

4.0 INDUSTRY LEVEL II

This Level II course continues the intermediate and advanced concepts related to next generation industry practices, known as Industry 4.0. Included in this course is a continuation of learning in the areas of Bar Code Systems, PLC Ethernet Communication, Database Concepts, Basic Robot Operation, RFID Programming, Cloud-Based Data Acquisition, and Fundamentals of Network Security.

- * Practicing Safety in the Workplace
- * Hazardous Materials Standards
- * Emergency and Accident Response
- * Advanced Manufacturing Organization
- * Power in Electrical Circuits
- * Manufacturing Materials
- * Mechanical Power Transmission
- * Control Logic Circuits
- * Electronic Sensors 2
- * Automation Sequence Circuits
- * PLC Ethernet Communication
- * HMI Ethernet Operation
- * Basic Robot Operation
- * Basic Robot Programming
- * Automatic Storage and Retrieval Systems
- * Introduction to Ethernet Networks
- * RFID Programming
- * Barcode System Programming
- * Basic VFD Control
- * Database Concepts
- * Cloud-Based Data Acquisition
- * Production Statistics
- * Lean Production Metrics
- * System Optimization
- * Fundamentals of Network Security

Self-Pace Online Training

Students will have six weeks to complete

\$100.00 per person



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Introduction to Industry 4.0 Level II

This Level II course continues the intermediate and advanced concepts related to next generation industry practices, known as Industry 4.0. Included in this course is a continuation of learning in the areas of bar code systems, PLC Ethernet communication, database concepts, basic robot operation, RFID programming, cloud-based data acquisition and fundamentals of network security.

Outline

1. Practicing Safety in the Workplace

Objective 1 - Explain How to Create a Culture of Safety in the Workplace
Objective 2 - Define an Injury and Identify Common Types
Objective 3 - Define an Accident and Identify Common Types
Objective 4 - Define Personal Protective Equipment
Objective 5 - Identify Seven Types of Personal Protective Equipment
Objective 6 - Describe an Employer's PPE Responsibilities
Objective 7 - Describe How to Identify Hazards in the Workplace
Objective 8 - Describe 11 Types of Hazards Found in the Workplace
Self Review 1

2. Hazardous Materials Standards

Objective 1 - Describe Three Categories of Hazardous Materials and Give Examples of Each
Objective 2 - Define the GHS and HCS Communication Standards
Objective 3 - Describe How to Interpret the HazCom Labeling System
Objective 4 - Define a Safety Data Sheet and Explain Its Use
Objective 5 - Describe the NFPA and HMIS Hazardous Material Identification Systems
Self Review 1

3. Emergency and Accident Response

Objective 1 - Describe Categories of Emergencies
Objective 2 - Describe the Elements of an Emergency Action Plan
Objective 3 - Describe How to Respond to an Emergency
Objective 4 - Describe How to Respond to a Workplace Accident
Objective 5 - Describe How to Use an Eyewash Station
Objective 6 - Describe How to Report a Workplace Accident
Self Review 1

4. Advanced Manufacturing Organization

Objective 1 - Describe Six Functional Areas of an Advanced Manufacturing Plant
Objective 2 - Identify Key Roles and Responsibilities of Advanced Manufacturing Employees
Objective 3 - Describe the Three Basic Production Layout Formats
Objective 4 - Define Takt Time and Explain Its Importance
Objective 5 - Define Line Balancing and Explain Its Importance
Self Review 1

5. Power in Electrical Circuits

Objective 1 - Define Electrical Power and Give Its Units of Measurement

Objective 2 - Describe How to Calculate the Power in a Simple Circuit
Objective 3 - Describe the Function of Two Types of Circuit Protection and Give an Application of Each
Objective 4 - Describe the Operation of a Fuse and Give Its Schematic Symbol
Skill 1 - Connect and Operate a Circuit that Uses a Fuse
Objective 5 - Describe the Basic Operation of a Circuit Breaker and Give Its Schematic Symbols
Skill 2 - Connect and Operate a Circuit That Uses a Circuit Breaker
Objective 6 - Describe How to Size Circuit Protection
Objective 7 - Describe the Basic Operation of Three-Phase Power
Self Review 1

6. Manufacturing Materials

Objective 1 - Define Ferrous Metals and Explain Their Importance
Objective 2 - Define Non-Ferrous Metals and Explain Their Importance
Objective 3 - Define Types of Alloys and Explain Their Importance
Objective 4 - Define Plastics and Explain Their Importance
Objective 5 - Define Composite Materials and Explain Their Importance
Objective 6 - Define Ceramics and Explain Their Importance
Self Review 1

7. Mechanical Power Transmission

Objective 1 - Describe the Function of a Mechanical Power Transmission System
Objective 2 - Describe Methods of Coupling a Mechanical Power Transmission
Objective 3 - Describe Methods of Parallel Shaft Mechanical Power Transmission
Objective 4 - Describe the Basic Operation of a Bearing
Objective 5 - Describe How to Install and Adjust a Pillow Block Bearing
Objective 6 - Describe Two Methods of Mounting a Shaft Bearing and Give an Application of Each
Objective 7 - Describe the Basic Operation of a Shaft Coupling
Self Review 1

8. Control Logic Circuits

Objective 1 - Describe the Function of Relay Logic Control Circuits
Objective 2 - List the Six Elements of Control Logic
Objective 3 - Describe the Operation of AND Logic and Give an Application
Skill 1 - Connect and Operate an AND Logic Control Circuit
Objective 4 - Describe the Operation of OR Logic and Give an Application
Skill 2 - Connect and Operate an OR Logic Control Circuit
Objective 5 - Describe the Operation of NOT Logic and Give an Application
Skill 3 - Connect and Operate a NOT Logic Control Circuit
Objective 6 - Describe the Operation of NOR Logic and Give an Application
Skill 4 - Connect and Operate a NOR Logic Control Circuit
Objective 7 - Describe the Operation of NAND Logic and Give an Application
Skill 5 - Connect and Operate a NAND Logic Control Circuit
Objective 8 - Describe the Operation of MEMORY Logic and Give an Application
Self Review 1

9. Electronic Sensors 2

Objective 1 - Describe the Operation of a Magnetic Reed Switch and Give an Application
Skill 1 - Connect and Operate a Magnetic Reed Switch
Objective 2 - Describe Six Characteristics That Affect Magnetic Reed Switch Operation
Skill 2 - Measure and Analyze the Performance of a Magnetic Reed Switch
Objective 3 - Describe the Operation of a Photoelectric Sensor and Give an Application
Skill 3 - Connect and Operate a Photoelectric Sensor
Objective 4 - Describe Five Characteristics That Affect Photoelectric Sensor Operation
Skill 4 - Measure and Analyze the Performance of a Photoelectric Sensor
Objective 5 - Explain How to Interface Electronic Sensors with Machine Controllers
Skill 5 - Interface an Electronic Sensor to Machine Controllers
Self Review 1

10. Automation Sequence Circuits

Objective 1 - Describe the Function of a Limit Switch and Give an Application
Objective 2 - Describe the Operation of a Limit Switch and Give Its Schematic Symbol
Objective 3 - Describe How to Read and Interpret Ladder Diagrams with Limit Switches
Skill 1 - Connect and Operate a Limit Switch
Objective 4 - Describe the Operation of a Limit Switch in an Event Sequencing Circuit
Skill 2 - Connect and Operate an Event Sequencing Circuit Given a Ladder Diagram
Skill 3 - Design a Logic Circuit That Uses a Limit Switch to Sequence an Event
Objective 5 - Describe the Operation of a Single-Cycle Cylinder Reciprocation Relay Circuit
Skill 4 - Connect and Operate a Single-Cycle Cylinder Reciprocation Circuit
Objective 6 - Describe the Operation of a Limit Switch in a Continuous-Cycle Reciprocation Circuit
Skill 5 - Connect and Operate a Continuous-Cycle Cylinder Reciprocation Circuit
Objective 7 - Describe the Operation of a Safety Interlock Circuit
Skill 6 - Design a Continuous-Cycle Cylinder Reciprocation Circuit with a Safety Interlock
Self Review 1

11. PLC Ethernet Communication

Objective 1 - Describe the Function of a Point-to-Point Ethernet Network
Objective 2 - Describe the Basic Operation of an Ethernet Network
Objective 3 - Describe Ethernet Network Addressing
Objective 4 - Describe How to Configure and Test a Point-to-Point Ethernet Network
Skill 1 - Connect and Configure a Point-to-Point Ethernet Network
Objective 5 - Describe How to Download and Upload a PLC Project
Skill 2 - Use Rockwell CCW Software to Download and Upload a PLC Project
Objective 6 - Describe How to Run and Monitor a PLC Program
Skill 3 - Use Rockwell CCW Software to Run and Monitor a PLC Project
Self Review 1

12. HMI Ethernet Operation

Objective 1 - Describe the Function of an HMI Panel
Objective 2 - Describe the Parts of an HMI Panel
Objective 3 - Describe How to Connect an HMI Panel in an Ethernet Network
Skill 1 - Connect an HMI Panel in an Ethernet Network
Objective 4 - Describe How to Configure the IP Address on an HMI Panel
Skill 2 - Configure an HMI Panel for an Ethernet Network
Objective 5 - Describe How to Download a Project to an HMI Panel
Skill 3 - Download an HMI Project to an HMI Panel
Objective 6 - Describe the Basic Operation of an HMI Panel
Objective 7 - Describe How to Operate a PLC Project Using an HMI Panel
Skill 4 - Operate a PLC Project Using an HMI Panel
Self Review 1

13. Basic Robot Operation

Objective 1 - Describe Four Types of Robot Classifications
Objective 2 - Describe Five Types of Servo Robots
Objective 3 - Describe the Basic Operation of a Servo Robot
Objective 4 - Describe the Axes of an Articulated Arm Robot
Objective 5 - Describe Seven Types of Robot Safety Devices
Objective 6 - Describe Robot Safety Rules
Objective 7 - Describe How to Power Up and Power Down a Servo Robot
Objective 8 - Describe How to Use a Teach Pendant to Jog a Servo Robot
Skill 1 - Jog a Servo Robot
Objective 9 - Describe How to Home a Servo Robot
Skill 2 - Home a Servo Robot
Self Review 1

14. Basic Robot Programming

Objective 1 - Describe Types of Robot End Effectors
Objective 2 - Describe Types of Robot Grippers
Objective 3 - Describe How to Teach Robot Points
Skill 1 - Teach Robot Position Points
Objective 4 - Describe How to Enter and Edit Robot Program Files
Skill 2 - Enter and Edit a Basic Robot Program
Objective 5 - Describe How to Transfer Robot Program Files between a PC and Robot Controller
Objective 6 - Describe How to Run a Robot Program
Skill 3 - Run a Servo Robot Program
Objective 7 - Describe the Operation of the Robot Command: Pmove
Skill 4 - Enter a Robot Program that Uses the Pmove Command
Objective 8 - Describe the Operation of the Robot Commands: Grasp and Release
Skill 5 - Enter a Robot Program that Uses the Grasp and Release Commands
Objective 9 - Describe the Operation of the Robot Commands: Label and Branch
Skill 6 - Enter a Robot Program that Uses the Label and Branch Commands
Self Review 1

15. Automatic Storage and Retrieval Systems

Objective 1 - Describe the Function of Automatic Storage and Retrieval Systems
Objective 2 - Describe the Operation of a Robot-Based Inventory Station
Objective 3 - Describe the Operation of a Servo Robot Traverse Axis
Objective 4 - Describe How to Program a Robot That Uses a Servo Traverse Axis
Skill 1 - Program a Robot That Uses a Servo Traverse Axis
Objective 5 - Describe the Operation of a Robot Program That Uses Discrete I/O Handshaking
Skill 2 - Operate a Robot Program That Uses Discrete I/O Handshaking
Objective 6 - Describe the Operation of a Robot Program That Uses Ethernet Communication
Self Review 1

16. Introduction to Ethernet Networks

Objective 1 - Describe the Function of an Industrial Network
Objective 2 - Describe Three Levels of Industrial Networks
Objective 3 - Describe the Basic Operation of a TCP/IP Ethernet Network
Objective 4 - Describe the Basic Components of an Ethernet Network
Skill 1 - Connect an Ethernet Network Using an Unmanaged Switch
Objective 5 - Describe How to Set Ethernet IP Addresses of Robots and PLCs
Skill 2 - Set IP Addresses of Robots and PLCs
Objective 6 - Describe How to Transfer Robot and PLC Programs via an Ethernet Network
Skill 3 - Transfer PLC Programs via an Ethernet Network
Self Review 1

17. RFID Programming

Objective 1 - Describe the Function of an IOLink Master
Objective 2 - Describe the Operation of an IOLink Master
Objective 3 - Describe How to Configure an IOLink Master in a PLC Project
Skill 1 - Configure an IOLink Master in a PLC Project
Objective 4 - Describe the Operation of an RFID Function Block Instruction
Skill 2 - Operate a CompactLogix PLC Project That Uses an RFID Function Block Instruction
Self Review 1

18. Barcode System Programming

Objective 1 - Describe the Basic Operation of a Function Block Instruction
Objective 2 - Describe the Basic Operation of a Barcode Function Block Instruction
Skill 1 - Operate a Micro800 PLC Project That Uses a Barcode Function Block Instruction
Objective 3 - Describe the Operation of PLC Comparison Instructions
Skill 2 - Operate a Micro800 PLC Project that Uses Comparison Instructions
Self Review 1

19. Basic VFD Control

Objective 1 - Describe Types of VFD Parameters
Objective 2 - Describe How to Configure a VFD for Operation
Skill 1 - Configure a VFD for Operation
Objective 3 - Describe the Operation of 2-Wire and 3-Wire VFD Control Systems
Objective 4 - Describe How to Configure a VFD for 2-Wire or 3-Wire Control
Objective 5 - Describe the Operation of a 2-Wire and 3-Wire PLC-Controlled VFD System
Skill 2 - Operate a PLC Project That Controls a VFD
Objective 6 - Describe VFD Fault Codes
Objective 7 - Describe How to Reset a VFD Fault
Skill 3 - Reset a VFD After a Fault Occurs
Self Review 1

20. Database Concepts

Objective 1 - Define a Database and Give a Manufacturing Application
Objective 2 - Describe Types of Databases
Objective 3 - Describe a Basic Relational Database Structure
Objective 4 - Describe How to Create and Manually Populate a Database
Skill 1 - Create and Manually Populate a Database
Objective 5 - Describe Types of Database Queries
Objective 6 - Describe How Collected Production Data Is Stored in a Database
Skill 2 - Use an SQL Database to Collect Automatic Production Data
Objective 7 - Describe How to Write a Database Query to Display Production Data
Skill 3 - Write a SQL Database Query to Display Production Data
Self Review 1

21. Cloud-based Data Acquisition

Objective 1 - Define Supervisory Control and Data Acquisition (SCADA)
Objective 2 - Describe the Operation of a Cloud-Based SCADA System
Skill 1 - Operate a Cloud-Based Data Acquisition System
Objective 3 - Describe How to Configure a Cloud-Based Data Acquisition Software to Retrieve Production Data
Skill 2 - Configure a Web-Based Data Acquisition System to Retrieve Data from a PLC
Objective 4 - Describe How to Configure a Cloud-Based Data Acquisition System to Display Production Statistics
Skill 3 - Configure a Cloud-Based Data Acquisition System to Display Production Statistics
Objective 5 - Describe the Operation of Cloud-Based Maintenance Management
Objective 6 - Describe How to Send/Receive a Cloud-Based Maintenance Message
Skill 4 - Configure a Cloud-Based Maintenance Management Message
Self Review 1

22. Production Statistics

Objective 1 - Describe Production Statistics Applications of PLC Math Instructions
Objective 2 - Describe the Operation of Basic PLC Math Instructions
Objective 3 - Describe the Operation of the MOV Instruction
Skill 1 - Operate a PLC Project That Uses Basic PLC Math Instructions
Objective 4 - Describe the Operation of a CPT Instruction
Skill 2 - Design a PLC Project That Uses Math Instructions to Track Production Statistics
Self Review 1

23. Lean Production Statistics

Objective 1 - Define Customer Lead Time
Objective 2 - Define Process Cycle Time
Objective 3 - Define Throughput
Objective 4 - Define Takt Time
Objective 5 - Define Process Yield
Self Review 1

24. System Optimization

Objective 1 - Define a Production Bottleneck

Objective 2 - Describe How to Eliminate Production Bottlenecks

Skill 1 - Identify and Analyze Production Bottlenecks

Objective 3 - Define Overall Equipment Effectiveness (OEE)

Objective 4 - Describe How to Program a Cloud-Based Data Acquisition System to Track OEE

Skill 2 - Configure a Cloud-Based Data Acquisition System to Track OEE Data

Objective 5 - Describe How to Export a Database to an Excel Spreadsheet

Skill 3 - Export a Database to an Excel Spreadsheet

Self Review 1

25. Fundamentals of Network Security

Objective 1 - Describe the Function of Industrial Network Security

Objective 2 - Describe the Basic Components of Industrial Network Security

Objective 3 - Describe How to Configure the Port Security of a Managed Ethernet Switch

Skill 1 - Configure the Port Security of a Managed Industrial Ethernet Switch

Objective 4 - Describe the Basic Operation of a Virtual LAN

Objective 5 - Describe How to Configure a Virtual LAN Using a Managed Ethernet Switch

Skill 2 - Configure a Virtual LAN Using a Managed Ethernet Switch

Self Review 1