



# **NIDA CORPORATION COMPUTER ASSISTED INSTRUCTION**

## **LESSON AND OBJECTIVE LISTING**

### **Master Course Listing Industrial**

**2018-08-30**



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## OBJECTIVE LISTING - Master Course Listing

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## OBJECTIVE LISTING - Master Course Listing

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CARDS/KITS

### **MOD 76 - POWER DISTRIBUTION**

- 7231-714-130 3-Phase Fundamentals ..... ES-151 Set
- Express the use of 3-phase power.
  - Describe the operation of an AC generator.
  - Describe the differences between 3-phase and single-phase services.
  - Describe the difference between 50 Hz and 60 Hz power.
  - Describe the operation of inverters.
  - Read a 3-phase power transmission block diagram.
  - Operate a 3-phase power transmission and distribution system.
  - Verify the presence of 3-phase power using an oscilloscope.
- 7231-714-160 Power Transmission and Distribution Fundamentals ..... ES-151 Set
- Express the need for power transmission and distribution.
  - Describe the use of a power transmission system.
  - Give a brief description of power distribution.
  - Discuss power stabilization techniques.
  - Describe the operation of grid-tie interfacing.
  - Recognize tools used on power transmission and distribution systems.
  - Recognize safe maintenance methods.
  - Initialize a power transmission and distribution system using default settings.
  - Validate system operation using sensors, monitors, and display devices.
  - Power down the power transmission and distribution system.
- 7231-714-190 3-Phase and Single-Phase Service Feeds ..... ES-151 Set
- Analyze the use of 3-phase service feeds.
  - Describe 3-phase service feeds.
  - Analyze the use of single-phase service feeds.
  - Describe single-phase service feeds.
  - Initialize a power distribution system using default settings.
  - Analyze 3-phase service feeds.
  - Analyze single-phase service feeds.
  - Power down the power transmission and distribution system.
- 7231-714-220 Power Transmission and Distribution Maintenance ..... ES-151 Set
- Recognize power transmission and distribution preventive/scheduled maintenance routines.
  - Describe physical inspection techniques for power transmission and distribution systems (visual and sound).
  - Recognize power transmission and distribution unscheduled maintenance routines.
  - Describe when unscheduled maintenance is necessary.
  - Initialize a power transmission and distribution system using default settings.
  - Perform a power transmission and distribution system operational check.
  - Show proper use of measurement devices.
  - Examine power transmission and distribution system fault isolation procedures.
  - Demonstrate the ability to diagnose a defective subsystem in a power transmission and distribution system using fault isolation procedures.
- 7231-714-250 Power Grid Troubleshooting ..... ES-151 Set
- Examine the troubleshooting process for power transmission and distribution systems.
  - Set up a power transmission and distribution system hardware following a given procedure.
  - Initialize a power transmission and distribution system with default settings.
  - Perform a power transmission and distribution system operational check.
  - Show proper use of measurement devices.

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### **MOD 76 - POWER DISTRIBUTION (cont.)**

7231-714-250 Power Grid Troubleshooting (cont.)

- Demonstrate the ability to maintain a power transmission and distribution system.
- Power down a power transmission and distribution system.

7231-714-920 Power Distribution Post-Test (Theory) . . . . . ---

### **MOD 77 - AC MOTORS**

7271-412-130 Single-Phase and 3-Phase Motor Familiarization . . . . . MO-151 Set

- Explain advantages of AC motors over DC motors in industrial applications.
- Identify DC, AC single-phase, and three-phase power signals.
- Describe advantages and disadvantages of multiple-phase power as related to motors.
- Perform the proper wiring techniques for single-phase motors.
- Test and verify operation of a single-phase shaded-pole motor.
- Perform the proper wiring techniques for 3-phase wye-configured motors.
- Test and verify operation of a 3-phase wye-configured motor.

7271-414-130 Universal Motor Operation . . . . . MO-151 Set

- Identify benefits and drawbacks of universal motors.
- Configure a universal motor for single-phase AC operation.
- Demonstrate ways to reverse the direction of a universal motor.

7271-414-160 Shaded-Pole Motors . . . . . MO-151 Set

- Identify benefits and drawbacks for shaded-pole motors.
- Describe the configuration of an operational shaded-pole motor.
- Explain the steps necessary to reverse the direction of a shaded-pole motor.
- Perform the proper wiring techniques for a shaded-pole motor using single-phase AC.

7271-414-190 Split-Phase Motors . . . . . MO-151 Set

- Describe the construction of single phase motors.
- Perform the proper wiring techniques for split-phase motors in both CW and CCW rotation directions.

7271-414-220 Permanent Split Capacitor Motors . . . . . MO-151 Set

- Describe the construction of permanent split capacitor motors.
- Perform the proper wiring techniques for a permanent split capacitor motor in both CW and CCW rotation directions.

7271-414-250 Capacitor Start Motors . . . . . MO-151 Set

- Describe the construction of capacitor start motors.
- Perform the proper wiring techniques for a capacitor start motor in both CW and CCW rotation directions.

7271-414-280 Capacitor Start / Capacitor Run Motors . . . . . MO-151 Set

- Describe the construction of capacitor start / capacitor run motors.
- Demonstrate knowledge of the theory of the capacitor start / capacitor run motor.
- Perform the proper wiring techniques for a capacitor start/capacitor run motor in both CW and CCW rotation directions.

7271-414-920 Single-Phase Motors Post-Test (Theory) . . . . . ---

7271-416-130 3-Phase Wye/Star Motors . . . . . MO-151 Set

- Describe the construction of 3-phase wye/star motors.
- Configure a wye/star motor for 3-phase AC operation.
- Demonstrate ways to reverse the direction of a 3-phase wye/star motor.

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### **MOD 77 - AC MOTORS (cont.)**

- 7271-416-160 3-Phase Delta Motors ..... MO-151 Set
- Describe the construction of 3-phase delta motors.
  - Configure a delta motor for 3-phase AC operation.
  - Demonstrate ways to reverse the direction of a 3-phase delta motor.
- 7271-416-190 3-Phase Wye/Star-Delta Motor Starters ..... MO-151 Set
- Describe the need for 3-phase starters.
  - Discuss the advantages and disadvantages of the 3-phase wye/star-delta motor starter.
  - Configure a wye/star-delta motor for 3-phase AC operation.
  - Demonstrate ways to reverse the direction of a wye/star-delta motor.
- 7271-416-220 3-Phase Resistive and Inductive Motor Starters ..... MO-151 Set
- Describe the need for 3-phase starters.
  - Discuss the advantages and disadvantages of alternative 3-phase motor starters.
  - Set up a 3-phase motor using the primary resistive starting configuration.
  - Demonstrate how to reverse the direction of a primary resistive starting configuration.
  - Set up a 3-phase motor using the primary autotransformer starting configuration.
  - Demonstrate ways to reverse the direction of an autotransformer starting configuration.
- 7271-416-250 AC Motor Frequency and Voltage Controllers ..... MO-151 Set
- Describe the need for 3-phase starters.
  - Identify the electronic starter benefits over other starters.
  - Demonstrate knowledge of AC motor frequency and voltage controllers.
  - Configure a soft starter configured motor for 3-phase AC operation.
  - Demonstrate ways to reverse the direction of a soft starter configured 3--phase motor.
- 7271-416-920 3-Phase Motors Post-Test (Theory) ..... ---
- 7271-418-130 Motor Nameplates ..... ---
- Examine all IEC and NEMA motor standards for listing on motor nameplates.
  - Categorize AC motor key performance standards.
  - Identify AC motor environmental, efficiency, and service design standards.
  - Classify standards for motor mounts, frames, and enclosures.

### **MOD 78 - INTRO TO PROCESS AUTOMATION**

- 7241-112-130 Fundamentals of Industrial Safety ..... ---
- Understand common safety concerns in industrial settings.
  - Explain methods used to enhance safety.
  - Define lockout-tagout.
  - Explain procedures involved with lockout-tagout.
- 7241-112-160 Using Industrial Control Diagrams ..... ---
- Identify basic characteristics found on control diagrams.
  - Trace signal flow through a typical industrial diagram.
- 7241-112-190 Introduction to Troubleshooting ..... ---
- Define troubleshooting.
  - Compare component and system level troubleshooting.
  - Recognize various troubleshooting methods.
- 7241-112-220 Introduction to Automated Systems ..... I3-101 Set
- Identify basic functions of automated systems.
  - Review open loop and closed loop control.
  - Observe the operation of a batch process control system.

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### **MOD 78 - INTRO TO PROCESS AUTOMATION (cont.)**

- 7241-112-220 Introduction to Automated Systems (cont.)  
▫ Observe the operation of a continuous process control system.
- 7241-112-250 Introduction to Process Control ..... I3-101 Set  
▫ Describe the basic elements of process control.  
▫ Define common terms associated with process control.  
▫ Perform basic operational checks on system processes.  
▫ Observe central control feedback information.  
▫ Use lockout-tagout safety features.
- 7241-112-280 Batch and Continuous Processing ..... I3-101 Set  
▫ Describe the function and operation of continuous processing.  
▫ Describe the function and operation of batch processing.  
▫ Identify basic faults in the primary process.  
▫ Use built-in-test feedback information.  
▫ Use lockout-tagout safety features.
- 7241-112-920 I3 Systems - Introduction to Process Automation Post-Test (Theory) ..... ---

### **MOD 79 - INSTRUMENTATION**

- 7241-212-130 Introduction to Instrumentation ..... ---  
▫ Describe the basic purpose of instrumentation devices used in automated industrial systems.  
▫ Describe the basic function of elements of an electromechanical instrumentation system.  
▫ Describe the basic function of elements of a hydraulic instrumentation system.  
▫ Describe the basic function of elements of a pneumatic instrumentation system.
- 7241-212-160 Sensor Fundamentals ..... ---  
▫ Explain the purpose of a sensor.  
▫ Understand important physical characteristics that are common to sensors.  
▫ Define important operational characteristics that are common to sensors.
- 7241-212-190 Actuator Fundamentals ..... ---  
▫ Identify functions of actuators used in industry.  
▫ Explain terms and basic principles associated with pneumatic and hydraulic instrumentation.  
▫ Describe actuator types most often used in industry.
- 7241-214-130 Position, Proximity, and Displacement Sensors ..... I3-201 Set  
▫ Describe the different types of position sensors and their applications.  
▫ Describe the different types of proximity sensors and their application.  
▫ Describe the different types of displacement sensors and their applications.  
▫ Test and confirm normal operation of limit and position sensors operating as part of automated processes in an industrial control system.
- 7241-214-160 Motion Sensors ..... ---  
▫ Describe the different types of motion sensors and their applications.
- 7241-214-190 Velocity Sensors ..... I3-201 Set  
▫ Describe the different types of velocity sensors and their applications.  
▫ Test and confirm normal operation of velocity (speed) sensors operating as part of automated processes in an industrial control system.
- 7241-214-220 Vibration Sensors ..... I3-201 Set  
▫ Describe the different types of vibration sensors and their applications.  
▫ Test and confirm normal operation of a vibration sensor operating as part of automated processes in an industrial control system.



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### **MOD 79 - INSTRUMENTATION (cont.)**

7241-214-250 Sensor Troubleshooting I . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Confirm normal operation of position sensors.</li> <li>▫ Troubleshoot a system containing position sensors.</li> <li>▫ Confirm normal operation of limit and speed sensors.</li> <li>▫ Troubleshoot a system containing limit and speed sensors.</li> <li>▫ Confirm normal operation of current level and vibration sensors.</li> <li>▫ Troubleshoot a system containing current level and vibration sensors.</li> </ul>	
7241-214-310 Temperature and Humidity Sensors . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Describe IR heat generation.</li> <li>▫ Describe friction heat generation.</li> <li>▫ Describe chemical heat generation.</li> <li>▫ Describe heat dissipation.</li> <li>▫ Describe mechanical heat sensors.</li> <li>▫ Describe thermocouples.</li> <li>▫ Describe thermistors.</li> <li>▫ Describe the different types of humidity sensors and their applications.</li> <li>▫ Test and confirm normal operation of temperature sensors operating as part of automated processes in an industrial control system.</li> </ul>	
7241-214-400 Sensor Troubleshooting II . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Confirm the normal operation of light and temperature sensors.</li> <li>▫ Troubleshoot light and temperature sensors.</li> </ul>	
7241-214-430 LVDT Displacement Sensor . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Describe the operation of LVDT sensors.</li> <li>▫ Test and confirm normal operation of an LVDT displacement sensor.</li> <li>▫ Troubleshoot an LVDT displacement sensor.</li> </ul>	
7241-216-130 Electromechanical Actuator Types and Applications . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Describe electromechanical positional actuators and their applications.</li> <li>▫ Describe electromechanical directional actuators and their applications.</li> <li>▫ Describe electromechanical rotational actuators and their applications.</li> <li>▫ Describe electromechanical regulatory actuators and their applications.</li> <li>▫ Test and confirm normal operation of positional and directional actuators in response to process controller output.</li> <li>▫ Test and confirm proper operation of subprocess actuators as part of automated processes in an industrial control system.</li> </ul>	
7241-216-160 Electromechanical Actuator Troubleshooting . . . . .	I3-201 Set
<ul style="list-style-type: none"> <li>▫ Confirm the normal operation of an electromechanical actuator.</li> <li>▫ Troubleshoot an electromechanical actuator.</li> </ul>	
7241-298-920 I3 Systems - Instrumentation Post-Test (Theory) . . . . .	---

### **MOD 80 - CONTROLLERS**

7241-312-130 System Process Controller Fundamentals . . . . .	---
<ul style="list-style-type: none"> <li>▫ Explore the history, present state, and future of process controllers.</li> <li>▫ Categorize discrete, batch, and continuous process control requirements.</li> <li>▫ Identify differences between the Programmable Logic Controller (PLC) and the Programmable Automation Controller (PAC).</li> <li>▫ Describe the functions of the Human Machine Interface (HMI) and the Remote Terminal Unit (RTU).</li> </ul>	

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### **MOD 80 - CONTROLLERS (cont.)**

- 7241-312-130 System Process Controller Fundamentals (cont.)  
 ▪ Identify differences between a Distributed Control System (DCS) and a Supervisory Control and Data Acquisition (SCADA) system.
- 7241-312-160 PID Controllers . . . . . ---  
 ▪ Identify the principles of proportional and derivative control.  
 ▪ Identify the principles of proportional and integral control.  
 ▪ Identify the principles of proportional, integral, and derivative control.
- 7241-314-130 PLC System Fundamentals . . . . . ---  
 ▪ Describe the function of the basic components of the programmable logic controller.  
 ▪ Discuss the types of inputs and outputs used with the PLC.  
 ▪ Recognize and understand a simple ladder logic diagram.  
 ▪ Recognize the symbols used in a basic ladder logic diagram.
- 7241-314-160 PAC System Fundamentals . . . . . ---  
 ▪ Describe the function of the basic components of the programmable automation controller system.  
 ▪ Compare PLC logic to PAC logic.  
 ▪ Discuss the methods used to program a PAC.
- 7241-316-130 Distributed Control (DCS) . . . . . I3-257 Set  
 ▪ Describe DCS system architecture.  
 ▪ Define and identify a block diagram of a DCS system.  
 ▪ Examine the operation of a DCS system.  
 ▪ Troubleshoot a DCS system.
- 7241-316-160 Supervisory Control and Data Acquisition (SCADA) . . . . . I3-257 Set  
 ▪ Describe SCADA system architecture.  
 ▪ Define and identify a block diagram of a SCADA system.  
 ▪ Describe the differences between DCS and SCADA Systems.  
 ▪ Examine the operation of a SCADA system.  
 ▪ Troubleshoot a SCADA system.
- 7241-398-920 I3 Systems - Controllers Post-Test (Theory) . . . . . ---

### **MOD 81 - INTEGRATION**

- 7241-412-130 Fundamentals of Industrial Systems Integration . . . . . ---  
 ▪ Define HMI functions.  
 ▪ Define M2M functions.  
 ▪ Discuss standards used for modern industrial control systems.
- 7241-414-130 4-20 mA Current Loop . . . . . I3-251 Set  
 ▪ Examine 4-20mA current loop basics.  
 ▪ Wire a 4-20 mA current loop system.  
 ▪ Perform measurements on a typical 4-20 mA current loop.  
 ▪ Troubleshoot a 4-20 mA current loop.
- 7241-414-160 Hardware Standard EIA-232 . . . . . I3-251 Set  
 ▪ Explore hardware standard EIA-232.  
 ▪ Compare EIA-232 benefits and limitations.  
 ▪ Identify standard connectors and pin layouts used.  
 ▪ Examine EIA-232 basics.  
 ▪ Configure an EIA-232 subsystem for communications.

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<b><u>MOD 81 - INTEGRATION (cont.)</u></b>	
7241-414-160 Hardware Standard EIA-232 (cont.)	
▫ Observe an operating EIA-232 subsystem.	
▫ Troubleshoot an EIA-232 communication subsystem.	
7241-414-190 Hardware Standards EIA-422 and 485 .....	I3-251 Set
▫ Explore hardware standard EIA-422 and 485.	
▫ Compare EIA-422 and 485 maximum allowed distances, maximum number of allowed devices, voltages, and protocols for each standard.	
▫ Configure an EIA-485 subsystem for communications.	
▫ Observe an operating EIA-485 subsystem.	
▫ Troubleshoot an EIA-485 communications subsystem.	
7241-414-220 Ethernet .....	I3-251 Set
▫ Explore hardware standards TIA-568A and TIA-568B.	
▫ Examine an industrial system using TCP/IP Internet Protocol Suite.	
▫ Demonstrate knowledge of static and dynamic TCP/IP address assignments.	
▫ Explore hardware standards EIA-568A and 568B.	
▫ Test and verify the configuration of several Ethernet cable assemblies.	
7241-498-920 I3 Systems - Integration Post-Test (Theory) .....	---



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**Nida Corporation**  
**Melbourne, Florida 32904**  
**300 S. John Rodes Blvd**  
**Tel: 321-727-2265 • Fax: 321-727-2655**  
**www.nida.com**