Engineering Design and Presentation I (2022)

Implementation. The provisions of this section shall be implemented by school districts beginning with the 2024-2025 school year. A

1 No later than August 31, 2024, the commissioner of education shall determine whether instructional materials funding has been made available to Texas public schools for materials that cover the essential knowledge and skills identified in this section. B.1

2 If the commissioner makes the determination that instructional materials funding has been made available, this section shall be implemented beginning with the 2024-2025 school year and apply to the 2024-2025 and subsequent school years. B.2

3 If the commissioner does not make the determination that instructional materials funding has been made available under this subsection, the commissioner shall determine no later than August 31 of each subsequent school year whether instructional materials funding has been made available. If the commissioner determines that instructional materials funding has been made available, the commissioner shall notify the State Board of Education and school districts that this section shall be implemented for the following 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. B

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. B

Introduction. C

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.** C.1

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

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.** C.3

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

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

Knowledge and skills. D

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

A demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site; D.1.A

B cooperate, contribute, and collaborate as a member of a group to attain agreement and achieve a collective outcome; D.1.B

C present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions; D.1.C

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 D.1.D

E demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed. D.1.E

2 **The student gains knowledge of and demonstrates the skills necessary for success in the workplace. The student is expected to:** D.2

- A distinguish between an engineering technician, engineering technologist, and engineer; D.2.A
- B identify employment and career opportunities in engineering and describe the educational requirements for each; D.2.B
- C investigate and describe the requirements of industry-based certifications in engineering; D.2.C
- D demonstrate the principles of teamwork related to engineering and technology; D.2.D
- E research and describe governmental regulations, including health and safety; D.2.E
- F analyze ethical issues related to engineering and technology and incorporate proper ethics in submitted projects; D.2.F
- G demonstrate respect for diversity in the workplace; D.2.G
- H identify consequences relating to discrimination, harassment, and inequality; D.2.H
- I demonstrate effective oral and written communication skills using a variety of software applications and media; and D.2.I
- J investigate and present on career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training. D.2.J

3 **The student participates in team projects in various roles. The student is expected to:** D.3

- A describe the various roles on an engineering team and discuss how teams function; D.3.A
- B apply teamwork to solve problems; and D.3.B
- C serve as both a team leader and member and demonstrate appropriate attitudes while participating in team projects. D.3.C

4 **The student develops skills for managing a project. The student is expected to:** D.4

- A implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project; D.4.A
- B develop a project schedule and complete work according to established criteria; D.4.B
- C participate in the organization and operation of a real or simulated engineering project; and D.4.C
- D develop a plan for production of an individual product. D.4.D

5 The student practices safe and proper work habits. The student is expected to: D.5

- A master relevant safety tests; D.5.A
- B comply with safety guidelines as described in various manuals, instructions, and regulations; D.5.B
- C identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations; D.5.C
- D describe the appropriate disposal of hazardous materials and wastes appropriately; D.5.D
- E perform maintenance on selected tools, equipment, and machines; D.5.E
- F handle and store tools and materials correctly; and D.5.F
- G describe the results of negligent or improper maintenance. D.5.G

6 The student applies skills associated with computer-aided drafting and design. The student is expected to: D.6

- A use single and multi-view projections; D.6.A
- B use orthographic and pictorial views; D.6.B
- C use auxiliary views; D.6.C
- D use section views; D.6.D
- E use advanced construction techniques; D.6.E
- F prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards; D.6.F
- G apply best practices for effective file structure and management; D.6.G
- H use advanced dimensioning techniques; D.6.H
- I construct and use basic 3D parametric drawings; and D.6.I
- J develop and use prototype drawings for presentation. D.6.J

7 The student uses engineering design methodologies. The student is expected to: D.7

- A describe principles of ideation and apply ideation techniques for an engineering project; D.7.A
- B demonstrate critical thinking, identify the solution constraints, and make fact-based decisions; D.7.B
- C develop or improve a product using rational thinking; D.7.C
- D apply decision-making strategies when developing solutions; D.7.D
- E use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and D.7.E
- F use an engineering notebook or portfolio to record the final design, construction, and manipulation of finished projects. D.7.F

8 **The student applies concepts of engineering to specific problems. The student is expected to:** D.8

- A design components using a variety of technologies; D.8.A
- B investigate the applications of different types of computer-aided drafting and design software for various engineering problems; and D.8.B
- C use multiple software applications for concept presentations. D.8.C

9 **The student designs products using appropriate design processes and techniques. The student is expected to:** D.9

- A interpret engineering drawings; D.9.A
- B identify areas where quality, reliability, and safety can be designed into a product; D.9.B
- C modify a product design to meet a specified need; D.9.C
- D produce engineering drawings to industry standards; and D.9.D
- E describe potential patents and the patenting process. D.9.E

10 **The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:** D.10

- A identify and describe the steps needed to produce a prototype; D.10.A
- B identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and D.10.B
- C present the prototype using a variety of media. D.10.C

11 The student creates justifiable solutions to open-ended real-world problems using engineering design practices and processes. The student is expected to: D.11

- A identify and define an engineering problem; D.11.A
- B formulate goals, objectives, and requirements to solve an engineering problem; D.11.B
- C determine the design parameters such as materials, personnel, resources, funding, manufacturability, feasibility, and time associated with an engineering problem; D.11.C
- D establish and evaluate constraints, including health, safety, social, environmental, ethical, political, regulatory, and legal, pertaining to a problem; D.11.D
- 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; D.11.E
- F test and evaluate proposed solutions using tools and methods such as models, prototypes, mock-ups, simulations, critical design review, statistical analysis, or experiments; and D.11.F
- 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. D.11.G