# Scope & Sequence

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| Course Name: Engineering Design and Presentation II **TSDS PEIMS Code:** 13036600 | **Course Credit:** 2.0**Course Requirements:** Recommended for students in Grades 11-12.**Prerequisites:** Algebra l and Geometry.**Recommended Prerequisite:** Principles of Applied Engineering or Engineering Design and Presentation l. |
| **Course Description:** 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 knowledge and skills of the design process as it applies to engineering fields using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Students will use a variety of computer hardware and software applications to complete assignments and projects. Through implementation of the design process, students will transfer advanced academic skills to component designs. Emphasis will be placed on using skills from ideation through prototyping. Students shall be awarded two credits for successful completion of this course. |
| **NOTE:** This is a suggested scope and sequence for the course content. This content will work with any textbook or instructional materials. If locally adapted, make sure all TEKS are covered. |
| **Total Number of Periods****Total Number of Minutes****Total Number of Hours** | 350 Periods15,750 Minutes262.5 Hours | \*Schedule calculations based on 175/180 calendar days. For 0.5 credit courses, schedule is calculated out of 88/90 days. Scope and sequence allows additional time for guest speakers, student presentations, field trips, remediation, extended learning activities, etc. |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***(assumes 45-minute periods)Total minutes per unit | **TEKS Covered****130.411. (c) Knowledge and Skills** |
| **Unit 1: Exploration of the STEM Field of Engineering Design** Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions. In this course, students will build upon the knowledge they acquired from Engineering Design and Presentation I to demonstrate advanced workplace readiness skills. Additional class time has been added in this unit to allow for hands-on laboratory-based activities. The unit culminates with an activity in which students identify specific employment and career opportunities and pursue industry certification. | 26 Periods1,179 Minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(A) distinguish the differences between an engineering technician, engineering technologist, and engineer;(B) identify employment and career opportunities;(C) investigate and work toward industry certifications. |
| **Unit 2: Employability Skills**This unit offers students basic technical skills necessary to fulfill careers in the workforce. Through group activities, students will demonstrate interpersonal skills, such as: professionalism, time management, and collaboration. Additional class time has been added to allow for hands-on laboratory-based activities. Students will research ethical issues related to engineering and technology and incorporate proper ethics in submitted projects. Additional class time has been added to allow for hands-on laboratory-based activities. The unit culminates with a peer review evaluation and reflection upon skills needed for success in the workforce. | 26 Periods1,179 Minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(D) demonstrate the principles of teamwork related to engineering and technology;(E) identify and use appropriate work habits;(F) demonstrate knowledge related to governmental regulations, including health and safety;(G) discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;(H) demonstrate respect for diversity in the workplace;(I) demonstrate appropriate actions and identify consequences relating to discrimination, harassment, and inequality. |
| **Unit 3: Teamwork in STEM**In this unit students will demonstrate teamwork processes that promote team building, consensus, continuous improvement, respect for the opinions of others, cooperation, adaptability, and conflict resolution. Students will collaborate to work together efficiently, using positive interpersonal skills to establish and maintain effective working relationships in order to demonstrate how teams function well. Additional class time has been added to allow for hands-on laboratory-based activities.  | 26 Periods1,179 Minutes | (2) The student participates in team projects in various roles. The student is expected to:(A) demonstrate an understanding of and discuss how teams function;(B) apply teamwork to solve problems; and(C) serve as a team leader and member and demonstrate appropriate attitudes while participating in team projects. |
| **Unit 4: Safety Precautions**This unit offers students the opportunity to demonstrate basic technical skills necessary for safety precautions in the STEM field. Students will adhere to and follow all guidelines and regulations to maintain a safe working environment. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students describe the results of negligent or improper maintenance of tools, equipment, and machines. | 26 Periods1,179 Minutes | (6) The student practices safe and proper work habits. The student is expected to:(A) master relevant safety tests;(B) comply with safety guidelines as described in various manuals, instructions, and regulations;(C) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;(D) dispose of hazardous materials and wastes appropriately;(E) perform maintenance on selected tools, equipment, and machines;(F) handle and store tools and materials correctly; and(G) describe the results of negligent or improper maintenance. |
| **Unit 5: Principles of Project Documentation and Work Flow**This unit will cover engineering project design and work flow. Students will take part in identifying factors affecting cost and strategies to increase efficiency. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students submit a project budget and production schedule based upon this goal. | 26 Periods1,179 Minutes | (4) The student demonstrates principles of project documentation and work flow. The student is expected to:(A) complete work orders and related documentation;(B) identify factors affecting cost and strategies to minimize costs;(C) prepare a project budget;(D) prepare a production schedule;(E) identify intellectual property and other legal restrictions; and(F) read and interpret technical drawings, manuals, and bulletins. |
| **Unit 6: Drafting and Design**In this unit, students willapply the concepts of sketching and skills associated with computer-aided drafting and design. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students demonstrate understanding of annotation styles and setup by defining units, fonts, dimension styles, notes, and leader lines. | 26 Periods1,179 Minutes | (5) The student applies the concepts and skills of computer-aided drafting and design software to perform the following tasks. The student is expected to:(A) prepare drawings to American National Standards Institute (ANSI) and International Organization for Standardization (ISO) graphic standards;(B) customize software user interface;(C) prepare and use advanced views such as auxiliary, section, and break-away;(D) draw detailed parts, assembly diagrams, and sub-assembly diagrams;(E) indicate tolerances and standard fittings using appropriate library functions;(F) demonstrate understanding of annotation styles and setup by defining units, fonts, dimension styles, notes, and leader lines. |
| **Unit 7: Advanced Drafting and Design**This unit will build upon the previous unit and have students create and use custom templates for advanced project management. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students create and render objects using parametric modeling tools. | 26 Periods1,179 Minutes | (5) The student applies the concepts and skills of computer-aided drafting and design software to perform the following tasks. The student is expected to:(G) identify and incorporate the use of advanced layout techniques and viewports using paper-space and modeling areas;(H) use management techniques by setting up properties to define and control individual layers;(I) create and use custom templates for advanced project management;(J) prepare and use advanced development drawings;(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. |
| **Unit 8: Engineering Design Methodologies**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." Physical, mathematical, and conceptual models describe this vast body of changing and increasing knowledge. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable. In this unit, students will demonstrate critical thinking skills, identify system constraints, and make fact-based decisions. Additional class time has been added to allow for hands-on laboratory-based activities. Students will use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process as well as record the final design, construction, and manipulation of finished projects. | 26 Periods 1,179 Minutes  | (7) The student uses engineering design methodologies. The student is expected to:(A) demonstrate an understanding of and discuss principles of system ideation;(B) demonstrate critical thinking, identify the system constraints, and make fact-based decisions;(C) use rational thinking to develop or improve a system;(D) apply decision-making strategies when developing solutions;(E) identify quality-control issues in engineering design and production;(F) describe perceptions of the quality of products and how they affect engineering decisions;(G) use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and(H) use an engineering notebook to record the final design, construction, and manipulation of finished projects. |
| **Unit 9: Solve Engineering Design Problems**Engineering Design and Problem Solving reinforces and integrates skills learned in previous mathematics and science courses. This unit emphasizes solving problems, moving from well-defined toward more open-ended, with real-world application. In this unit, students will use a variety of technologies to design components and develop prototypes. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students use multiple software applications for concept presentation. | 26 Periods1,179 Minutes | (8) The student applies concepts of engineering to specific problems. The student is expected to:(A) use a variety of technologies to design systems;(B) use tools, laboratory equipment, and precision measuring instruments to develop prototypes;(C) research applications of different types of computer-aided drafting and design software; and(D) use multiple software applications for concept presentations. |
| **Unit 10: Product Design Processes and Techniques**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. In this unit, students will interpret engineering drawings and identify areas where quality, reliability, and safety can be designed into a product. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity for this unit will have students produce engineering drawings to industry standards; and describe potential patents and the patenting process. | 26 Periods1,179 Minutes | (9) The student designs systems using appropriate design processes and techniques. The student is expected to:(A) interpret engineering drawings;(B) identify areas where quality, reliability, and safety can be designed into a system;(C) improve a system design to meet a specified need, including properties of materials selected;(D) produce engineering drawings to industry standards; and(E) describe potential patents and the patenting process. |
| **Unit 11: Building a Prototype**In this unit students will plan development of a prototype. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students present the prototype using several forms of media. | 32 Periods1,440 Minutes | (10) The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:(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 using a variety of media. |
| **Unit 12: Project Management**In this unit, students will develop a project management plan including initiating, executing, monitoring, controlling, and closing a real or simulated project. Additional class time has been added to allow for hands-on laboratory-based activities. The culminating activity will have students develop and present a production plan for an individual project. | 26 Periods1,179 Minutes | (3) The student develops skills for managing a project. The student is expected to:(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;(B) develop a project schedule and complete projects according to established criteria;(C) participate in the organization and operation of a real or simulated engineering project; and(D) develop a plan for production of an individual product. |
| **Unit 13: Extended Learning Experience**In this unit, students are encouraged to expand their learning experiences through avenues such as STEM organizations and other leadership or extracurricular organizations. By connecting with these networks and/or their peers in the previous unit, students will explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training. Students will develop and demonstrate communication skills to relay information to others both verbally and written. Additional class time has been added to allow for hands-on laboratory-based activities.  | 32 Periods1,440 Minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:(J) demonstrate effective oral and written communication skills using a variety of software applications and media; and(K) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training. |