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 grove 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 devises 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