Indiana CTE

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

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

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