

# Foundations of Engineering and Technology

<b>Course Credit</b>	1.0
<b>Grade Level(s)</b>	9-12
<b>Prerequisite(s)</b>	None

Foundations of Engineering and Technology offers students an exploratory view of the engineering profession and the fundamental skills utilized in the field. Students investigate various engineering disciplines and related career paths. Students will develop leadership and teamwork skills through creativity, collaboration, communication, and critical thinking. Additionally, students will increase their understanding of science, technology, engineering, and mathematics (STEM) principles used in problem-solving as they use the engineering design process. Upon completion of this course students may be ready to earn a credential in a Computer-Aided Design (CAD) software such as Autodesk Inventor, SolidWorks, or SolidEdge.

Foundational standards, shown in the chart below, are an important part of every course. Through these standards, students learn and apply safety concepts, explore career opportunities and requirements, practice the skills needed to succeed in the workplace, learn and practice essential digital literacy skills, develop leadership, and take advantage of the opportunities afforded by Career and Technical Student Organizations (CTSOs). Students in this course may be affiliated with the Technology Student Association (TSA) or Skills USA. The foundational standards are to be incorporated throughout the course.

## Foundational Standards

1. Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and following protocols for fire and electrical safety.
2. Demonstrate effective workplace and employability skills, including communication, awareness of diversity, positive work ethic, problem-solving, time management, and teamwork.
3. Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing.
4. Demonstrate digital literacy by using digital and electronic tools appropriately, safely, and ethically.
5. Participate in a Career and Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork.

# Foundations of Engineering and Technology Content Standards

Each content standard completes the stem “*Students will...*”

<b>Safety</b>	<ol style="list-style-type: none"><li>1. Describe and follow appropriate safety and health procedures for engineering classroom and laboratory situations.<ol style="list-style-type: none"><li>a. Utilize tools and equipment safely.</li><li>b. Identify environmental safety requirements for specific applications. <i>Examples: proper storage of chemicals, disposal of used materials</i></li></ol></li></ol>
<b>Essential Skills</b>	<ol style="list-style-type: none"><li>2. Exhibit essential skills required by business and industry in the engineering field.<ol style="list-style-type: none"><li>a. Communicate effectively through writing, speaking, listening, and reading.</li><li>b. Show appropriate interpersonal skills, punctuality, work habits, ethical behavior, and workappropriate attire.</li><li>c. Create a resume and digital portfolio and participate in a mock interview.</li></ol></li><li>3. Connect leadership and teamwork skills from CTSO activities with engineering practices.<ol style="list-style-type: none"><li>a. Use standard technical knowledge and skills during CTSO activities.</li><li>b. Exhibit leadership and teamwork skills.</li><li>c. Demonstrate effective collaboration in a diverse group to define and solve engineering problems.</li></ol></li></ol>
<b>Careers</b>	<ol style="list-style-type: none"><li>4. Compare and investigate various aspects of jobs in STEM disciplines and the engineering field, including education requirements, job responsibilities, and potential earnings.<ol style="list-style-type: none"><li>a. Investigate current and future engineering job opportunities.</li><li>b. Analyze positive and negative impacts of engineering on society.</li><li>c. Critique significant contributions of leaders in engineering fields.</li><li>d. Differentiate among engineering, technology, and science.</li><li>e. Identify and discuss the various tools utilized by individuals in STEM disciplines, including engineering.</li></ol></li></ol>

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### Standard Practices

5. Apply standard engineering practices and skills to solve problems.
  - a. Use a variety of appropriate tools throughout the engineering design process.  
*Examples: hand tools, power tools, software programs, and other appropriate engineering instruments*
  - b. Present a research-based solution to an engineering problem in a professional manner.
  - c. Use terminology and vocabulary relevant to the field of engineering.
6. Cite evidence and document the steps in an engineering design process.
  - a. Construct an engineering notebook based upon industry standard best practices.
  - b. Display clear standard technical knowledge and skills when categorizing and classifying engineering practices.
  - c. Record ideas, sketches, calculations, observations, and summaries of activities.
  - d. Compare and contrast the methods of creating written and digital portfolios.
7. Demonstrate the use of analog and digital precision measuring instruments utilized in engineering.  
*Examples: micrometers, calipers, indicators, rulers, protractors, multimeters, digital data collection devices*
  - a. Compare and convert between customary and metric measurement systems.
  - b. Apply conversion factors of customary and metric measurements.
  - c. Perform measurements using significant digits.
8. Create basic engineering drawings, including sketches and computer-aided designs (CAD).
  - a. Produce multi-view sketches and drawings.
  - b. Create two-dimensional and three-dimensional appropriate sketches.
9. Differentiate among components of engineering drawings. *Examples: cross sections, dimensions, line weights*
10. Create models and prototypes using CAD techniques and/or appropriate manufacturing tools.

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### Application

11. Utilize real-world STEM principles to investigate a variety of engineering disciplines.

*Example: Use project-based learning to investigate and solve problems related to engineering.*

- a. Research and investigate engineering challenges in today's world.
- b. Apply the systems model of input, process, output, feedback, and impact to the engineering design process.
- c. Analyze an engineering design brief.
- d. Collaborate with team members to observe, identify, and modify individual solutions to engineering problems.
- e. Design and/or test a prototype using an engineering design process.

12. Generate code to solve challenges using appropriate languages.