Introduction to Robotics

Course Credit	1.0
Grade Level	9-12
Prerequisites	

Introduction to Robotics is designed to introduce students to the fundamentals of robotics. The course emphasizes fundamentals of electrical current, digital circuits, electronic control systems, and the design and operation of robotic systems. This course may be taken in the Robotics and Automated Manufacturing program.

Foundational standards, shown in the table below, are an important part of every course. Through these standards, students learn and apply safety concepts, explore career opportunities and requirements, practice the skills needed to succeed in the workplace, develop leadership qualities and take advantage of the opportunities afforded by Career and Technical Student Organizations (CTSOs), and learn and practice essential digital literacy skills. The foundational standards are to be incorporated throughout the course.

Each foundational standard completes the stem *"**Students will**..."*

Foundational Standards	
	1. Incorporate safety procedures in handling, operating, and maintaining tools and machinery; handling materials; utilizing personal protective equipment; maintaining a safe work area; and handling hazardous materials and forces. 2. Demonstrate effective workplace and employability skills, including communication, awareness of diversity, positive work ethic, problem-solving, time management, and teamwork. 3. Explore the range of careers available in the field and investigate their educational requirements, and demonstrate job-seeking skills including resume-writing and interviewing. 4. Advocate and practice safe, legal, responsible, and ethical use of information and technology tools specific to the industry pathway. 5. Participate in a Career and Technical Student Organization (CTSO) to increase knowledge and skills and to enhance leadership and teamwork.

INTRODUCTION TO ROBOTICS
CONTENT STANDARDS

Each content standard completes the stem *"**Students will**..."*

Orientation	1. Gather and share information on how robotics has influenced the manufacturing process, citing real-world examples. a. List personal characteristics necessary to succeed in robotics. 2. Demonstrate how to program a robot, using safety devices and hand tools correctly.
Fundamentals of Electrical Current	3. Gather and share information on chemical, mechanical, and solar sources of electricity. 4. Explain the relationship of the atom to an electrical charge. 5. Gather and share information on electrical terms and units of measures, including direct and alternating current measured in amperes, the voltage measured in volts, the resistance measured in ohms, power measured in watts, and conductors and insulators. 6. Diagram components of a basic circuit. a. Design series, parallel, and combination circuits. b. Compute current, voltage, and resistance using available devices. 7. Construct electrical circuits utilizing soldering and breadboarding techniques. a. Measure current, voltage, and resistance in electrical circuits.
Digital Circuits	8. Gather and share information about basic digital principles, including signal levels and signal types. a. Explain various digital number systems. b. Interpret logic gate symbols used in digital circuits. c. Develop the truth table for each logic gate as specified in robotic applications.

Electronic Control Systems	9. Compare and contrast open-loop and closed-loop control systems. a. Document the differences between manual and automatic control systems. 10. Interpret symbols used in control circuit diagrams. a. Correlate construction, electrical, and mechanical schematic symbols to real-world devices. 11. Compare programming methods and the input and output devices used in motion control systems. a. Identify ways programmable logic controllers can be used. b. Develop a ladder logic diagram to perform a specific function. c. Model ladder logic programs for multiple programmable logic controllers.
Design	12. Explain and utilize robotics design terms, including *controller, teach pendant, manipulator, end-effector and end-of-arm tooling, degrees of freedom, work envelope,* and *power supplies*. 13. Compare and contrast types of robot configurations, including revolute, selective compliant assembly robot arm (SCARA), Cartesian, cylindrical, spherical, and jointed-arm. a. Describe the use of specialty robots in automated systems.
Operation	14. Demonstrate the proper use of input and output devices for performing robotic tasks. 15. Explain the operation of fluid power systems used in robotic systems. 16. Debug a robotic work cell. a. Identify robotic abnormalities. b. Change errors in robotics programs.