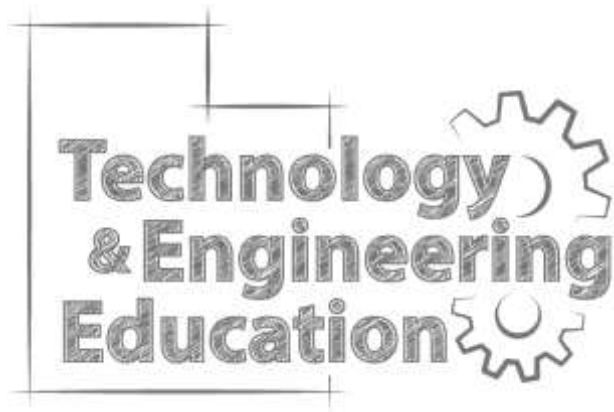


Strands & Standards

ROBOTICS 2



COURSE DESCRIPTION

The second 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: 38.01.00.00.032

CE Core Code: N/A

Prerequisite: Robotics 1

Skill Certification: 612

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 ethical and social impacts of robotics and automation.

- Standard 1** Contrast the social benefits and the negative consequences of robotics and automation.
- Standard 2** Describe the ethical impact of robotics and automation.
Example discussion points:
- Discuss military and political use of robots; e.g. spy bugs and drones.
 - Discuss who is responsible for a robot's intended use; e.g. a robot made to search a mine v/s the same technology used to invade someone's privacy.
 - Discuss ethical and professional behavior in the development and use of technology.
- Standard 3** Students will explain the application of copyright and patent laws.
- Standard 4** Identify the uses of robotics in industry and how it impacts manufacturing and production.
- Describe how robotics can improve manufacturing safety.
 - Identify five or more industries that utilize robotic applications.
 - Identify the advantages and disadvantages of automated assembly lines.

STRAND 3 Students will be able to identify and report on educational pathways and career opportunities in robotics and automation.

- Standard 1** Identify occupations related to robotics.
- Standard 2** Identify different types of occupational training that would prepare them for a career in robotics.

STRAND 4 Students will understand and develop positive work ethics, communication skills, and leadership skills.

- Standard 1** Employ a Career & Technical Student Organization (CTSO) as an integral element of the curriculum.
- Technology Student Association (TSA)
 - SkillsUSA

Standard 2 Demonstrate positive work ethics and leadership skills.

- Responsibility
- Reliability
- Dependability
- Effective Communication
- Delegation
- Cooperation
- Teamwork
- Integrity

Standard 3 Take minutes of team meetings.

STRAND 5 Students will be able to create program code for robots and automated systems.

Standard 1 Define Closed-Loop and Open-Loop systems.

Standard 2 Create and explain a program that utilizes input and output commands.

Standard 3 Compile and utilize a personal library of commands.

Standard 4 Apply sensors to obtain feedback.

Standard 5 Apply switches and sensors to control robot movement.

Standard 6 Apply digital logic to a problem solving situation.

Examples:

- Following a line
- Avoiding an obstacle
- Turning on an alarm
- Pick and place a small object

STRAND 6 Students will understand the fundamentals of electricity as applied to robotics.

Standard 1 Calculate voltage, amperage, and resistance using Ohms Law.

Standard 2 Use a multi-meter to measure voltage, amperage, and resistance.

Standard 3 Define and identify series and parallel circuits.

Standard 4 Compare and contrast energy sources and their ability to change to other forms of energy.

- Describe and contrast energy sources.
- Identify and contrast sources of electrical energy including AC & DC.
- Describe energy ratings such as amp/hour and kilowatt/hour.

Standard 5 Use batteries, solar cells or generators to provide energy for the operation of small motors and other mechanical devices.

- Identify batteries and describe their uses and hazards.
- Properly connect and disconnect batteries and power supplies.
- Define and calculate increase performance through series and parallel connections.

STRAND 7 Students will be able to identify, understand, and utilize mechanical advantage and efficiency to perform robotic tasks.

- Standard 1** Identify the six simple machines and apply their use to a structural design.
The six simple machines defined by Renaissance scientists are:
- Levers
 - Wheel and axle
 - Pulley
 - Inclined plane
 - Wedge
 - Screw
- Standard 2** Analyze the effects of various forces on a mechanical device. (Every force is a vector and has two components, magnitude and direction.)
- Discuss and demonstrate the following forces:
 - Gravitational forces
 - Normal force
 - Friction or Drag forces
 - Tension and Applied forces
 - Rotational forces (torque)
- Standard 3** Calculate the mechanical advantage of gears, pulleys, and levers.
- Standard 4** Discuss and calculate mechanical rates.
- Discuss the difference between speed, velocity and acceleration.
 - Explore the concept of and calculate linear velocity.
 - Explore the concept of and calculate angular speed.
 - Explore the concept of and calculate linear acceleration.
- Standard 5** Describe the effects of friction.
- Discuss the advantages and disadvantages of friction.
 - Demonstrate rolling friction and explain why it reduces friction.
- Standard 6** Describe the advantages and disadvantages of hydraulics and pneumatics.
- Compare the advantages and disadvantages of hydraulics and pneumatics.
 - Discuss appropriate uses of both hydraulics and pneumatics.

STRAND 8 Work in teams to design, build, and present a final 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.

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	8		
Robotics 2	612	5	2	2	1	13	11	18	2	54	37

Performance Objectives

<insert link>