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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<thead>
<tr>
<th>Core Code</th>
<th>38.03.00.00.010</th>
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<tr>
<td>Concurrent Enrollment Core Code</td>
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<td>Units of Credit</td>
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<td>Intended Grade Level</td>
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<td>Prerequisite</td>
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<td>Skill Certification Test Number</td>
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<td>Required Endorsement(s)</td>
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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.

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)

STAND 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/tech/publicationsresources](https://schools.utah.gov/cte/tech/publicationsresources)

2. Demonstrate practice of the *Technology & Engineering Professional Workplace Skills*.  
   [https://schools.utah.gov/cte/tech/publicationsresources](https://schools.utah.gov/cte/tech/publicationsresources)

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

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Test #</th>
<th>Number of Test Points by Strand</th>
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<td>615</td>
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