

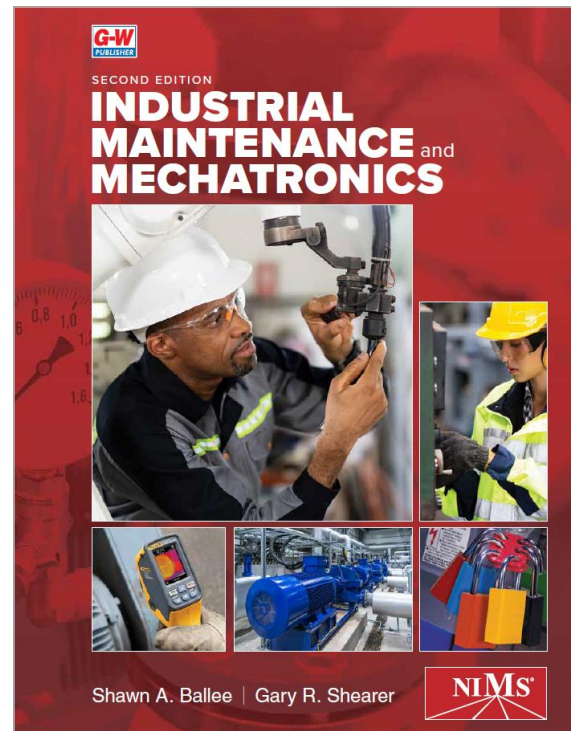


Correlation of
Industrial Maintenance and Mechatronics,
Shawn A. Ballee and Gary R. Shearer
 Goodheart-Willcox Publisher ©2024
 to
NIMS (National Institute for Metalworking Skills)
 Classic Credential:
Process Control Systems

Industrial Maintenance and Mechatronics carries NIMS' exclusive endorsement and supports attainment of NIMS credentialing in Industrial Technology Maintenance (ITM).

The textbook is designed to work hand-in-glove with the NIMS Standards for Industrial Technology Maintenance. The standards-based learning package will help students pass the testing and performance requirements for NIMS credentialing.

The correlation below lists the standards for a specific NIMS Classic ITM Credential. The Classic ITM areas covered in *Industrial Maintenance and Mechatronics* include Maintenance Operations, Basic Mechanical Systems, Basic Hydraulic Systems, Basic Pneumatic Systems, Electrical Systems, Electronic Control Systems, Process Control Systems, and Maintenance Piping.



| Standards | G-W Content |
|---|---|
| Duty Title: 7.01. Adhere to process control systems safety rules. | |
| Identify roles and responsibilities for safety, health, and environment. | Textbook: pg. 13, 24-28, 36-44, 70 |
| Adhere to OSHA, NIOSH, EPA, and other federal and state safety requirements for the workplace. | Textbook: pg. 18, 24-25, 43-44 |
| Identify and recognize common industrial hazards, per OSHA standards (including, ergonomics, laser safety, NFPA arc flash, confined space, gases and combustibles, steam and compressed air). | Textbook: pg. 24-26 |
| Define elements of a lockout/tagout (LOTO) program, describe the LOTO process and test to ensure a zero energy state. | Textbook: pg. 28-32 Lab Workbook: Activity 2-1, Lockout/Tagout Procedure |

| Standards | G-W Content |
|---|--|
| Identify and explain how to select the appropriate personal protective equipment (eyes, head, breathing air apparatus, body, feet, hands, ears) for a job. | Textbook: pg. 13, 32-35 Lab Workbook: Activity 2-2, Personal Protective Equipment |
| Explain how to locate a material Safety Data Sheet (SDS) and describe how you interpret the information. | Textbook: pg. 24-27 |
| List and select proper fall protection for working at heights and using ladders, scaffolding, and lifts. | Textbook: pg. 37 |
| Identify and recognize hazardous situations and apply proper procedures (includes following guidelines to prevent spread of bloodborne pathogens, spill control, proper storage, handling, protection of equipment, first aid). | Textbook: pg. 28-32, 36-43 |
| Describe the process used to perform a job safety analysis. | Textbook: pg. 43 Lab Workbook: Activity 2-3, Job Safety Analysis |
| Explain the principles of 6S program (Sort, Sweep, Sanitize, Set-to-order, Sustain, Safety). | Textbook: pg. 43 |
| Identify fuel source and selection of correct extinguisher class. | Textbook: pg. 43 |
| PCS Specific: | |
| Describe safety procedures for disconnecting or connecting process control components. | Textbook: pg. 796, 803, 815 |
| Describe hazards and precautionary safety procedures for working with process control systems. | Textbook: pg. 796, 805, 808, 832, 833 |
| Define the environmental rules and regulations that could be impacted while working with process control systems. | Textbook: pg. 833–834 |
| Duty Title: 7.02. Process control nomenclature and documentation. | |
| Identify process control components given their ISA P&ID schematic symbol. | Textbook: pg. 799–800 |
| Interpret the operation of a process control system given a P&ID diagram. | Textbook: pg. 799–800 |
| Identify and understand components on a P&ID diagram given their instrument tags. | Textbook: pg. 799–800 |
| Interpret instrument data given an instrument index. | Textbook: pg. 800 |
| Duty Title: 7.03. Calibrate and test analog sensors. | |
| Describe the operation of current-output and voltage-output signal sensors. | Textbook: pg. 806–807 |
| Describe the operation of signal conditioners for analog sensors. | Textbook: pg. 807–808 |
| Describe the operation of various transmitter types. | Textbook: pg. 801–803 |

| Standards | G-W Content |
|--|---|
| Interpret specifications for analog sensors. | Textbook: pg. 390–391, 800–801, 804, 806–807 |
| Interpret units of measurement variables converted from raw data units (4–20 mA). | Textbook: pg. 799, 807 |
| Connect and test sensors and associated signal conditioners. | Textbook: pg. 807–808 |
| Adjust the span and zero point of analog sensor. | Textbook: pg. 390–391, 806–807 Lab Workbook: Activity 36-1, Sonic Flow Meter Lab Workbook: Activity 36-2, Calibrating an I/P Converter |
| Describe types of failures of analog sensors. | Textbook: pg. 390–391, 817 |
| Duty Title: 7.04. Calibrate and test final control elements. | |
| Describe the operation of current-output and voltage-output signal final control elements. | Textbook: pg. 797–799, 801, 806 |
| Describe the operation of I/P converters. | Textbook: pg. 807–808 |
| Describe the operation of pneumatic proportional valves. | Textbook: pg. 408–410, 811, 849–851 |
| Connect and test 2-way and 3-way pneumatic proportional valves. | Textbook: pg. 385, 408, 849–853 Lab Workbook: Activity 18-3, Basic Pneumatic Circuits 2 Lab Workbook: Activity 18-4, Troubleshooting Pneumatic Circuits |
| Connect and test an I/P converter. | Textbook: pg. 808 Lab Workbook: Activity 36-2, Calibrating an I/P Converter |
| Calibrate an I/P converter. | Textbook: pg. 814–815 Lab Workbook: Activity 36-2, Calibrating an I/P Converter |
| Calibrate a pneumatic proportional valve. | Textbook: pg. 814–815 Lab Workbook: Activity 38-1, Calibrating a Pneumatic Thermostat |
| Duty Title: 7.05. Install and operate a basic single loop system. | |
| Identify components for a basic single loop process control system. | Textbook: pg. 810–811 |
| Draw a print of a single loop process control system. | Textbook: pg. 800, 810–811 |
| Connect, calibrate, and tune a single loop process control system. | Textbook: pg. 810–811, 814–815 |
| Describe the operation of a PID process control loop. | Textbook: pg. 808–810 |
| Describe the operation of a single loop process controller. | Textbook: pg. 810–811 |
| Describe the basic operation and application of PLC process control and Distributed Control Systems (DCS). | Textbook: pg. 796–797, 808 |