

INDUSTRIAL AUTOMATION AND ROBOTICS II

Industrial Automation and Robotics II, is a capstone course that focuses on industrial robots, programming PLC's, automating cells, advanced programming, and designing/building task oriented industrial robots. Students will engage in active learning, critical thinking, and problem solving through advanced robotic procedures and processes. Students will learn industrial robotic programming languages as well as strategies for improving efficiency through automation. Students will study basic computer numerical controlled (CNC) machining and will combine automation and CNC machining to perform common industrial tasks. They will also apply knowledge to real world situations to create working solutions.

- DOE Code: 5612
- Recommended Grade Level: Grades 12
- Recommended Prerequisites: Introduction to Advanced Manufacturing
- Credits: 2 semester course, 2 semesters required, 1-3 credits per semester, maximum of 6 credits
- Counts as a Directed Elective or Elective for all diplomas.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this` course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations and Career are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in TSA or SkillsUSA the CTSO's for this area.

Domain – Robots in Industry

Core Standard 1 Students examine the uses of robots and automation in the industrial setting to understand the advantages of robots in industry.

Standards

- IARII-1.1 Indicate the common uses of robots in the industrial setting
- IARII-1.2 Examine the advantages and disadvantages of automation
- IARII-1.3 Describe the role of the automation professional in the life span of an automated system
- IARII-1.4 Differentiate between different types of industrial activities and the robots used to complete them
- IARII-1.5 Explain the purpose of robots in industry

- IARII-1.6 Recognize and understand varying types of hardware used throughout industry
- IARII-1.7 Demonstrate safe working practices and understand the hazards of electromechanical equipment

Domain – Industrial Controllers

Core Standard 2 Students use industrial controllers and various systems to manipulate automation equipment.

Standards

- IARII-2.1 Define the roles of input and output devices within automation
- IARII-2.2 Differentiate between microcontrollers and PC processors
- IARII-2.3 Compare the advantages of electrical, pneumatic, and hydraulic systems

Domain – Electricity

Core Standard 3 Students apply principals of electrical and lab safety to safely operate automation equipment.

Standards

- IARII-3.1 Apply principles of lab and electrical wiring safety in commercial and residential settings
- IARII-3.2 Identify and apply Ohm's law and the power law
- IARII-3.3 Discuss power supply and voltage regulation as applied to basic electricity
- IARII-3.4 Explain the characteristics of AC waveforms and AC voltage generation
- IARII-3.5 Introduce single and three phase AC power
- IARII-3.6 Localize, identify, document, and troubleshoot malfunctions in electrical circuits, based upon technical documents

Domain – Hydraulic Systems

Core Standard 4 Students examine hydraulic components and processes to operate automated systems.

Standards

- IARII-4.1 Analyze simple mathematical models of hydraulic circuits
- IARII-4.2 Explore the effects of fluid power on automation activities
- IARII-4.3 Apply Pascal's law and Bernoulli's principle to solve fluid power problems
- IARII-4.4 Construct simple fluid power system circuits
- IARII-4.5 Measure simple fluid power system circuits

Domain – System Assessment

Core Standard 5 Students examine various automation principles to assess system operations.

Standards

- IARII-5.1 Recognize the difference between linear speed and rotational speed
- IARII-5.2 Define mechanical terms such as horsepower, torque, friction, thrust, and efficiency
- IARII-5.3 Explain the relationships between RPM, horsepower, and torque
- IARII-5.4 Explain the relationships between gear ratios, speed and torque
- IARII-5.5 Identify the types of friction in various situations

Domain – Advanced Manufacturing Processes

Core Standard 6 Students apply automation principles to modern manufacturing processes.

Standards

- IARII-6.1 Examine the role of automation in advanced manufacturing
- IARII-6.2 Describe three basic types of manufacturing systems and give an application of each
- IARII-6.3 Describe two types of mass production manufacturing systems and give an application of each
- IARII-6.4 Describe three types of automated manufacturing systems and give an application of each
- IARII-6.5 Compare LEAN operation processes to conventional processes
- IARII-6.6 Examine the role of automation in LEAN manufacturing
- IARII-6.7 Students will gain a basic understanding of codes and standards for automation and robotic development including but not limited to; NEC, ANSI, NFPA-79, OSHA, and ANSI/RIA 15.06