

# CLEVELAND INSTITUTE OF ELECTRONICS SYLLABUS

## Industrial Control and PLC Operation Course

View entire [Industrial Electronics with PLC Training Lab](#) program.

**Course Number:** L435A

**Course Name:** Industrial Control and PLC Operation

**Course Clock Hours:** 150

**Course Prerequisites:** MOD A DC-AC, Audio, and Radio Frequency Circuit

**Course Co-requisites:** None

**Course Contact Information:** [www.cie-wc.edu](http://www.cie-wc.edu) [faculty@cie-wc.edu](mailto:faculty@cie-wc.edu)  
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**Course Description:** This course covers the full spectrum of industrial maintenance and control, from servomechanisms to instrumentation. The components, circuits, instruments, control techniques, calibration, tuning and programming associated with industrial automated systems are introduced. This course will focus on the operation, rather than mathematical design concepts.

**Course Objectives:** Upon the completion of this course the student will be able to:

- Describe A/D and D/A converters
- Discuss the nature and methods of motion control
- Describe the components used for motion control
- Design and Troubleshoot motion control circuits
- Utilize basic instruments, control techniques and calibration of motion control circuits
- Develop and interpret programming codes and logic ladders associated with motion control circuits

**Course Readings:** The required readings will be drawn from a textbook published by Course Technology/Cengage Learning. The author is Terry Bartelt and the title of the textbook is [Industrial Automated Systems Instrumentation and Motion Control ISBN: 1-4354-8888-1](#). Students should complete the required readings and solve all problems in the exercise sections before continuing to the next topic.

**Student Evaluation and Grading:** Each of the thirteen lessons concludes with an examination; all examinations are open book. The minimum passing score of 70% must be achieved but if the score is less than 70%, the examination must be retaken to earn a passing score of 70% for the lesson. The fifteen examination scores are averaged together in calculating the course grade.

93% - 100%	A	The final grade for this course will be determined as follows:	
86% - 92.9%	B	Thirteen examinations =	100%
78% - 85.9%	C		
70% - 77.9%	D		

**Course Schedule:** You should complete the following lessons in the order shown in the table. It is best to complete 1-2 lessons per week to maintain your schedule.

Lesson Number	Title of Lesson	Topics Covered
3471	Industrial Control Overview	<ul style="list-style-type: none"> <li>• Open and Closed Loop Systems</li> <li>• A/D and D/A Converters</li> <li>• 555 Timer</li> </ul>
3472	Methods and Operation of the Controller	<ul style="list-style-type: none"> <li>• SCRs &amp; UJT's</li> <li>• Diacs and Triacs</li> <li>• PI and PID Controllers</li> </ul>
3473	DC Motors and Drives	<ul style="list-style-type: none"> <li>• DC Motors</li> <li>• Motor Speed Control</li> <li>• Load Characteristics of DC Drives</li> </ul>
3474	AC Motors and Drives	<ul style="list-style-type: none"> <li>• Synchronous Speed of AC Motors</li> <li>• Acceleration and Deceleration</li> <li>• Induction Motors</li> </ul>
3475	Servo Motors and Servomechanisms	<ul style="list-style-type: none"> <li>• Brushless DC Motor</li> <li>• PM and VR Stepper Motors</li> <li>• Master-Slave Servo Systems</li> <li>• Static and Dynamic Characteristics</li> </ul>
3476	Pressure Systems and Temperature Control	<ul style="list-style-type: none"> <li>• Pressure and Fluid</li> <li>• Law of Thermodynamics</li> <li>• Thermocouples, RTDs and Thermistors</li> </ul>
3477	Flow Control and Level Control Systems	<ul style="list-style-type: none"> <li>• Flow, Flow Rate, and Flow Sensors</li> <li>• Level, Direct Level and Indirect Level</li> <li>• Gauges and Detectors</li> </ul>
3478	Analytical and Industrial Instrumentation	<ul style="list-style-type: none"> <li>• pH, Conductivity, &amp; Combustion</li> <li>• P &amp; ID</li> <li>• Proportional Gain and Proportional Band</li> </ul>
3479	Detection Sensors	<ul style="list-style-type: none"> <li>• Batch, Continuous, Static and Zero</li> <li>• Electronic and Pneumatic Signals</li> <li>• Proportional, Integral &amp; Derivative</li> <li>• Head Pressure and Lag</li> </ul>
3480	Programmable Controllers	<ul style="list-style-type: none"> <li>• Photoelectric Sensor</li> <li>• Proximity Detectors-Capacitive &amp; Inductive</li> <li>• Modulation and Demodulation</li> <li>• R-F Signals</li> </ul>
3481	PLC Programming, Interfacing and Troubleshooting	<ul style="list-style-type: none"> <li>• Ladder Diagrams</li> <li>• Block Diagram of PLC</li> <li>• Examine-On &amp; Examine-Off Instruction</li> <li>• I/O Modules</li> </ul>
3482	Motion Control	<ul style="list-style-type: none"> <li>• Motion-Control Parameters</li> <li>• Types of Position Movements</li> <li>• Motion-Control Feedback Devices</li> <li>• Encoders, Binary &amp; Gray Codes</li> </ul>
3483	Industrial Networking	<ul style="list-style-type: none"> <li>• Data Flow Management</li> <li>• Industrial Networks</li> <li>• Industrial Communications Protocol</li> </ul>