

# Engineering Design 1 Pacing

## Scope & Sequence

<b>Course Name:</b> Engineering Design and Presentation I <b>TSDS PEIMS Code:</b> 13036500		<b>Course Credit:</b> 1.0 <b>Course Requirements:</b> Recommended for students in Grades 10-12. <b>Prerequisite:</b> Algebra I. <b>Recommended Prerequisite:</b> Principles of Applied Engineering.
<b>Course Description:</b> Engineering Design and Presentation I is a continuation of knowledge and skills learned in Principles of Applied Engineering. 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. Additionally, students explore career opportunities in engineering, technology, and drafting and what is required to gain and maintain employment in these areas. Students shall be awarded one credit for successful completion of this course.		
<b>NOTE:</b> 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.		
<b>Total Number of Periods</b> <b>Total Number of Hours</b>	175 Periods 131.25 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.
<b>Unit Number, Title, and Brief Description</b>	<b># of Class Periods*</b> (assumes 45-minute periods) Total minutes per unit	<b>TEKS Covered</b> <b>130.410.(c) Knowledge and skills</b>
<b>Unit 1: Exploration of the STEM Field of Engineering Design</b>  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 unit, students will further their knowledge of engineering design and demonstrate workplace readiness skills. The unit culminates with an activity in which students identify employment and career opportunities and plan to obtain industry certification.	15 Periods 675 Minutes	(2) The student gains knowledge of and demonstrates the skills necessary for success in the workplace. 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.
<b>Unit 2: Workplace Readiness Skills in the STEM Field</b>  Students will now apply technical skills and knowledge of Science,	15 Periods 675 Minutes	(2) The student gains knowledge of and demonstrates the skills necessary for success in the workplace. The student is expected to: (D) demonstrate the principles of teamwork related to engineering and

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<p>Technology, Engineering, and Mathematics to analyze, evaluate, and communicate problems and solutions in this unit. Students will develop and demonstrate communication skills to relay this information to others both verbally and written.</p>		<p>technology;</p> <ul style="list-style-type: none"> <li>(E) identify and use appropriate work habits;</li> <li>(F) demonstrate knowledge related to governmental regulations, including health and safety;</li> <li>(G) discuss ethical issues related to engineering and technology and incorporate proper ethics in submitted projects;</li> <li>(H) demonstrate respect for diversity in the workplace;</li> <li>(I) demonstrate appropriate actions and identify consequences relating to discrimination, harassment, and inequality;</li> <li>(J) demonstrate effective oral and written communication skills using a variety of software applications and media; and</li> </ul>
<p><b>Unit 3: Teamwork in STEM</b></p> <p>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.</p>	<p>15 Periods 675 Minutes</p>	<ul style="list-style-type: none"> <li>(3) The student participates in team projects in various roles. The student is expected to: <ul style="list-style-type: none"> <li>(A) demonstrate an understanding of and discuss how teams function;</li> <li>(B) apply teamwork to solve problems; and</li> <li>(C) serve as both a team leader and member and demonstrate appropriate attitudes while participating in team projects.</li> </ul> </li> </ul>
<p><b>Unit 4: Safety Precautions</b></p> <p>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. The culminating activity will have students describe the results of negligent or improper maintenance of tools, equipment, and machines.</p>	<p>10 Periods 450 Minutes</p>	<ul style="list-style-type: none"> <li>(5) The student practices safe and proper work habits. The student is expected to: <ul style="list-style-type: none"> <li>(A) master relevant safety tests;</li> <li>(B) comply with safety guidelines as described in various manuals, instructions, and regulations;</li> <li>(C) identify and classify hazardous materials and wastes according to Occupational Safety and Health Administration (OSHA) regulations;</li> <li>(D) dispose of hazardous materials and wastes appropriately;</li> <li>(E) perform maintenance on selected tools, equipment, and machines;</li> <li>(F) handle and store tools and materials correctly; and</li> <li>(G) describe the results of negligent or improper maintenance.</li> </ul> </li> </ul>
<p><b>Unit 5: Drafting and Design</b></p>	<p>15 Periods 675 Minutes</p>	<ul style="list-style-type: none"> <li>(6) The student applies the concepts of sketching and skills associated with computer-</li> </ul>

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<p>In this unit, students will apply the concepts of sketching and skills associated with computer-aided drafting and design. The culminating activity will have students construct and use basic 3D parametric drawings and develop and use prototype drawings for presentation.</p>		<p>aided drafting and design. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) use single and multi-view projections;</li> <li>(B) use orthographic and pictorial views;</li> <li>(C) use auxiliary views;</li> <li>(D) use section views;</li> <li>(E) use advanced construction techniques;</li> <li>(F) prepare and revise annotated multi-dimensional production drawings in computer-aided drafting and design to industry standards;</li> <li>(G) demonstrate knowledge of effective file structure and management;</li> <li>(H) use advanced dimensioning techniques;</li> <li>(I) construct and use basic 3D parametric drawings; and</li> <li>(J) develop and use prototype drawings for presentation.</li> </ul>
<p><b>Unit 6: Engineering Design Methodologies</b></p> <p>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. The culminating activity will have students use rational thinking to develop or improve a product.</p>	<p style="text-align: center;">15 Periods 675 Minutes</p>	<p>(7) The student uses engineering design methodologies. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) demonstrate an understanding of and discuss principles of ideation;</li> <li>(B) demonstrate critical thinking, identify the system constraints, and make fact-based decisions;</li> <li>(C) use rational thinking to develop or improve a product;</li> <li>(D) apply decision-making strategies when developing solutions;</li> <li>(E) use an engineering notebook to record prototypes, corrections, and/or mistakes in the design process; and</li> <li>(F) use an engineering notebook and portfolio to record the final design, construction, and manipulation of finished projects.</li> </ul>
<p><b>Unit 7: Solve Engineering Design Problems</b></p> <p>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</p>	<p style="text-align: center;">15 Periods 675 Minutes</p>	<p>(8) The student applies concepts of engineering to specific problems. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) use a variety of technologies to design components;</li> <li>(B) use tools, laboratory equipment, and precision measuring instruments to develop prototypes;</li> <li>(C) research applications of different types of computer-aided drafting and</li> </ul>

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<p>components and develop prototypes. The culminating activity will have students use multiple software applications for concept presentation.</p>		<p>(D) design software; and use multiple software applications for concept presentations.</p>
<p><b>Unit 8: Product Design Processes and Techniques</b></p> <p>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. The culminating activity for this unit will have students produce engineering drawings to industry standards; and describe potential patents and the patenting process.</p>	<p>15 Periods 675 Minutes</p>	<p>(9) The student designs products using appropriate design processes and techniques. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) interpret engineering drawings;</li> <li>(B) identify areas where quality, reliability, and safety can be designed into a product;</li> <li>(C) improve a product design to meet a specified need;</li> <li>(D) produce engineering drawings to industry standards; and</li> <li>(E) describe potential patents and the patenting process.</li> </ul>
<p><b>Unit 9: Building a Prototype</b></p> <p>In this unit students will plan development of a prototype. The culminating activity will have students present the prototype using several forms of media.</p>	<p>15 Periods 675 Minutes</p>	<p>(10) The student builds a prototype using the appropriate tools, materials, and techniques. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) identify and describe the steps needed to produce a prototype;</li> <li>(B) identify and use appropriate tools, equipment, machines, and materials to produce the prototype; and</li> <li>(C) present the prototype using a variety of media.</li> </ul>
<p><b>Unit 10: Project Management</b></p> <p>In this unit, students will develop a project management plan including initiating, executing, monitoring, controlling, and closing a real or simulated project. The culminating activity will have students develop and present a production plan for an individual project.</p>	<p>15 Periods 675 Minutes</p>	<p>(4) The student develops skills for managing a project. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) implement project management methodologies, including initiating, planning, executing, monitoring and controlling, and closing a project;</li> <li>(B) develop a project schedule and complete work according to established criteria;</li> <li>(C) participate in the organization and operation of a real or simulated engineering project; and</li> <li>(D) develop a plan for production of an individual product.</li> </ul>

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<p><b>Unit 11: Employability Skills</b></p> <p>This unit offers students basic technical skills necessary to fulfill careers in the workforce. Through group activities, students will demonstrate interpersonal skills, such as: communication, professionalism, time management, and collaboration. The unit culminates with a peer review evaluation and reflection upon skills needed for success in the workforce.</p>	<p style="text-align: center;">15 Periods 675 Minutes</p>	<p>(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:</p> <ul style="list-style-type: none"> <li>(A) demonstrate knowledge of how to dress appropriately, speak politely, and conduct oneself in a manner appropriate for the profession and work site;</li> <li>(B) cooperate, contribute, and collaborate as a member of a group in an effort to attain agreement and achieve a collective outcome;</li> <li>(C) present written and oral communication in a clear, concise, and effective manner, including explaining and justifying actions;</li> <li>(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</li> <li>(E) complete a consistent demonstration of punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed.</li> </ul>
<p><b>Unit 12: Extended Learning Experience</b></p> <p>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.</p>	<p style="text-align: center;">15 Periods 675 Minutes</p>	<p>(2) The student gains knowledge of and demonstrates the skills necessary for success in the workplace. The student is expected to:</p> <ul style="list-style-type: none"> <li>(K) explore career preparation learning experiences, including job shadowing, mentoring, and apprenticeship training.</li> </ul>