# Scope & Sequence

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| Course Name: Principles of Applied Engineering **TSDS PEIMS Code:** 13036200 | | | **Course Credit:** 1.0  **Course Requirements:** Recommended for students in Grades 9-10.  **Prerequisites:** None. |
| **Course Description:** Principles of Applied Engineering provides an overview of the various fields of science, technology, engineering, and mathematics and their interrelationships. Students will develop engineering communication skills, which include computer graphics, modeling, and presentations, by using a variety of computer hardware and software applications to complete assignments and projects. Upon completing this course, students will have an understanding of the various fields of engineering and will be able to make informed career decisions. Further, students will have worked on a design team to develop a product or system. Students will use multiple software applications to prepare and present course assignments. | | | |
| **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** | 175 Periods  7,875 Minutes  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. | |
| **Unit Number, Title, and Brief Description** | **# of Class Periods\***  (assumes 45-minute periods)  Total minutes per unit | **TEKS Covered**  **130.402. (c) Knowledge and Skills** | |
| **Unit 1: Introduction to Applied Engineering**  This unit introduces students to applied engineering. Students will investigate the history of engineering science and report on their findings to evidence completion of this unit. | 15 Periods  675 Minutes | (2) The student investigates the components of engineering and technology systems. The student is expected to:  (A) investigate and report on the history of engineering science;  (B) identify the inputs, processes, and outputs associated with technological systems;  (C) describe the difference between open and closed systems;  (D) describe how technological systems interact to achieve common goals. | |
| **Unit 2: Portfolio Planning and Introduction to Media to be Used in this Course**  In this unit, students will be introduced to variety of media to be used throughout this course as well as processes and expectations of capturing materials created. Upon culmination of this unit, students will exhibit the beginning framework to build upon a paper or digital portfolio by using the engineering documentation process. | 15 Periods  675 Minutes | (3) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:  (A) use clear and concise written, verbal, and visual communication techniques;  (B) maintain a design and computation engineering notebook;  (C) use sketching and computer-aided drafting and design (CADD) to develop and present ideas;  (D) use industry standard visualization techniques and media; and  (E) use the engineering documentation process to maintain a paper or digital portfolio. | |
| **Unit 3: Safety Preparation for Applied Engineering**  In this unit, students will prepare for safety in applied engineering. To assure safety is a priority, this unit will have students master relevant safety tests and follow lab safety guidelines in compliance with local, state, and federal regulations. The culminating activity will have students describe the implications of improper safety measurements. | 15 Periods  675 Minutes | (4) The student uses appropriate tools and demonstrates safe work habits. The student is expected to:  (A) master relevant safety tests;  (B) follow lab safety guidelines as prescribed by instructor in compliance with local, state, and federal regulations;  (C) recognize the classification of hazardous materials and wastes;  (D) dispose of hazardous materials and wastes appropriately;  (E) maintain, safely handle, and properly store laboratory equipment;  (F) describe the implications of negligent or improper maintenance; and  (G) demonstrate the use of precision measuring instruments. | |
| **Unit 4: Exploration of the STEM Field in Applied Engineering**  In this unit, students willfurtherexplore the Science, Technology, Engineering, and Mathematics (STEM) Career Cluster. Students will overview engineering, science, and technology careers, research innovative technology and analyze design processes in engineering. The unit culminates with an activity in which students summarize the STEM Career Cluster and present upon the respective characteristics, skills and education necessary for success in these careers. | 15 Periods  675 Minutes | (2) The student investigates the components of engineering and technology systems. The student is expected to:  (E) compare and contrast engineering, science, and technology careers;  (F) conduct and present research on emerging and innovative technology; and  (G) demonstrate proficiency of the engineering design process. | |
| **Unit 5: Exploration of the STEM Field with Focus on Modeling and Design**  In this unit, students will apply fundamental principles of system modeling and design to multiple design projects. Students will begin by exploring design process and prototype development to problem-solving to develop technological solutions. The culminating activity will result in students assessing the risks and benefits of a design solution. | 15 Periods  675 Minutes | (6) The student thinks critically and applies fundamental principles of system modeling and design to multiple design projects. The student is expected to:  (A) identify and describe the fundamental processes needed for a project, including the design process and prototype development and initiating, planning, executing, monitoring and controlling, and closing a project;  (B) identify the chemical, mechanical, and physical properties of engineering materials;  (C) use problem-solving techniques to develop technological solutions;  (D) use consistent units for all measurements and computations; and  (E) assess the risks and benefits of a design solution. | |
| **Unit 6: Exploration of the STEM Field with Focus on Robotics, Process Control, and Automation Systems**  Students willdive deeper into STEM fields focused on robotics, process control, and automation systems. Students will describe applications of and identify emerging trends in robotics, process control and automation systems. The unit culminates with an activity in which students present on their application of design concepts to problems in robotics, process control, and automation systems. | 15 Periods  675 Minutes | (7) The student understands the opportunities and careers in fields related to robotics, process control, and automation systems. The student is expected to:  (A) describe applications of robotics, process control, and automation systems;  (B) apply design concepts to problems in robotics, process control, and automation systems;  (C) identify fields and career opportunities related to robotics, process control, and automation systems; and  (D) identify emerging trends in robotics, process control, and automation systems. | |
| **Unit 7: Exploration of the STEM Field with Focus on Electrical and Mechanical Systems**  Students willdive deeper into STEM fields focused on electrical and mechanical systems. Students will describe applications of and identify emerging trends in electrical and mechanical systems. The unit culminates with an activity in which students describe and apply basic electronic theory. | 15 Periods  675 Minutes | (8) The student understands the opportunities and careers in fields related to electrical and mechanical systems. The student is expected to:  (A) describe the applications of electrical and mechanical systems;  (B) describe career opportunities in electrical and mechanical systems;  (C) identify emerging trends in electrical and mechanical systems; and  (D) describe and apply basic electronic theory. | |
| **Unit 8: Exploration of the STEM Field with Focus on Drafting**  Students willdive deeper into STEM fields focused on drafting. Students will set up, create, and modify various drawings. The unit culminates with an activity in which students demonstrate an understanding of the use of line-types in engineering drawings. | 15 Periods  675 Minutes | (10) The student demonstrates a knowledge of drafting by completing a series of drawings that can be published by various media. The student is expected to:  (A) set up, create, and modify drawings;  (B) store and retrieve geometry;  (C) demonstrate an understanding of the use of line-types in engineering drawings;  (D) draw 2-D single view objects;  (E) create multi-view working drawings using orthographic projection;  (F) dimension objects using current American National Standards Institute (ANSI) standards;  (G) draw single line 2-D pictorial representations;  (H) create working drawings that include section views; and  (I) demonstrate knowledge of screw thread design per ANSI standards by drawing a hex head bolt with standard, square, and acme threads. | |
| **Unit 9: Preparation for the Workforce**  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, decision-making, leadership, and conflict resolution. The unit culminates with a peer review evaluation and reflection upon skills needed for success in the workforce. | 15 Periods  675 Minutes | (1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:  (A) demonstrate knowledge of how to dress, speak, and conduct oneself in a manner appropriate for the profession;  (B) show the ability to cooperate, contribute, and collaborate as a member of a group in an effort to achieve a positive collective outcome;  (C) present written and oral communication in a clear, concise, and effective manner;  (D) demonstrate time-management skills in prioritizing tasks, following schedules, and performing goal-relevant activities in a way that produces efficient results; and  (E) demonstrate punctuality, dependability, reliability, and responsibility in performing assigned tasks as directed. | |
| **Unit 10: Teamwork in STEM**  Using all elements derived from this course, this unit will have students apply the design process in a group setting. Students will collaborate to develop a comprehensive project in the STEM field. The culminating activity will be for the students to present this STEM project. | 15 Periods  675 Minutes | (9) The student demonstrates the ability to function as a team member while completing a comprehensive project. The student is expected to:  (A) apply the design process as a team participant;  (B) assume different roles as a team member within the project;  (C) maintain an engineering notebook for the project;  (D) develop and test the model for the project; and  (E) demonstrate communication skills by preparing and presenting the project. | |
| **Unit 11: Planning for Careers in STEM**  In this unit, students will focus on planning to secure a career within the STEM Career Cluster. Students will formulate a philosophy of education and assemble components collected during this course culminating in a robust portfolio. | 10 Periods  450 Minutes | (3) The student presents conclusions, research findings, and designs using a variety of media throughout the course. The student is expected to:  (A) use clear and concise written, verbal, and visual communication techniques;  (B) maintain a design and computation engineering notebook;  (C) use sketching and computer-aided drafting and design (CADD) to develop and present ideas;  (D) use industry standard visualization techniques and media; and  (E) use the engineering documentation process to maintain a paper or digital portfolio. | |
| **Unit 12: 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, students will be able to research and document trends, issues and job forecasts, as well as predict possible changes caused by the advances of technology. | 15 Periods  675 Minutes | (5) The student describes the factors that affect the progression of technology and the potential intended and unintended consequences of technological advances. The student is expected to:  (A) describe how technology has affected individuals, societies, cultures, economies, and environments;  (B) describe how the development and use of technology influenced past events;  (C) describe how and why technology progresses; and  (D) predict possible changes caused by the advances of technology. | |