

# Applications of Engineering and Technology

<b>Course Credit</b>	1.0
<b>Grade Level(s)</b>	10-12
<b>Prerequisite(s)</b>	Foundations of Engineering and Technology; Algebra I with Probability

Applications of Engineering and Technology offers students an investigative view of the engineering profession and the fundamental skills utilized in the field. Students continue investigating engineering disciplines and related career paths. Students will expand 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 through the engineering design process.

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.

# Applications of Engineering and Technology Content Standards

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

<b>Standard Practices</b>	<ol style="list-style-type: none"><li>1. Apply the design process to problems that can be solved using methods of engineering.</li><li>2. Create a project scope which includes, but is not limited to, a Gantt chart, a budget, and a materials list.</li></ol>
<b>Energy and Power</b>	<ol style="list-style-type: none"><li>3. Design, create, test, and perform calculations on simple machines, gear trains, and sprockets.</li><li>4. Investigate the application of multiple energy sources to a variety of systems.</li><li>5. Describe the features of and explain the differences between series and parallel circuits.<ol style="list-style-type: none"><li>a. Use Ohms Law to calculate current, voltage, resistance, and power in series and parallel circuits.</li></ol></li><li>6. Use a multimeter to measure current, voltage, and/or resistance to diagnose and correct problems within a series or parallel circuit.</li></ol>
<b>Communication Technologies</b>	<ol style="list-style-type: none"><li>7. Analyze properties and functionalities of communication technologies. <i>Examples: terrestrial communication technology with analog or digital data; satellite communication technology including satellite ground station, remote sensing, navigation, geocentric orbit (low earth orbit, medium earth orbit, high earth orbit); Global Positioning Systems (GPS); geostationary satellites (GEOs); polar satellites; Nano satellites; CubeSats; SmallSats</i></li><li>8. Analyze properties and functionalities of laser and fiber optic technologies.</li></ol>

**Materials and Structures**

9. Calculate unknown forces using vectors.
  - a. Construct free-body diagrams.
  - b. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes.
10. Calculate weight, density, mass, volume, and surface area of common items.
11. Design, create, test, and perform calculations on structural members using real models and computerized simulations. *Examples: beams, trusses*
12. Use 3D modeling software to examine properties and functionality of objects.

**Control Systems**

13. Design, create, and test fluid power devices powered by hydraulics and pneumatics.
  - a. Use appropriate vocabulary to identify components of hydraulic and pneumatic systems.
  - b. Solve for unknown values using established fluid laws.
14. Use current programming languages to complete computer-based tasks.  
*Examples: manipulating user input, mechanical tasks using motors and sensors such as a robot lifting and transporting an object*

**Statistics**

15. Construct the five-number summary for a set of data.
  - a. Perform measures of central tendency, variance, and standard deviation.
  - b. Use the normal curve, when appropriate, to compute probabilities concerning a data set, and relate the normal curve to applications of quality control in manufacturing.
16. Calculate the probability of single, sequential, and simultaneous events if they are independent, dependent, mutually exclusive and non-mutually exclusive, using tools such as tables and trees and implementing logical operators such as *and*, *or*, and *not*.

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### Kinematics

17. Solve problems involving linear motion, projectiles, and objects in free-fall using kinematics.
  - a. Design, create, and test a mechanism to launch a projectile in the field.
  - b. Analyze mathematically relevant components of a parabola.