

STRANDS AND STANDARDS

ENGINEERING TECHNOLOGY



Course Description

A foundational engineering design course that introduces basic problem-solving and documentation skills. Various aspects of engineering will be explored along with technology's environmental, societal, political, and economic impacts on our world. By utilizing problem-solving skills, students will develop essential abilities and attitudes that will in turn expand their occupational opportunities in the world of engineering.

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| Core Code | 38.03.00.00.010 |
| Concurrent Enrollment Core Code | None |
| Units of Credit | 0.5 |
| Intended Grade Level | 8-9 |
| Prerequisite | None |
| Skill Certification Test Number | 615 |
| Test Weight | 0.5 |
| License Area of Concentration | Secondary |
| Required Endorsement(s) | Technology & Engineering, or Technology |

STRAND 1

Students will follow safety practices.

Standard 1

Identify potential safety hazards and follow general laboratory safety practices.

- Assess workplace conditions regarding safety and health.
- Identify potential safety issues and align with relevant safety standards to ensure a safe workplace/jobsite.
- Locate and understand the use of show safety equipment.
- Select appropriate personal protective equipment.

Standard 2

Use safe work practices.

- Use personal protective equipment according to manufacturer rules and regulations.
- Follow correct procedures when using any materials, tools, or equipment.
- Ref: <https://schools.utah.gov/cte/engineering/resources> under the Safety Program and Management tab.

Standard 3

Complete a basic safety test without errors (100%) before using any tools or shop equipment.

STRAND 2

Students will develop an engineering mindset.

Standard 1

Use an engineering design process to solve a problem.

For example:

1. Identify & define the problem (criteria & constraints).
2. Brainstorm solutions.
3. Create a model (predictive analysis) & build a prototype.
4. Test the prototype (gather data).
5. Iteration (redesign & optimize).

Standard 2

Use mathematics and science to produce technology (STEM) which often requires a multi-disciplinary approach.

- Algebra
- Geometry
- Physics

Standard 3

Demonstrate the relationship between a scientific method and an engineering design process.

For example:

- Record data
- Sketch ideas
- Analyze data to develop a mathematical model
- Reach a conclusion (cause & effect)

STRAND 3

Students will apply the elements of an engineering design process to create a product or system.

Standard 1

Identify the design problem and decide how to address it.

For example:

- Clearly define the problem based on wants and needs.
- Identify criteria and constraints and determine how they will affect the design.
- Investigate existing design solutions.
- Consider factors including safety, reliability, cost, quality control the environment, production, manufacturability, maintenance and repair, aesthetics ergonomics, and human factors.

Standard 2

As a team, think of new ideas or approaches to the problem and choose one.

- Brainstorm a variety of potential solutions.
- Evaluate their strengths and weaknesses based on the established criteria.
- Choose the best solution.

Standard 3

Create a model and a prototype of the proposed design.

For example:

- Mathematical models (spreadsheets and graphs)
- Technical drawings (isometric & orthographic)
- 3D solid models
- Working prototype

Standard 4

Test the prototype, record the results, and evaluate the performance of the design.

For example:

- Identify and record both failures and successes.
- Evaluate the performance of the prototype against the stated requirements.

Standard 5

Redesign the prototype by repeating the design process in order to further optimize the design. For example:

- Learn from failed attempts and identify areas for improvement from testing.
- Reconsider any discarded ideas.
- Look for mathematical relationships and use them to identify the factors that affect the design the most.
- Repeat the steps of the design process until the prototype meets the requirements.

STRAND 4

Students will develop an understanding of the cultural, environmental, economic, and political effects of engineering, and the impacts of technology throughout history.

Standard 1

In order to understand the effects of engineering on society, students should learn that engineers have improved the quality of life by introducing revolutionary technologies such as:

- Clean water systems
- Transportation & infrastructure
- Medicines & biotechnology
- Electronics
- Energy

Standard 2

In order to realize the impact of society on technology, students should learn that:

- The use of inventions and innovations has led to changes in society and the creation of new needs and wants.
- Each innovation introduces both solutions and new challenges.

Standard 3

Students will recognize that engineers will have a role in solving current and future problems such as the National Academy of Engineering Grand Challenges.

STRAND 5

Students will apply engineering fundamentals.

Standard 1

Distinguish between six simple machines and their identifying characteristics.

- Lever
- Wedge
- Inclined Plane
- Screw
- Wheel & Axle
- Pulley

Standard 2

Practice real world applications of physical laws.

- Ohm's Law & Watt's Law
- Newton's Laws of Motion
- Pascal's Principle
- Bernoulli's Principle
- Mass and energy balances, and chemical reactions.

STRAND 6

Students will investigate future training opportunities and careers in engineering.

Standard 1

Investigate the USBE's CTE engineering pathway.

Standard 2

Identify occupations related to engineering.

- Technician
- Designer
- Engineer
- Manager

Standard 3

List and differentiate among different engineering disciplines.

For example:

- Aerospace
- Biomedical
- Civil
- Chemical
- Computer (both Hardware & Software)
- Electrical
- Energy
- Manufacturing
- Mechanical

Standard 4

Investigate different types of occupational training.

For example:

- Trade school
- Community College
- University
- Graduate Training

Standard 5

Recognize the importance of both "hard" and "soft" skills in the workplace.

Performance Skills

1. Create and utilize an engineering notebook per established conventions.
<https://schools.utah.gov/cte/engineering/resources>
2. Demonstrate practice of the *Technology & Engineering Professional Workplace Skills*.
<https://schools.utah.gov/cte/engineering/resources>
3. Participate in a significant activity that provides each student with an opportunity to render service to others, employ leadership skills, or demonstrate skills they have learned through this course, preferably through participation in a Career & Technical Student Organization (CTSO) such as the Technology Student Association (TSA).

Skill Certificate Test Points by Strand

| Test Name | Test # | Number of Test Points by Strand | | | | | | Total Points | Total Questions |
|------------------------|--------|---------------------------------|----|---|---|---|---|--------------|-----------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | | |
| Engineering Technology | 615 | 3 | 10 | 9 | 5 | 9 | 6 | 42 | 29 |