

Industrial Automation and Robotics

Students study electrical laws and explore principles pertaining to DC and AC circuits.

1. Define voltage, resistance, current amperage, direct current, alternating current, and power supply [IARI-6.1](#)
2. Identify electrical components [IARI-6.2](#)
3. Use Ohm/s Law to calculate voltage, current, and resistance problems [IARI-6.3](#)
4. Perform voltage, current, and resistance measurements using the proper measurement devices [IARI-6.4](#)
5. Explain the basic principles and operation of transformers, resistors, capacitors and diodes. [IARI-6.5](#)
6. Explore concepts of both DC and AC inductance and capacitance [IARI-6.6](#)
7. Design, assemble, and test circuits [IARI-6.7](#)

Students examine automation processes in the industrial environment to improve manufacturing output and efficiency

1. Apply basic knowledge of robot physics in manufacturing environments [IARI-5.1](#)
2. Verbally describe and interpret data obtained from engineering drawings [IARI-5.2](#)
3. Identify the various coordinate types of industrial robots [IARI-5.3](#)
4. List the advantages and disadvantages of different coordinate types of industrial robots [IARI-5.4](#)
5. Recognize the work envelope of various types of industrial robots [IARI-5.5](#)
6. Describe the types of robot end effectors and the process each performs [IARI-5.6](#)
7. Define the common types of factory automation [IARI-5.7](#)
8. Explain how multiple robots, PLCs, and CNC types of equipment integrate with each other [IARI-5.8](#)

Students manipulate automation equipment

1. Identify and demonstrate correct design, programming, troubleshooting, and editing of robot programs [IARI-4.1](#)

using industry programming software

2. Solve mathematical problems related to machine control operations IARI-4.2
3. Understand how to read and design complex programs with the Microbot, which includes using I/O, decision making statements, and sub-routines, by way of a teach pendant and the Editor Software IARI-4.3
4. Understand the basic workcell with I/O, be able to identify the basics of the EMIA board schematic, and test I/O from the Editor Software IARI-4.4
5. Read and design using industry standard software IARI-4.5

Students manipulate programmable controllers and circuits to perform specific automation procedures

1. Distinguish Program Logic Circuit (PLC) components and their functions IARI-3.1
2. Select appropriate type of circuit logic for a given application IARI-3.2
3. Apply suitable commands for PLC circuits IARI-3.3
4. Apply timer and counter principles to industry related problems IARI-3.4
5. Setup, test, and troubleshoot PLC programs and systems properly IARI-3.5
6. Create and demonstrate programming diagrams for real world application IARI-3.6
7. Develop machine order of operations IARI-3.7
8. Examine computer logic and scanning sequence in automated controls IARI-3.8
9. Describe the common parts of programmable controllers IARI-3.9
10. Convert relay logic into ladder logic diagrams IARI-3.10
11. Program timer and counter programs on a PLC system IARI-3.11
12. Describe the role of PLC systems in manufacturing IARI-3.12

Students use industrial controllers and various systems to manipulate automation equipment

1. Identify a robot's axes of motion IARI-2.1
2. Determine the total number of degrees of freedom needed to perform a specific job task IARI-2.2
3. Define end effectors IARI-2.3
4. Select appropriate end effectors for a given job task IARI-2.4
5. Develop criteria to determine where, how and with what force an end effector should grasp a part IARI-2.5
6. Measure a robot's performance IARI-2.6

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- 7. Identify the pinch points in a robotic work cell** IARI-2.7

 - 8. Describe the safety precautions associated with teach pendant operation** IARI-2.8

 - 9. Perform proper start up, operating, and shutdown operations for industrial robots** IARI-2.9

 - 10. Complete a work-cell RISK assessment based on the RIA 15.06-2012 safety standards** IARI-2.10
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Students explore the history of automation and robotics in industry to understand modern manufacturing trends

- 1. Describe the history of robotics** IARI-1.1

- 2. Define automation and explain its impact on manufacturing** IARI-1.2

- 3. Explain and identify the difference between robotics and automation.** IARI-1.3

- 4. Identify the basic parts of a robot** IARI-1.4

- 5. Identify the various types of robots** IARI-1.5

- 6. Explain the role of sensors within robotics** IARI-1.6

- 7. Describe the hazards associated with robots** IARI-1.7

- 8. Determine appropriate safety methods for working around robots** IARI-1.8