Indiana CTE Next Level Programs of Study

Industrial Automation and Robotics Capstone (2025)

Fluid Power

1. Calculate and demonstrate the basic physics of fluid mechanics using Pascal's Law. 7224.D1.1
2. Describe the function and construction of various fluid power components, including pumps, valves, cylinders, filters, heat exchangers, pressure regulators, and accumulators. 7224.D1.2
3. Identify fluid power symbols and interpret fluid power schematic diagrams. 7224.D1.3
4. Demonstrate basic fluid power plumbing. 7224.D1.4
5. Design elementary fluid power circuits. 7224.D1.5
6. Troubleshoot elementary fluid power circuits. 7224.D1.6
7. Demonstrate knowledge of safety procedures related to fluid power equipment. 7224.D1.7
8. Demonstrate ability to read and interpret technical documents. 7224.D1.8
9. Demonstrate the ability to use various types of software applicable to course. 7224.D1.9
10. Demonstrate proper safety precautions related to equipment. 7224.D1.10

Machine Maintenance and Installation

1. Perform the rigging and lifting of industrial components. 7224.D2.1
2. Describe the principles of mechanical power transmission systems. 7224.D2.2
3. Make speed, torque, and pitch calculations. 7224.D2.3
4. Explain the advantages and disadvantages of belt, gear, chain and coupling drives. 7224.D2.4
5. Install and align belts, gears, chains, and couplings correctly. 7224.D2.5
6. Describe the use and construction of seals and packings. 7224.D2.6

	7 Recognize the differences and correct uses of plain and anti-friction type bearings. 7224.D2.7
	8 Compare gear drive systems, their components and function. 7224.D2.8
	9 Analyze failures due to heat, vibration, and observation. 7224.D2.9
	10 Selection of proper lubricants for the correct use, in specific applications. 7224.D2.10
	11 Installing and maintaining components safely. 7224.D2.11
	12 Follow conventional industrial safety practices. 7224.D2.12
Pressurized Systems	1 Understand the hazards of electromechanical equipment and apply safe working practices. 7224.D3.1
	2 Understand what a mechatronic system is, and the inter relationships of components and modules within a complex mechatronic system with a focus on (electro) pneumatic and hydraulic control systems. 7224.D3.2
	3 Understand the role of (electro) pneumatic and hydraulic control systems in complex mechatronic systems and subsystems. 7224.D3.3
	4 Understand troubleshooting, maintenance and safety issues revolving around (electro) pneumatic and hydraulic circuits within a mechatronic system. 7224.D3.4
	5 Explain the role of various pneumatic / hydraulic components within a system or module and trace and describe the flow of energy in a given system or module. 7224.D3.5
	6 Describe the basic physical properties of pneumatic/hydraulic components in a system and carry out measurements and adjustments on pneumatic / hydraulic components. 7224.D3.6
	7 Read, analyze, and utilize technical documents for the pneumatic/hydraulic control system. 7224.D3.7
	8 Localize, identify, document and correct malfunctions in complex mechatronic systems. 7224.D3.8
	9 Transfer the knowledge learned from one system to other systems. 7224.D3.9
	10 Effectively use current and emerging computer technologies when applicable. 7224.D3.10
Advanced Control Systems	1 Explain the role of programmable logic controllers within a given system or module. 7224.D4.1

	2 **Trace and describe the flow of information in a given mechatronic system or subsystem with a focus on the control function of PLCs in the system.** 7224.D4.2
	3 **Describe the basic functions and design of PLCs.** 7224.D4.3
	4 **Read, analyze, and utilize technical documents such as data sheets, timing diagrams, operation manuals, schematics, and ladder diagrams.** 7224.D4.4
	5 **Correctly localize, identify, and document system malfunctions in or caused by PLC hardware, based upon the technical documentation.** 7224.D4.5
	6 **Transfer the knowledge learned from one system to another system.** 7224.D4.6
	7 **Effectively use current and emerging computer technologies when applicable.** 7224.D4.7
	8 **Attain readiness to take Level 1 - Siemens Certified Mechatronic Systems Assistant exam.** 7224.D4.8
Programmable Logic Controllers	1 **Review basic computer operations.** 7224.D5.1
	2 **Program from relay logic to ladder logic diagrams.** 7224.D5.2
	3 **Design timer circuits and logic circuits.** 7224.D5.3
	4 **Describe logic circuits.** 7224.D5.4
	5 **Describe the common parts of programmable controllers.** 7224.D5.5
	6 **Program a start/stop circuit using a PLC.** 7224.D5.6
	7 **Program counters and timers using a programmable controller.** 7224.D5.7
	8 **Install and troubleshoot a simple programmable controller system.** 7224.D5.8
	9 **Discuss input and output analog signals to/ from the PLC.** 7224.D5.9
	10 **Discuss sequencers.** 7224.D5.10
	11 **Demonstrate ability to read and interpret technical documents.** 7224.D5.11