughout engineering processes. The student is expected to:	CCRS SS III.A.1
(A)	use professional standards and templates, including executive summaries, reverse engineering forms, test reports, failure documents, system black box models, engineering notebooks, and drawing packages;	CCRS SS III.A.1
(B)	identify the stakeholder and appropriately select the document format for the information being communicated; and	CCRS SS III.A.1
(C)	explain and justify the structure and sequence of how the information is presented in the engineering documents.	CCRS SS III.A.1
(6)	Designing to Mission Requirements. The student generates conceptual aircraft solutions to meet a set of given requirements. The student is expected to:	CCRS SS III.A.1
(A)	analyze given mission requirements such as altitude, speed, and payload to derive sub requirements;	CCRS SCI I.A.4
(B)	generate additional aircraft requirements considering factors such as maintainability, producibility, operational cost, and safety;	CCRS SCI I.A.3
(C)	generate conceptual aircraft solutions to address requirements;	CCRS SCI V.E.1
(D)	classify conceptual solutions into appropriate aircraft categories such as Single-Engine Land (SEL), Gyroplane, Powered-lift, and Glider using the Federal Aviation Agency (FAA) classification system;	CCRS SCI I.A.3
(E)	select, justify, and document a conceptual solution that addresses the overall requirements; and	CCRS SCI I.A.3
(F)	create a model that displays the relationships between aircraft requirements.	CCRS SCI V.E.1
(7)	Managing Aerospace Engineering Projects. The student applies project management techniques to aerospace projects. The student is expected to:	
(A)	generate a project plan that includes time, deliverable, and cost estimates;	CCRS SCI III.C.1
(B)	review and update periodically the project plan according to a stage gate process;	CCRS SS III.A.1

(C)	document and execute test plans to evaluate prototypes against requirements;	CCRS SCI I.B.1
(D)	present progress and justify design choices through design reviews; and	CCRS SS III.A.1
(E)	generate a final design report with an executive summary, a body with problem and solution descriptions, and appendices with additional relevant information such as the design process used, requirements compliance matrix, concept reports, and test reports.	CCRS SCI III.C.1
(8)	Prototyping Aerospace Vehicles. The student creates a prototype to address a set of mission requirements. The student is expected to:	
(A)	evaluate the presented requirements and generate a list of design parameters;	CCRS SCI I.A.3
(B)	generate and document design concepts to address design parameters;	CCRS SCI III.C.1
(C)	use appropriate tools such as decision matrices, pro-con lists, and pair-wise comparison to evaluate, downselect, and justify design concepts to prototype;	CCRS SCI V.E.1
(D)	create and document prototypes to test, validate, and modify design concepts;	CCRS SCI I.A.3, I.B.1
(E)	use appropriate tools such as decision matrices, pro-con lists, and pair-wise comparison to evaluate, downselect, and justify prototypes to develop as the solution;	CCRS SCI V.E.1
(F)	identify areas of improvement of previously selected solution to revise, document, and prototype a new solution;	CCRS SCI V.E.1
(G)	test, evaluate, and document performance of the revised prototype in meeting project requirements; and	CCRS SCI I.B.1
(H)	compose and present a project debrief including lessons learned.	CCRS SCI III.C.1
(9)	Atmospheric Flight. The student relates the three axes of an aircraft, the four forces of flight, and the components used for stability and control. The student is expected to:	
(A)	calculate and discuss the relationships between temperature, pressure, and density;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2

(B)	research and discuss ways to control motion about the three axes;	CCRS SCI VIII.C.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(C)	explain and calculate changes in motion due to the four forces acting on aircraft during flight;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(D)	explain why loads acting on aircraft change during different flight scenarios;	CCRS SCI VIII.C.1
(E)	draw and calculate the forces of flight for a straight and level flight and a level banked turn; and	CCRS SCI V.E.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(F)	describe which aircraft components control and provide stability with respect to the six degrees of freedom.	CCRS SCI VIII.C.1
(10)	Lift and Drag. The student explains how lift and drag are generated by an aircraft and how they change during flight. The student is expected to:	
(A)	explain the lift equation and illustrate the relationships between its variables;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(B)	explain the drag equation and illustrate the relationships between its variables;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(C)	describe how aircraft control surfaces, including leading edge flaps, trailing edge flaps, ailerons, and spoilers influence lift;	CCRS SS III.C.1
(D)	describe how aircraft control surfaces, including leading edge flaps, trailing edge flaps, ailerons, and spoilers influence drag;	CCRS SS III.C.1
(E)	define and discuss how the stall angle and stall speed can be changed; and	CCRS SCI VIII.C.1
(F)	research contemporary developments reducing drag such as winglets, boundary layer control, and surface effects.	CCRS SCI II.B.I

(11)	Weight and Balance. The student recognizes components have mass, weight, and location resulting in moments that are balanced by control surfaces. The student is expected to:	
(A)	calculate the aircraft's estimated Center of Gravity throughout a mission profile considering factors such as fuel consumption, payload, and passengers;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(B)	estimate the location of the aircraft's Center of Pressure;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(C)	calculate the static margin throughout a flight profile to verify positive stability margin;	CCRS SCI II.B.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(D)	generate and document solutions to improve positive static stability in the event of a negative stability margin; and	CCRS SCI III.A.1
(E)	revise and document static margin calculations reflecting proposed solutions.	CCRS SCI III.A.1
(12)	Propulsion. The student evaluates various propulsion solutions to downselect the solutions to meet mission requirements. The student is expected to:	
(A)	evaluate and select a propulsion solution that meets requirements such as piston, jet, turboprop, rocket;	CCRS SCI I.A.2
(B)	evaluate and select the number of engines to meet requirements; and	CCRS SCI I.A.2
(C)	calculate propulsion weight of the selected solution to meet requirements.	CCRS SCI II.B.1; SI: VIII.C.1; M I.C.1 VII.A.1-2 VIII.A.1-3 VIII.B.1 VIII.C.1 IX.A.1-2
(13)	Material Selection. The student evaluates various materials to meet requirements. The student is expected to:	
(A)	evaluate and select a material that meets requirements for a component; and	CCRS SCI I.A.2
(B)	document justification of materials selected.	CCRS SCI III.A.1

(14)	Aerospace Structures. The student evaluates and selects structure types to meet requirements. The student is expected to:	
(A)	evaluate and select a structure type that meets requirements for a component; and	CCRS SCI I.A.2
(B)	document justification of structure types selected.	CCRS SCI III.A.1
(15)	Navigation. The student defines and explains types of navigation used for flight. The student is expected to:	
(A)	explain Dead Reckoning navigation with an aeronautical chart, compass, clock, and airspeed indicator;	CCRS SCI I.A.2
(B)	explain navigation using radio radials such as Automatic Direction Finder (ADF) and VHF Omnidirectional Range (VOR);	(VHF is the preferred nomenclature) VHF = Very High Frequency CCRS SCI III.B.1
(C)	explain navigation using an Inertial Navigation System (INS); and	CCRS SCI III.B.1
(D)	explain navigation using Global Positioning Systems (GPS).	CCRS SCI III.B.1