

Engineering Technology

Exam Information	Description
Exam number 615 Items 29 National Career Cluster Architecture & Construction Manufacturing Science, Technology, Engineering, & Mathematics Certification available Yes	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 and Performance Skills

Standard	Percentage of exam score
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%

*Includes performance skill evaluation

Standard 1 - Safety Practices

Candidates 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 - Engineering Mindset

Candidates 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 - Engineering Design Process

Candidates 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.

Optional: Standard performance evaluations on the final page of this document

Standard 4 - History & Effects Of Engineering

Candidates 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, candidates 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, candidates 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 Candidates 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 - Engineering Fundamentals

Candidates 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 - Careers in Engineering

Candidates 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.

Optional: Standard performance evaluations on the final page of this document.

Performance Skills Evaluation

Exam name: Engineering Technology

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Standard 3 – Engineering Design Process

- 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).

Pass:

Standard 6 – Careers in Engineering

- Participate in a significant activity that provides each candidate 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 Candidate Organization (CTSO) such as the Technology Candidate Association (TSA).

Pass:

Evaluator Name:

Date:
