Correlation of

Industrial Maintenance and Mechatronics,

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to

NIMS (National Institute for Metalworking Skills)

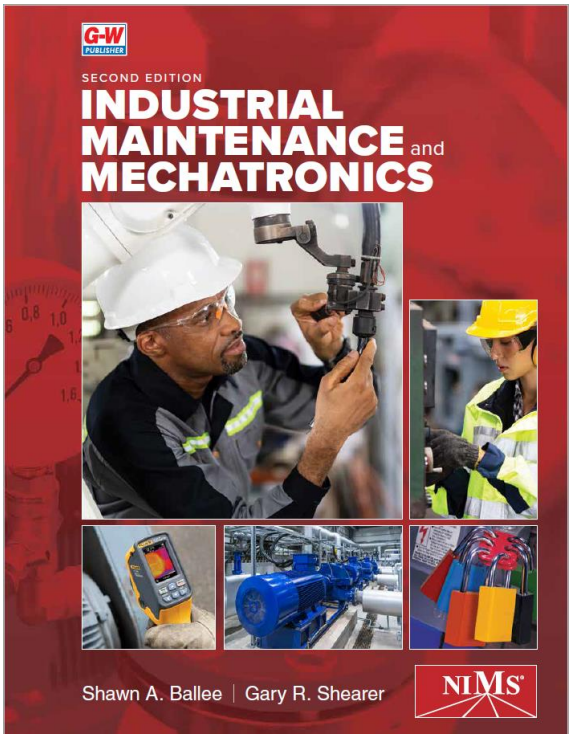
Classic Credential:

Basic Mechanical 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: 2.01. Adhere to mechanical power transmission 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
BMS-Specific	
Explain the purpose of machine guarding for mechanical power transmission systems.	Textbook: pg. 252, 261,
Identify required machine guarding for mechanical power transmission systems.	Textbook: pg. 252, 261
Describe how to safely store and dispose lubricants and maintenance chemicals.	Textbook: pg. 226
Duty Title: 2.02. Use dimensional measurement tools.	
Use metric, decimal, and inch fraction rules.	Textbook: pg. 926–927, 929, 931
Apply English and metric units conversions of measurement.	Textbook: pg. 925, 931, 932
Use digital calipers and dial calipers.	Textbook: pg. 151-152
Use digital and vernier micrometers.	Textbook: pg. 151-152
Recognize and explain the difference between Resolution, Repeatability, Accuracy.	Textbook: pg. 299-300
Identify and select a measurement tool for a given task based on needed accuracy and feature to be measured.	Textbook: pg. 117, 148, 150-152
Describe how to check calibration of a measurement tool—concept of a master.	Textbook: pg. 243
Use a dial indicator or digital indicator to measure TIR (run out), flatness, and other features.	Textbook: pg. 243, 259 Lab Workbook: Activity 11-2, Dial Indicator Use Lab Workbook: Activity 11-3, Alignment Prechecks Lab Workbook: Activity 11-5, Final Alignment
Describe the concept of indirect measurement.	Textbook: pg. 507-508, 512, 937-939

Standards	G-W Content
Duty Title: 2.03. Power transmission	
Describe how to mount a motor.	Textbook: pg. 244-246, 586-587 Lab Workbook: Activity 11-3, Alignment Prechecks Lab Workbook: Activity 11-4, Rough Shaft Alignment Lab Workbook: Activity 11-5, Final Alignment
Describe how to correct for a soft foot on a motor.	Textbook: pg. 150, 241-242 Lab Workbook: Activity 11-3, Alignment Prechecks
Describe how to level motors and shaft.	Textbook: pg. 244 Lab Workbook: Activity 11-3, Alignment Prechecks
Install flexible, flange, grid, and chain couplings.	Textbook: pg. 235, 237-240
Identify couplings given a specification.	Textbook: pg. 237-240
Use manufacturer's documentation to locate alignment specifications of a coupling.	Textbook: pg. 237-240
Measure shaft speed using a tachometer.	Textbook: pg. 303
Align a shaft using various equipment techniques; feeler gauge and straight edge, rim and face, dial indicators and laser aligning equipment.	Textbook: pg. 244-246 Lab Workbook: Activity 11-2, Dial Indicator Use Lab Workbook: Activity 11-3, Alignment Prechecks Lab Workbook: Activity 11-4, Rough Shaft Alignment Lab Workbook: Activity 11-5, Final Alignment
Describe how to install a multiple V-belt drive onto a shaft with a bushing (define).	Textbook: pg. 252-255 Lab Workbook: Activity 12-1, Bushings Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment
Describe how to install a timing belt or HTD belt onto a shaft using a bushing.	Textbook: pg. 253-255 Lab Workbook: Activity 12-1, Bushings Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment
Describe how to install split taper, QD, and taper lock bushings.	Textbook: pg. 255-256 Lab Workbook: Activity 12-1, Bushings
Interpret specifications of sheaves and V-belts.	Textbook: pg. 252-257 Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment
Identify V-belt drive components given a specification.	Textbook: pg. 252-253
Align a V-belt drive using a straightedge.	Textbook: pg. 259-260 Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment

Standards	G-W Content
Check tension of a V-belt drive using a tension tool.	Textbook: pg. 259, Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment
Tension a V-belt drive by positioning the prime mover.	Textbook: pg. 258-259 Lab Workbook: Activity 12-2, Initial Belt Installation and Sheave Alignment
Interpret specifications of sprockets and chains given a specification.	Textbook: pg. 261-264, Lab Workbook: Activity 12-3, Installing and Tensioning a Chain Drive
Install a chain drive using proper tools.	Textbook: pg. 261-264 Lab Workbook: Activity 12-3, Installing and Tensioning a Chain Drive
Align a chain drive using a straightedge.	Textbook: pg. 260 Lab Workbook: Activity 12-3, Installing and Tensioning a Chain Drive
Check tension of a chain drive using a straightedge and rule.	Textbook: pg. 265 Lab Workbook: Activity 12-3, Installing and Tensioning a Chain Drive
Tension a chain drive by positioning the prime mover.	Textbook: pg. 264-265 Lab Workbook: Activity 12-3, Installing and Tensioning a Chain Drive
Duty Title: 2.04. Alignment and adjustment of a gear drive.	
Explain how gears are attached to shafts through keys and keyways.	Textbook: pg. 108, 234-235
Interpret specifications of gears.	Textbook: pg. 266-269 Lab Workbook: Activity 12-4, Identifying Gears
Identify spur and right angle gear components given a specification.	Textbook: pg. 267, Lab Workbook: Activity 12-4, Identifying Gears Lab Workbook: Activity 12-5, Aligning Gears and Checking Backlash
Align a gear drive using a straightedge (define straightedge).	Lab Workbook: Activity 12-5, Aligning Gears and Checking Backlash
Explain how to check backlash of gears using a dial indicator per specifications.	Textbook: pg. 266, 271 Lab Workbook: Activity 12-5, Aligning Gears and Checking Backlash
Duty Title: 2.05. Install, align, and adjust pillow block and flange bearings.	
Interpret specifications of pillow block and flange bearings.	Textbook: pg. 235-237
Identify pillow block bearings given a specification.	Textbook: pg. 235-237
Install, align and adjust pillow block and flange bearings.	Textbook: pg. 235-237

Standards	G-W Content
Duty Title: 2.06. Equipment lubrication.	
Explain importance of a lubrication plan.	Textbook: pg. 226-227
Identify all oil and grease lubrication points using the manual.	Textbook: pg. 224-226
Identify/ select correct lubricant given a specification from the manual.	Textbook: pg. 226-227
Describe the procedure for safe handling and storage of lubricants.	Textbook: pg. 226
Lubricate bearings using Zerk fittings.	Textbook: pg. 221, 227
Use a grease gun to lubricate a bearing.	Textbook: pg. 227 Lab Workbook, Activity 10-3, Lubricant Selection and Specification
Fill an oil cup.	Textbook: pg. 227
Inspect and fill automatic lubricators.	Textbook: pg. 227
Explain what is a lubrication oil.	Textbook: pg. 265
Explain what is a lubricating grease and what different grades are used for.	Textbook: pg. 226
Explain the purpose of vent plugs.	Textbook: pg. 227
Explain the purpose of additives and viscosity.	Textbook: pg. 224-226
Explain the effects of over- and under-lubrication of bearings.	Textbook: pg. 227
Duty Title: 2.07. Power transmissions troubleshooting.	
Identify the cause of wear or malfunction of a flexible coupling through visual inspection.	Textbook: pg. 217
Perform troubleshooting techniques to analyze the wear or malfunction of a V-belt drive.	Textbook: pg. 258-261
Perform troubleshooting techniques to analyze the wear or malfunction of a chain drive.	Textbook: pg. 264-265
Perform troubleshooting techniques to analyze the wear or malfunction of a gear drive.	Textbook: pg. 270-272
Perform troubleshooting techniques to analyze the wear or malfunction of a pillow block bearing.	Textbook: pg. 235-236