Engineering Technology

Exam Information

Exam number
615

Items
29

Points
42

Prerequisites
None

Recommended course length
One semester

National Career Cluster
Architecture & Construction
Manufacturing
Science, Technology, Engineering, & Mathematics

Performance standards
Included (Optional)

Certificate available
Yes

Description

The Engineering Technology industry certification exam assesses foundational engineering design knowledge, focusing on basic problem-solving and documentation abilities. The exam explores various aspects of engineering and evaluates learners' understanding of technology's environmental, societal, political, and economic impacts on the world. It measures how learners utilize problem-solving to develop essential abilities and attitudes that expand their occupational opportunities in the field of engineering.

Exam Blueprint

Standard	Percentage of exam
1. Safety Practices	7%
2. Engineering Mindset	24%
3. Engineering Design Process	21%
4. History & Effects of Engineering	12%
5. Engineering Fundamentals	21%
6. Careers in Engineering	14%

Standard 1

Students will follow safety practices.

Objective 1 Identify potential safety hazards and follow general laboratory safety practices.

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

Objective 2 Use safe work practices.

1. Use personal protective equipment according to manufacturer rules and regulations.
2. Follow correct procedures when using any materials, tools, or equipment.

Standard 2

Students will develop an engineering mindset.

Objective 1 Use an engineering design process to solve a problem.

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).

Objective 2 Use mathematics and science to produce technology (STEM) which often requires a multi-disciplinary approach.

1. Algebra
2. Geometry
3. Physics

Objective 3 Demonstrate the relationship between a scientific method and an engineering design process.

1. Record data
2. Sketch ideas
3. Analyze data to develop a mathematical model
4. Reach a conclusion (cause & effect)

Standard 3

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

Objective 1 Identify the design problem and decide how to address it.

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

Objective 2 As a team, think of new ideas or approaches to the problem and choose one.

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

Objective 3 Create a model and a prototype of the proposed design.

1. Mathematical models (spreadsheets and graphs)
2. Technical drawings (isometric & orthographic)
3. 3D solid models
4. Working prototype

Objective 4 Test the prototype, record the results, and evaluate the performance of the design.

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

Objective 5 Redesign the prototype by repeating the design process in order to further optimize the design.

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

Standard 3 Performance Evaluation included below (Optional)

Standard 4

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

Objective 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:

1. Clean water systems
2. Transportation & infrastructure
3. Medicines & biotechnology
4. Electronics

5. Energy

Objective 2 In order to realize the impact of society on technology, students should learn that:

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

Objective 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.

Standard 5

Students will apply engineering fundamentals.

Objective 1 Distinguish between six simple machines and their identifying characteristics.

1. Lever
2. Wedge
3. Inclined Plane
4. Screw
5. Wheel & Axle
6. Pulley

Objective 2 Practice real world applications of physical laws.

1. Ohm's Law & Watt's Law
2. Newton's Laws of Motion
3. Pascal's Principle
4. Bernoulli's Principle
5. Mass and energy balances, and chemical reactions

Standard 6

Students will investigate future training opportunities and careers in engineering.

Objective 1 Investigate the USBE's CTE engineering pathway.

Objective 2 Identify occupations related to engineering.

1. Technician
2. Designer
3. Engineer
4. Manager

Objective 3 List and differentiate among different engineering disciplines.

1. Aerospace
2. Biomedical

3. Civil
4. Chemical
5. Computer (both Hardware & Software)
6. Electrical
7. Energy
8. Manufacturing
9. Mechanical
10. Nuclear

Objective 4 Investigate different types of occupational training.

1. Trade school
2. Community College
3. University
4. Graduate Training

Objective 5 Recognize the importance of both “hard” and “soft” skills in the workplace.

Standard 6 Performance Evaluation included below (Optional)

Engineering Technology

Performance assessments may be completed and evaluated at any time during the course. The following performance skills are to be used in connection with the associated standards and exam. To pass the performance standard the student must attain a performance standard average of 8 or higher on the rating scale. Students may be encouraged to repeat the objectives until they average 8 or higher.

Student’s Name: _____

Class: _____

Performance standards rating scale

0	Limited skills	2	→	4	Moderate skills	6	→	8	High skills	10

Standard 3 – Engineering Design Process **Score:**

- Use an engineering design process to solve a problem.
  - Identify & define the problem (criteria & constraints).
  - Brainstorm solutions.
  - Create a model (predictive analysis) & build a prototype.
  - Test the prototype (gather data).
  - Iteration (redesign & optimize).

Standard 6 – Careers in Engineering **Score:**

- 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).

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____