

STATE OF WYOMING

MANUFACTURING CLUSTER AND PATHWAY COMPETENCIES

Manufacturing Cluster

Cluster Level Core Competencies & Objectives

COMPETENCY

MFG1 The student will understand and apply safe practices and professional machine shop procedures

OBJECTIVES

- MFG1-1 Understand and apply appropriate clothing protection appropriate to the task
- MFG1-2 Locate and properly use protective equipment
- MFG1-3 Identify hazardous and non-hazardous materials
- MFG1-4 Understand and apply appropriate handling, lifting and transport of materials (hazardous and non-hazardous)
- MFG1-5 Understand and apply proper storage, stacking and securing of materials (hazardous and non-hazardous)
- MFG1-6 Apply appropriate disposal of hazardous and non-hazardous materials
- MFG1-7 Demonstrate understanding of legal issues relating to disposal of materials
- MFG1-8 Identify the purposes and use of MSDS sheets

COMPETENCY

MFG2 The student will demonstrate proper equipment safety practices

OBJECTIVES

- MFG2-1 Maintain and use appropriate protective guards and equipment on machinery
- MFG2-2 Select appropriate tool for the task
- MFG2-3 Conduct pre-use inspection and set-up of tools
- MFG2-4 Apply proper use of the tool (hand placement, minimum and max material sizes, feed rates)
- MFG2-5 Demonstrate awareness of proper functioning during use of the tool
- MFG2-6 Demonstrate maintenance of the tool (cleaning, lubrication, sharpening)

COMPETENCY

MFG 3 The student will demonstrate proper use of emergency equipment and procedures

- MFG3-1 Demonstrate proper use of fire extinguisher
- MFG3-2 Understand purpose and meaning of fire triangle (covers all areas)
- MFG3-3 Understand and apply evacuation procedures
- MFG3-4 Understand basic first aid to cuts and burns, eye wash, and blood-born pathogens

COMPETENCY

MFG 4 The student will use basic math and measuring skills

OBJECTIVES

- MFG4-1 Demonstrate proper use of measuring devices
 - Example: tape measure, rule and square
- MFG4-2 Identify and apply appropriate unit of measurement
- MFG4-3 Able to measure to a specified tolerance
- MFG4-4 Convert fractions/decimals/metric
- MFG4-5 Apply appropriate calculation to the task (add, subtract, multiply, divide)
- MFG4-6 Perform basic layout techniques

COMPETENCY

MFG 5 The student will demonstrate knowledge and skills specific to the pathway

OBJECTIVES

- MFG5-1 Student demonstrates an understanding of the different career paths and opportunities within a pathway
 - Example (Welding Pathway): Student will demonstrate knowledge of welding opportunities in the oil and natural gas, heavy equipment manufacturing and mining industries within Wyoming.
 - Example (Precision Machining Pathway): Student will demonstrate knowledge of precision machining in the industries within Wyoming
- MFG5-2 The student will be able to interpret drawings, plans and control documents specific to the pathway
- MFG5-3 The student will be able to identify generally used materials specific to the pathway
- MFG5-4 The student will demonstrate ability to complete core processes within the pathway
- MFG5-5 The student will demonstrate proper use of the tool in completing a specific process

Manufacturing Cluster

WELDING PATHWAY

Pathway Core Competencies & Objectives

COMPETENCY

WDG1 The student will identify welding tools and equipment.

OBJECTIVES

- WDG1-1 Identify basic hand tools (chipping hammers, brushes, files, strikers)
- WDG1-2 Identify basic power tools and equipment (grinders, drills, oxyfuel equipment, and electric arc welding equipment)

COMPETENCY

WDG2 The student will demonstrate an understanding of welding processes.

OBJECTIVES

- WDG2-1 Identify and describe different welding processes (SMAW, GMAW, GTAW, OXYFUEL cutting, FCAW)
- WDG2-2 Identify welding orientation (positioning (flat, vertical, horizontal, overhead, IG-4G, and 1G/F))
- WDG2-3 Identify joint types (five types -- butt, lap, T, corner, edge)
- WDG2-4 Identify cutting processes (plasma, oxyfuel, carbon-arc)

COMPETENCY

WDG3 The student will be able to interpret drawings, plans and control documents.

OBJECTIVES

- WDG3-1 Interpret welding prints to determine tolerance dimensions in decimal, fractions, and degrees.
- WDG3-2 Identify the basic components of a blueprint.
- WDG3-3 Identify and interpret basic welding symbols
 - EXAMPLES: Fillet Weld and Groove weld

COMPETENCY

WDG4 The student will be able to identify generally used welding materials.

OBJECTIVES

- WDG4-1 Identify key welding materials include ferrous and non-ferrous materials (steel, aluminum, stainless, high-carbon steel, low-carbon steel, cast iron)
- WDG4-2 identify welding structures (channel, angle, tubing, i-beam, h-beam, sheeting)
- WDG4-3 Select the material for the appropriate application

COMPETENCY

WDG5 The student will demonstrate ability to understand, plan and complete core welding processes.

OBJECTIVES

- WDG5-1 Select appropriate process and tooling for the specified thickness/gauge
- WDG5-2 Understand testing and inspection methods (non-destructive and destructive)
- WDG5-3 Identify appropriate electrodes and filler materials for the specific process (AWS standards)
- WDG5-4 Perform safety inspections of equipment and accessories used in process

COMPETENCY

WDG6 The student will demonstrate proper use of the tool to conduct shielded metal arc welding processes.

OBJECTIVES

- WDG6-1 Conduct set up for shielded metal arc welding operations on plain carbon steel
- WDG6-2 Start and restart an arc, crater, and backfill at the edge while running a bead on mild steel plate (performance application)
- WDG6-3 Complete a weld that meets these specifications: E6010, E7018, flat and horizontal positions)

COMPETENCY

WDG7 The student will demonstrate proper use of the tool to conduct manual oxyfuel gas cutting processes.

OBJECTIVES

- WDG7-1 Conduct set up for manual oxyfuel gas cutting operations on plain carbon steel
- WDG7-2 Operate manual oxyfuel gas cutting equipment
- WDG7-3 Perform straight cutting operations on plain carbon steel (within 1/8" tolerance)
- WDG7-4 Perform shape-cutting operations on plain carbon steel (within 1/8" tolerance)
- WDG7-5 Perform bevel-cutting operations on plain carbon steel (within 1/8" tolerance)

COMPETENCY

WDG8 The student will demonstrate proper use of equipment to conduct oxy fuel welding processes.

OBJECTIVES

- WDG8-1 Conduct set up for oxy fuel welding operations on plain carbon steel
- WDG8-2 Operate oxy fuel welding equipment
- WDG8-3 Perform a flat weld using mild steel filler rod on plain carbon steel (butt, lap and T and outside corner joints)
- WDG8-4 Perform a flat braze on mild steel (butt, lap, T, and outside corner joints.)

COMPETENCY

WDG9 The student will demonstrate proper use of the tool to conduct gas metal arc welding processes.

OBJECTIVES

- WDG9-1 Conduct set up for gas metal arc welding operations on plain carbon steel
- WDG9-2 Operate gas metal arc welding equipment
- WDG9-3 Use Short Circuit Transfer to make fillet welds in flat and horizontal position on plain carbon steel
- WDG9-4 Use Short Circuit Transfer to make grove welds in flat and horizontal position on plain carbon steel

*Note: The following are competencies that are NOT OFFERED STATEWIDE.
Accordingly, these core competencies apply only to those programs that cover
these topics.*

COMPETENCY

WDG10 The student will demonstrate proper use of the tool to conduct flux cored arc welding processes

OBJECTIVE

- WDG10-1 Conduct set up for flux core arc welding operations on plain carbon steel
- WDG10-2 Operate flux core arc welding equipment
- WDG10-3 Make fillet welds in flat and horizontal position on plain carbon steel

COMPETENCY

WDG11 The student will demonstrate proper use of the tool to conduct gas tungsten arc welding processes.

OBJECTIVES

- WDG11-1 Conduct set up for gas tungsten arc welding operations on plain carbon steel
- WDG11-2 Operate gas tungsten arc welding equipment
- WDG11-3 Make square groove and fillet joints in flat position

COMPETENCY

WDG12 The student will demonstrate proper use of the tool to conduct air carbon arc welding processes.

OBJECTIVES

- WDG12-1 Conduct set up for air carbon arc welding operations on plain carbon steel
- WDG12-2 Operate air carbon arc welding equipment
- WDG12-3 Perform straight cutting operations on plain carbon steel
- WDG12-4 Perform bevel-cutting operations on plain carbon steel
- WDG12-5 Perform gouging operations on plain carbon steel

COMPETENCY

WDG13 The student will demonstrate proper use of the tool to conduct plasma arc cutting processes.

OBJECTIVES

- WDG13-1 Conduct set up for plasma arc welding operations on plain carbon steel
- WDG13-2 Operate plasma arc welding equipment
- WDG13-3 Perform straight cutting operations on plain carbon steel
- WDG13-4 Perform shape cutting operations on plain carbon steel
- WDG13-5 Perform bevel-cutting operations on plain carbon steel

Note: We would like to acknowledge that some schools within the state currently or will in the future offer the following. However, these topics are NOT OFFERED STATEWIDE due to size or time limitations and as such, competencies have not been identified at this time.

- Plastic welding
- CNC cutting
- Plasma and oxy fuel
- Waterjet cutting
- Laser cutting and welding
- Hard surfacing

Manufacturing Cluster
PRECISION MACHINING PATHWAY

Pathway Core Competencies & Objectives

COMPETENCY

PM1 The student will use basic math and measuring skills specific to Precision Machining.

OBJECTIVES

- PM1-1 Perform basic trigonometric functions
- PM1-2 Solve for unknown angles
- PM1-3 Solve for unknown sides
- PM1-4 Calculate bolt hole patterns
- PM1-5 Apply proper measuring techniques
- PM1-6 Demonstrate how to check calibration of various precision instruments.

COMPETENCY

PM2 The student will be able to interpret engineering drawings, plans and control documents.

OBJECTIVES

- PM2-1 Review blueprint notes and dimensions
- PM2-2 Explain basic blueprint terminology
- PM2-3 Identify the types of dimensions
- PM2-4 Identify general note symbols
- PM2-5 Locate notes on a print
- PM2-6 Interpret commonly used abbreviations and terminology
- PM2-7 Determine tolerances associated with dimensions on a drawing
- PM2-8 Identify and list the essential components found in the general drawing notes

COMPETENCY

PM3 The student will identify the basic layout of drawings.

OBJECTIVES

- PM3-1 Identify types of lines within a drawing
- PM3-2 Identify item number symbols

- PM3-3 Identify general note symbols
- PM3-4 List the essential components found in the title block
- PM3-5 Locate bill of materials on a drawing
- PM3-6 List the components found in the revision block

COMPETENCY

PM4 The student will identify basic types of drawings.

OBJECTIVES

- PM4-1 Identify orthographic views
- PM4-2 Identify positions of views (top, front, side, and auxiliary)
- PM4-3 Visualize one or more views from a given view
- PM4-4 Identify isometric views
- PM4-5 Identify exploded isometric drawings
- PM4-6 Identify assembly drawings

COMPETENCY

PM5 The student will be able to recognize different precision machining materials.

OBJECTIVES

- PM5-1 Identify common materials and explain their desired properties
- PM5-2 Describe general characteristics for carbon steels, tool steels, stainless steels, structural steels, cast irons, aluminum, and other commonly used metals

COMPETENCY

PM6 The student will apply and select proper measurement techniques and tools as they best relate to part characteristics and specified accuracy.

OBJECTIVES

- PM6-1 Identify basic semi-precision measuring tools and describe their major applications
- PM6-2 Identify precision measuring tools and describing their major applications
- PM6-3 Demonstrate proper reading of tools to their finest precision
- PM6-4 Demonstrate proper reading of tools to their finest graduation
- PM6-5 Demonstrate proper manipulation and care of precision measuring tools

COMPETENCY

PM7 The student will be able to understand, plan and complete core processes in Precision Machining.

OBJECTIVES

- PM7-1 Perform basic semi-precision and precision layout as necessary
- PM7-2 Plan machining operations and write a plan of procedures
- PM7-3 Use the machinery handbook as a reference
- PM7-4 Calculate proper speeds, feeds, depth of roughing, and finish cuts for specific applications
- PM7-5 Describe machine-ability and chip formation and make adjustments to calculate speeds, feeds, and depths of roughing and finish cuts for common machining applications (performance application)
- PM7-6 Demonstrate order of operations to complete a specified task using milling, drilling, turning, and shaping machines

COMPETENCY

PM8 The student will demonstrate proper use of the hand tools in completing a specific process.

OBJECTIVES

- PM8-1 Identify common hand tools and describe their basic applications.
- PM8-2 Demonstrate the proper care and use of arbor and shop presses
- PM8-3 Select necessary work holding devices and hand tools as dictated by the size and shape of the part plus the machining to be done
- PM8-4 Select the most appropriate hand file and properly demonstrate its use
- PM8-5 Correctly identify and use: hand taps; thread cutting dies; and thread gauges
- PM8-6 Demonstrate the proper use and care of bench and pedestal grinders.

COMPETENCY

PM9 The student will demonstrate the proper use of machines in completing a specific process.

OBJECTIVES

- PM9-1 For each machine, including Drilling, Vertical Milling, Metal Lathes, and Abrasive Machines, the student will demonstrate:
- PM9-2 Proper setup and operation
- PM9-3 Proper cleaning and care
- PM9-4 Inspection of designated machines
- PM9-5 Carry out a specific, appropriate operation within a specified time frame

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- Computer Numerical Controlled (CNC)
- Foundry work
- Plastics
- Principles of Technology
- Robotics
- Mechatronics
- Ornamental ironworking