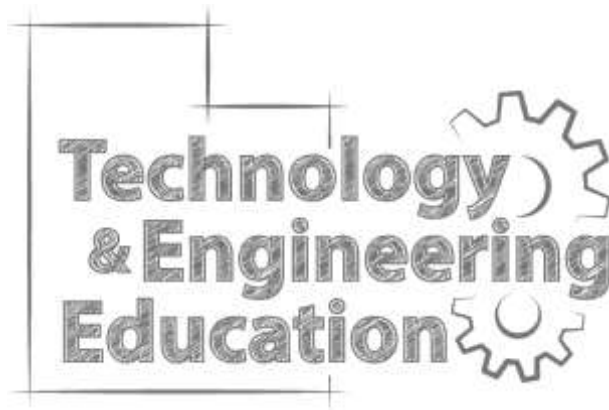


# Strands & Standards

## ROBOTICS 1



### COURSE DESCRIPTION

The first in a sequence of courses that prepares individuals with a lab-based, hands-on curriculum combining electrical, mechanical and engineering principles. Students will learn to design, build, program, and control robotic devices. A rigorous study and application of electrical concepts will include: sources of energy, electrical safety, use and identification of basic electronic components, sensors and actuators. Engineering concepts will include: mechanical design, prototype development, design testing, programming, and proper engineer documentation.

#### License Type

Secondary Education 6-12

#### Required Endorsement

Robotics,  
Engineering, or  
Technology & Engineering

Intended Grade Level: 10-12

Units of Credit: 0.5

Core Code: 38.01.00.00.031

CE Core Code: N/A

Prerequisite: None

Skill Certification: 611

Test Weight: 0.5

# Strands & Standards

## STRAND 1 Students will follow safety practices.

- Standard 1** Identify potential safety hazards and follow general laboratory safety practices.
- Assess workplace conditions with regard to 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 shop 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 hand or power tools.
  - Ref: <http://schools.utah.gov/CTE/tech/DOCS/SafetyCommonViolations.aspx>
- Standard 3** Complete a basic safety test without errors (100%) before using any tools or shop equipment.

## STRAND 2 Students will identify the history and application of technology and engineering as it applies to robotics and automated systems.

- Standard 1** Define and identify historical impacts of robotic and automated systems and their benefit to society.
- Define “robot”.  
Sample definitions:
    - A robot is any device that emulates human movement, capabilities, or appearance; from the Czech word “robata”.
    - A robot is an automatically controlled, reprogrammable, multipurpose machine.
  - Describe the history and early beginnings of automated manufacturing & robotics.
  - Define automated manufacturing/systems.
- Standard 2** Explain how automation and robotic systems have improved the quality of life, increased production, precision, and safety a variety of applications.
- Standard 3** Identify four engineering fields that impact the robotic and automation industry.
- Mechanical
  - Electrical
  - Manufacturing
  - Computer Science

## STRAND 3 Students will be able to create, and interpret fundamental programming of robots and automated systems.

- Standard 1** Demonstrate the ability to use good programming style.
- Understand specifications and requirements for computer programs.
  - Decompose the problem into appropriate components.
  - Design solutions using algorithms and other problem solving techniques.
  - Create a flow chart and write a program that utilizes input (controller) and output commands.
  - Write the code for a program.
    - Demonstrate how to use white space properly.
    - Employ an appropriate naming convention.
  - Test programs for errors and proper functionality.

- Provide internal and external documentation for a program during development.
- Redo all steps as needed.

- Standard 2** Identify the syntactical components of a program.
- Identify keywords, identifiers, operators, operands, and literals.
  - Identify the entry-point of a program.
  - Identify statements and expressions in a program.
  - Identify program components such as functions, methods, or procedures.

- Standard 3** Demonstrate the ability to use basic elements of a specific language.
- Write programs formatted based on the conventions of the utilized language.
  - Declare, initialize, and assign values to constants and variables.
  - Demonstrate the ability to use input and output commands.

## **STRAND 4 Work in teams to design, build, and present a robotics project.**

- Standard 1** Demonstrate the ability to develop a solution to a given problem using robotics.

- Standard 2** Demonstrate the ability to work as team to build and program a robot.

- Standard 3** Demonstrate the ability to document, evaluate, and report on the final design.
- Summarize the design process used in the development of the robot.
  - Defend the final robot design.
  - Make a formal presentation to the class.

## **STRAND 5 The student will understand, apply and document the Engineering Design Process.**

- Standard 1** Adopt an engineering design model that includes these elements.
- A Conceptual Stage which defines the problem and brainstorms ideas.
    - Formulate a problem statement.
    - Identify and analyze design constraints.
    - Brainstorm and choose best solution.
  - A Developmental Stage where ideas are explored, research done, and a prototype built.
    - Build a model or prototype.
  - An Evaluation Stage where the idea is tested, refined, and a final report is made.
    - Test, analyze, and optimize.

- Standard 2** Demonstrate the ability to clearly formulate a problem statement.
- Identify that a problem exists.
  - State or write the problem clearly.

- Standard 3** Demonstrate the ability to identify and analyze design constraints.
- Analyze typical constraints: time, energy, space or area, tools, people, materials, capital and information.
  - Document constraints that have a positive or negative effect on the design problem.

- Standard 4** Demonstrate the ability to investigate and research information pertaining to the design brief and choose the best solution.
- Brainstorm and research information that is currently available.
  - Identify conditions or factors which may affect the solution such as appearance, durability, simplicity and safety.
  - Use sketches and notes in the process of generating alternative design solutions.
  - Select the best solution or design using a decision matrix.

- Standard 5** Implement the design by building a model or prototype.
- Create a chart that shows the build schedule and the team work assignments.
  - Students will use their parts list to obtain needed material.
  - Using safety procedures construct the prototype.
  - Students will demonstrate the use of simple machines and show how they are used in structural design of complex devices and machines.
- Standard 6** Demonstrate the ability to test, analyze and optimize their design.
- Test the prototype, apply math calculations, and document the results.
  - Re-design and improve the prototype.

## **STRAND 6** Students will document the design process in an engineering notebook.

- Standard 1** Make accurately proportioned sketches using correct drawing conventions.
- Notes are neat and legible.
  - Objects should be drawn to correct proportions.
  - Dimensions are used appropriately.
  - Views can be isometric, orthogonal, sections, or assemblies.
- Standard 2** Create and utilize an engineering notebook per established conventions.
- Sequential and chronological.
  - Accurate and complete reflection of the progress being recorded.
  - Sketches or pictures are included where appropriate.
  - No loose entries or pages.
  - Each page is dated and witnessed.
  - Unused spaces are identified and lined out.
  - Errors are not erased or obliterated.
  - Test data and calculations are included.
- Standard 3** Write a reflection of the project.
- What was the objective?
  - What worked?
  - What didn't work and why it didn't?
  - How did the design compare with the best and worst performers?
  - What you would do differently?
  - Was the objective accomplished?

## **STRAND 7** Students will understand and develop positive work ethics, communication skills, and leadership skills.

- Standard 1** Employ the Technology Student Association (TSA) and/or SkillsUSA Career & Technical Student Organization (CTSO) as an integral element of the curriculum.
- Standard 2** Demonstrate positive work ethics and leadership skills:
- |                           |               |
|---------------------------|---------------|
| ■ Responsibility          | ■ Delegation  |
| ■ Reliability             | ■ Cooperation |
| ■ Dependability           | ■ Teamwork    |
| ■ Effective Communication | ■ Integrity   |
- Standard 3** Understand the importance of inter-disciplinary teams.
- Standard 4** Take minutes of team meetings.

## 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	7		
Robotics 1	611	3	3	10	2	12	8	2	40	34

## Performance Objectives

<insert link>