

Snead State Community College **Workforce Development**



Self-Pace Online Training
Students will have six weeks to complete

\$100.00 per person



INTRODUCTION TO INDUSTRY 4.0 LEVEL I

This introductory Level I course introduces the student to the basic concepts related to next generation industry practices, known as Industry 4.0. Included in the course is an introduction to manufacturing processes, safety responsibilities, industrial lean production concepts, and Internet of Things.

- * **Introduction to Advanced Manufacturing**
- * **Technology and Advanced Manufacturing**
- * **Principles of Manufacturing Processes**
- * **Basic Mechanical Elements**
- * **Safety Responsibilities**
- * **Machine Safety**
- * **Types of PPE**
- * **Equipment Safety**
- * **Material Handling Safety**
- * **Manufacturing Metrics**
- * **Lean Production Concepts**
- * **Industrial Internet of Things**
- * **Multi-Station Mechatronic Communications**
- * **Network Performance and Managed Ethernet Switch Operation**
- * **Introduction to Electronic Sensors**
- * **Smart Photoelectric Sensors**
- * **Smart Pressure Sensors**
- * **RFID Operation**
- * **Basic VFD Operation**
- * **Barcode System Operation**
- * **Stepper Motor Indexing Systems**

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Introduction to Industry 4.0 Level I

This introductory level I course introduces the student to the basic concepts related to next generation industry practices, known as Industry 4.0. Included in the course is an introduction to manufacturing processes, safety responsibilities, industrial lean production concepts and Internet of Things.

Outline

1. Introduction the Advanced Manufacturing

Objective 1 - Define Manufacturing and Identify Types of Manufactured Products
Objective 2 - Define Advanced Manufacturing and Identify Three Examples
Objective 3 - Describe the Role of Product Design in Advanced Manufacturing
Self Review 1

2. Technology and Advanced Manufacturing

Objective 1 - Describe the Impact of Computers on Advanced Manufacturing
Objective 2 - Describe the Benefits of Factory Automation
Objective 3 - Describe the Function of a CNC Machine
Objective 4 - Identify Two Types of Robots
Objective 5 - Describe the Function of a PLC
Objective 6 - Explain the Use of Software in Advanced Manufacturing
Objective 7 - Describe the Use of New Technologies in Advanced Manufacturing
Self Review 1

3. Principles of Manufacturing Processes

Objective 1 - Describe Types of Assembly
Objective 2 - Describe Types of Metal Separation Processes
Objective 3 - Describe Types of Forming Processes
Objective 4 - Describe Types of Heat Treating Processes
Objective 5 - Describe Types of Finishing Processes
Objective 6 - Describe Types of Automated Material Handling Processes
Objective 7 - Describe Types of Inspection Processes
Objective 8 - Describe Types of Material Storage Methods
Self Review 1

4. Basic Mechanical Elements

Objective 1 - Describe Three Types of Basic Mechanisms
Objective 2 - Describe Three Types of Levers
Skill 1 - Operate a First-Class Lever
Objective 3 - Define Torque and Give Its Units of Measurement
Objective 4 - Define Mechanical Advantage
Skill 2 - Measure the Mechanical Advantage of a First-Class Lever
Objective 5 - Define Rotary Mechanical Power
Self Review 1

5. Safety Responsibilities

Objective 1 - Define Workplace Health and Safety and Explain Its Importance

Objective 2 - Describe the Importance of Safety Policies
Objective 3 - Describe the Results of Unsafe Behavior
Objective 4 - Describe the Purpose of the Occupational Safety and Health Administration
Objective 5 - Describe the Purpose of the Environmental Protection Agency
Objective 6 - Describe the Purpose of NIOSH, EPCRA, and State Safety Agencies
Objective 7 - Describe the Safety Responsibilities within a Company
Objective 8 - Describe How to Locate Safety Regulations and Policies
Self Review 1

6. Machine Safety

Objective 1 - Describe Clothing Safety Guidelines for Machine Operators
Objective 2 - Describe the Machine Operation Safety Guidelines
Objective 3 - Describe the Types of Machine Guards
Objective 4 - Describe the Operation of Machine Interlocks
Objective 5 - Describe the Operation of Emergency Stop Controls
Objective 6 - Describe the Function of a Lockout/Tagout System
Objective 7 - Describe How to Perform an Electrical Lockout/Tagout
Self Review 1

7. Types of PPE

Objective 1 - Describe the Types of Head PPE
Objective 2 - Describe the Types of Eye PPE
Objective 3 - Describe the Types of Ear PPE
Objective 4 - Describe the Types of Hand and Arm PPE
Objective 5 - Describe the Types of Foot PPE
Objective 6 - Describe the Types of Respiratory PPE
Objective 7 - Describe the Types of Body PPE
Self Review 1

8. Equipment Safety

Objective 1 - Describe Types of Hand Tools and Power Tools
Objective 2 - Describe the Hand Tool Safety Guidelines
Objective 3 - Describe the Portable Power Tool Safety Guidelines
Objective 4 - Describe Compressed Gas Safety Guidelines
Self Review 1

9. Material Handling Safety

Objective 1 - Describe Types of Manual Material Handling Equipment
Objective 2 - Describe Basic Safety Rules for Hoist and Crane Use
Objective 3 - Describe Basic Safety Rules for Forklift Use
Self Review 1

10. Manufacturing Metrics

Objective 1 - Describe Five Critical Manufacturing Performance Objectives
Objective 2 - Define Performance Metrics and Key Process Indicators
Objective 3 - Define Productivity and List Its Measures
Objective 4 - Describe How to Calculate Machine/Employee Productivity
Objective 5 - Describe How to Calculate Production Efficiency
Objective 6 - Describe How to Calculate Machine Utilization
Objective 7 - Describe How to Calculate Value Added Per Employee
Self Review 1

11. Lean Production Concepts

Objective 1 - Define Lean Manufacturing
Objective 2 - Define Value-Added and Non-Value-Added Activities
Objective 3 - Describe the Eight Deadly Wastes
Objective 4 - Describe the Core Elements of Lean Manufacturing
Objective 5 - Define Lean Production (Just-In-Time)

Self Review 1

12. Industrial Internet of Things

Objective 1 - Define Industry 4.0 and Explain Its Benefits

Objective 2 - Define the Industrial Internet of Things (IIoT) and Its Benefits

Objective 3 - Describe the History of IIoT

Objective 4 - Describe the Components of Industrial Internet of Things (IIoT)

Objective 5 - Describe Industry Sector Applications of IIoT

Objective 6 - Describe Manufacturing Applications of Industrial Internet of Things (IIoT)

Objective 7 - Describe Manufacturing Logistics Applications of Industrial Internet of Things (IIoT)

Self Review 1

13. Multi-station Mechatronic Communications

Objective 1 - Describe the Function of Controller Handshaking

Objective 2 - Describe the Operation of a PLC Program That Uses Discrete I/O to Sequence Stations

Skill 1 - Design a PLC Program to Use Discrete I/O Handshaking

Objective 3 - Describe the Operation of a Micro800 PLC CIP Symbolic Message Instruction

Skill 2 - Operate a Micro800 PLC Program That Uses a CIP Symbolic Message Instruction

Objective 4 - Describe the Operation of a Micro800 PLC Sockets Message Instruction

Objective 5 - Describe the Operation of a PLC Program That Uses Ethernet Communication

Self Review 1

14. Network Performance and Managed Ethernet Switch Operation

Objective 1 - Describe Ethernet Network Topologies

Objective 2 - Describe Hardware Used in Large-Scale Industrial Ethernet Networks

Objective 3 - Describe the Basic Operation of an Industrial Managed Ethernet Switch

Objective 4 - Describe DHCP's Automatic Assignment of IP Addresses

Objective 5 - Describe the Operation of an Ethernet Subnet

Objective 6 - Describe How to Configure an Industrial Managed Ethernet Switch

Skill 1 - Configure an Industrial Managed Ethernet Switch

Objective 7 - Describe How to View Network Diagnostics Using a Managed Ethernet Switch

Skill 2 - View a Managed Ethernet Switch's Network Performance Diagnostics

Self Review 1

15. Introduction to Electronic Sensors

Objective 1 - List Five Advantages of Electronic Sensors and Two Disadvantages

Objective 2 - List Five Types of Electronic Sensors

Objective 3 - Describe the Function of the Two Parts of an Electronic Sensor

Objective 4 - Describe the Operation of Two Types of Transistors Used in Electronic Sensors

Objective 5 - Describe the Operation of an Inductive Proximity Sensor and Give an Application

Skill 1 - Connect and Operate an Inductive Proximity Sensor

Objective 6 - Describe Five Characteristics That Affect Inductive Proximity Sensor Operation

Skill 2 - Measure and Analyze the Performance of an Inductive Proximity Sensor

Objective 7 - Describe the Operation of a Capacitive Proximity Sensor and Give an Application

Skill 3 - Connect and Operate a Capacitive Proximity Sensor

Objective 8 - Describe Five Characteristics That Affect Capacitive Proximity Sensor Operation

Skill 4 - Measure and Analyze the Performance of a Capacitive Proximity Sensor

Self Review 1

16. Smart Photoelectric Sensors

Objective 1 - Describe the Function of a Smart Sensor

Objective 2 - Describe the Operation of a Smart Photoelectric Sensor

Objective 3 - Describe How to Configure a Smart Photoelectric Sensor in a PLC Project

Skill 1 - Configure a Smart Photoelectric Sensor in a PLC Project

Objective 4 - Describe the Operation of a Smart Photoelectric Sensor in a PLC Project

Skill 2 - Operate a PLC Project that Uses a Smart Photoelectric Sensor

Skill 3 - Design a Smart Factory PLC Project that Uses a Smart Photoelectric Sensor

Self Review 1

17. Smart Pressure Sensors

Objective 1 - Describe the Function of a Smart Sensor
Objective 2 - Describe the Operation of a Smart Pressure Sensor
Objective 3 - Describe How to Configure an IOLink Master in a PLC Project
Skill 1 - Configure a Smart Pressure/Vacuum Sensor in a PLC Project
Objective 4 - Describe the Operation of a Smart Pressure Sensor in a PLC Project
Skill 2 - Operate a PLC Project That Uses a Smart Pressure/Vacuum Sensor
Skill 3 - Design a Smart Factory PLC Project That Uses a Smart Pressure/Vacuum Sensor
Self Review 1

18. RFID Operation

Objective 1 - Describe the Function of an RFID System
Objective 2 - Describe the Basic Operation of an RFID System
Objective 3 - Describe Factors That Affect RFID System Operation
Skill 1 - Operate an RFID System
Objective 4 - Describe the Operation of Rockwell Studio 5000 Message Instruction
Skill 2 - Enter and Operate a Rockwell Studio 5000 PLC Logic Program That Uses a Message Instruction
Self Review 1

19. Basic VFD Operation

Objective 1 - Describe the Function of an AC Variable Frequency Drive
Objective 2 - Describe the Basic Operation of an AC Variable Frequency Drive
Objective 3 - Describe the Main Parts of an AC Variable Frequency Drive
Objective 4 - Describe the Wiring Connections to an AC Variable Frequency Drive
Objective 5 - Describe the Keypad Menus of an AC Variable Frequency Drive
Objective 6 - Describe How to Use a Keypad to Operate an AC Variable Frequency Drive
Skill 1 - Use a Keypad to Operate an AC Variable Frequency Drive
Self Review 1

20. Barcode System Operation

Objective 1 - Describe the Function of a Barcode Identification System
Objective 2 - Describe the Operation of a Barcode Reader
Objective 3 - Describe How to Maximize Barcode Scan Accuracy
Objective 4 - Describe the Basic Operation of Serial Communication
Skill 1 - Operate a Barcode Reader
Objective 5 - Describe the Basic Operation of an Ethernet-to-Serial Interface Module
Objective 6 - Describe How to Configure and Test an Ethernet-to-Serial Interface Module
Skill 2 - Configure and Test an Ethernet-to-Serial Interface Module
Self Review 1

21. Stepper Motor Indexing Systems

Objective 1 - Describe the Operation of an Indexing Material Processing Station
Objective 2 - Describe the Operation of a Stepper Motor
Objective 3 - Describe the Operation of a Stepper Motor Control System
Objective 4 - Describe the Operation of a PLC-Controlled Stepper Motor System
Skill 1 - Operate a Stepper Motor Indexing System
Objective 5 - Describe How to Adjust a Thru-Beam Fork Sensor
Skill 2 - Adjust a Thru-Beam Fork Sensor
Objective 6 - Describe the Sequence of Operation of an Indexing Station
Skill 3 - Design a PLC Program That Sequences an Indexing Station
Self Review 1