

# 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

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- 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

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- 3 Identify fluid power symbols and interpret fluid power schematic diagrams.** 7224.D1.3

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- 4 Demonstrate basic fluid power plumbing.** 7224.D1.4

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- 5 Design elementary fluid power circuits.** 7224.D1.5

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- 6 Troubleshoot elementary fluid power circuits.** 7224.D1.6

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- 7 Demonstrate knowledge of safety procedures related to fluid power equipment.** 7224.D1.7

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- 8 Demonstrate ability to read and interpret technical documents.** 7224.D1.8

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- 9 Demonstrate the ability to use various types of software applicable to course.** 7224.D1.9

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- 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

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- 2 Describe the principles of mechanical power transmission systems.** 7224.D2.2

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- 3 Make speed, torque, and pitch calculations.** 7224.D2.3

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- 4 Explain the advantages and disadvantages of belt, gear, chain and coupling drives.** 7224.D2.4

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- 5 Install and align belts, gears, chains, and couplings correctly.** 7224.D2.5

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- 6 Describe the use and construction of seals and packings.** 7224.D2.6

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- 7 Recognize the differences and correct uses of plain and anti-friction type bearings.** 7224.D2.7

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  - 8 Compare gear drive systems, their components and function.** 7224.D2.8

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  - 9 Analyze failures due to heat, vibration, and observation.** 7224.D2.9

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  - 10 Selection of proper lubricants for the correct use, in specific applications.** 7224.D2.10

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  - 11 Installing and maintaining components safely.** 7224.D2.11

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  - 12 Follow conventional industrial safety practices.** 7224.D2.12
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## Pressurized Systems

- 1 Understand the hazards of electromechanical equipment and apply safe working practices.** 7224.D3.1

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  - 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

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  - 3 Understand the role of (electro) pneumatic and hydraulic control systems in complex mechatronic systems and subsystems.** 7224.D3.3

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  - 4 Understand troubleshooting, maintenance and safety issues revolving around (electro) pneumatic and hydraulic circuits within a mechatronic system.** 7224.D3.4

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  - 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

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  - 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

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  - 7 Read, analyze, and utilize technical documents for the pneumatic/hydraulic control system.** 7224.D3.7

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  - 8 Localize, identify, document and correct malfunctions in complex mechatronic systems.** 7224.D3.8

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  - 9 Transfer the knowledge learned from one system to other systems.** 7224.D3.9

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  - 10 Effectively use current and emerging computer technologies when applicable.** 7224.D3.10
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## Advanced Control Systems

- 1 Explain the role of programmable logic controllers within a given system or module.** 7224.D4.1

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- 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

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  - 3 Describe the basic functions and design of PLCs.** 7224.D4.3

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  - 4 Read, analyze, and utilize technical documents such as data sheets, timing diagrams, operation manuals, schematics, and ladder diagrams.** 7224.D4.4

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  - 5 Correctly localize, identify, and document system malfunctions in or caused by PLC hardware, based upon the technical documentation.** 7224.D4.5

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  - 6 Transfer the knowledge learned from one system to another system.** 7224.D4.6

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  - 7 Effectively use current and emerging computer technologies when applicable.** 7224.D4.7

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  - 8 Attain readiness to take Level 1 - Siemens Certified Mechatronic Systems Assistant exam.** 7224.D4.8
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## **Programmable Logic Controllers**

- 1 Review basic computer operations.** 7224.D5.1

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- 2 Program from relay logic to ladder logic diagrams.** 7224.D5.2

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- 3 Design timer circuits and logic circuits.** 7224.D5.3

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- 4 Describe logic circuits.** 7224.D5.4

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- 5 Describe the common parts of programmable controllers.** 7224.D5.5

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- 6 Program a start/stop circuit using a PLC.** 7224.D5.6

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- 7 Program counters and timers using a programmable controller.** 7224.D5.7

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- 8 Install and troubleshoot a simple programmable controller system.** 7224.D5.8

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- 9 Discuss input and output analog signals to/ from the PLC.** 7224.D5.9

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- 10 Discuss sequencers.** 7224.D5.10

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- 11 Demonstrate ability to read and interpret technical documents.** 7224.D5.11