Florida CTE

Manufacturing (2021): Machining Technologies

Adopted 2021

Machining Technologies (J200100)

Machining Technologies - Course Number: PMT0020

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0. Demonstrate an understanding of workplace safety and workplace organization.--The student will be able to: 01.0
    01. Identify safety requirements for manual, electrical-powered, and pneumatic tools. 01.01
    02. Demonstrate, apply, and provide evidence of safely using manual, electrical-powered, and pneumatic tools. 01.02
    03. Identify safety requirements for operation of automated machines and equipment. 01.03
    04. Demonstrate, apply, and provide evidence of safely operating automated machines and equipment. 01.04
    05. Demonstrate, apply, and provide evidence of properly storing equipment and tools. 01.05
    06. Demonstrate, apply, and provide evidence of properly storing precision measuring tools. 01.06
    07. Identify, demonstrate, apply, and provide evidence of understanding of shop safety rules on an ongoing basis. 01.07
    08. Research and characterize class A, B, and C type fires. 01.08
    09. Demonstrate and apply the proper procedures for extinguishing class A, B, and C type fires. 01.09
    10. Identify various workplace injuries related to the machining industry. 01.10
    11. Demonstrate and practice knowledge of first aid and first response procedures appropriate for this course. 01.11
    12. Identify and apply safety procedures in case of smoke or chemical inhalation. 01.12
    13. Demonstrate and apply material handling techniques to safely move materials. 01.13
    14. Demonstrate and apply proper techniques for lifting loads. 01.14
    15. Research Occupational Safety Health Administration (OSHA) safety standards. 01.15
    16. Demonstrate, apply, and provide evidence of understanding Occupational Safety Health Administration (OSHA) safety standards. 01.16
    17. Locate Safety Data Sheets (SDS). 01.17
    18. Demonstrate understanding and knowledge of using and applying the information located on Safety Data Sheets (SDS). 01.18
    19. Proactively respond to a safety concern and then document occurrences. 01.19
    20. Demonstrate knowledge of emergency exits and signage. 01.20
    21. Develop safety checklists. 01.21
    22. Identify and report unsafe conditions. 01.22

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23. Determine the appropriate corrective action after an unsafe condition is identified. 01.23
24. Demonstrate knowledge of various emergency alarms and procedures. 01.24
25. Perform emergency drills and participate in emergency teams. 01.25
26. Demonstrate knowledge and apply clean-up procedures for spills. 01.26
27. Explain Lock Out/Tag Out requirements and procedures. 01.27
28. Demonstrate knowledge of machinery and equipment safety functions to determine if all safeguards are operational. 01.28
29. Identify and apply procedures for handling hazardous material. 01.29
30. Perform safety and environmental inspections. 01.30
31. Perform leak checks to determine if toxic or hazardous material is escaping from a piece of equipment. 01.31
32. Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations. 01.32
33. Demonstrate and apply proper equipment shutdown procedures. 01.33
34. Identify safety related maintenance procedures. 01.34
35. Select lubricants for machining operations. 01.35
36. Lubricate equipment parts. 01.36
37. Inspect and maintain machine cutting fluids. 01.37
38. Inspect drive pulleys and belts; perform necessary action. 01.38
39. Properly dispose of scrap-metal chips, shavings, trash, and waste. 01.39
40. Identify, select, and use personal protective equipment (PPE). 01.40
41. Explain the safety benefits of 6S work environment. 01.41
42. Identify, demonstrate, and apply ergonomic work techniques. 01.42
43. Train other students to use and apply safety skills outlined in this standard. 01.43

0. Solve basic job-related math problems.--The student will be able to: 02.0
    01. Solve job-related problems by adding, subtracting, multiplying, and dividing whole numbers, decimals, and common fractions. 02.01
    02. Calculate the amount of material that should be removed to obtain correct limits for secondary operations. 02.02
    03. Solve job-related problems using mathematical handbooks, charts, and tables. 02.03
    04. Calculate machine speed and feed by using appropriate formulas. 02.04
    05. Calculate chip load per tooth on milling operations. 02.05

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0. Interpret basic blueprint information.--The student will be able to: 03.0
    01. Interpret view concepts. 03.01
    02. Interpret lines. 03.02
    03. Read and interpret title blocks. 03.03
    04. Read and interpret change orders on working and assembly prints. 03.04
    05. Read and interpret abbreviations. 03.05
    06. Identify basic geometrical dimensioning & tolerancing (GD&T) terminology. 03.06
0. Perform basic measuring operations.--The student will be able to: 04.0
    01. Comply with safe and efficient work practices. 04.01
    02. Measure a workpiece and compare measurements with blueprint specifications, including tolerances. 04.02
    03. Read and measure with rules and calipers. 04.03
    04. Read and measure with micrometers. 04.04
    05. Read and measure with vernier tools. 04.05
    06. Use surface-plate techniques. 04.06
0. Perform benchwork skills.--The student will be able to: 05.0
    01. Comply with safe and efficient work practices. 05.01
    02. Cut materials by using appropriate hand saws. 05.02
    03. Cut threads by using hand taps. 05.03
    04. Cut threads by using dies. 05.04
    05. Deburr workpiece. 05.05
    06. Demonstrate or identify filing techniques. 05.06
0. Demonstrate basic knowledge of manufacturing history and primary manufacturing processes.--The student will be able to: 06.0
    01. Demonstrate knowledge of how manufacturing processes have evolved throughout history. 06.01
    02. Demonstrate knowledge of obtaining raw materials through harvesting and extracting. 06.02
    03. Explain the difference between primary and secondary manufacturing processes. 06.03
    04. Demonstrate knowledge of primary processes (e.g., thermal, chemical, mechanical, etc.) 06.04

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0. Demonstrate basic knowledge of secondary manufacturing processes and manufacturing systems.--The student will be able to: 07.0
    01. Demonstrate knowledge of secondary processes. (e.g., casting and molding, separating, forming, conditioning, assembling, and finishing) 07.01
    02. Demonstrate knowledge of the various materials used in manufacturing. (e.g., metallic, polymeric, ceramic, composite) 07.02
    03. Demonstrate knowledge of the various material properties. (e.g., physical, mechanical, chemical, thermal, acoustic, optical, electrical and magnetic) 07.03
    04. Demonstrate knowledge of the technological or universal systems model. (inputs, process, outputs, feedback) 07.04
    05. Demonstrate knowledge of the various manufacturing/production systems. (e.g., custom, intermittent, continuous, flexible, automated) 07.05
    06. Demonstrate knowledge of the use of current manufacturing processes. 07.06
    07. Demonstrate knowledge of quality assurance. 07.07
0. Demonstrate an understanding of graphic design by generating and interpreting computer-aided drawings.--The student will be able to: 08.0
    01. Create a sketch of an object. 08.01
    02. Select the front view of an object. 08.02
    03. Use a CAD System to open and change the views of CAD drawings. 08.03
    04. Use standard CAD commands (such as Grid, Snap, Array, Erase, Trim Break) in the editing of a drawing. 08.04
    05. Use CAD software to create a single view drawing. 08.05
    06. Use CAD software to create a multi-view drawing. 08.06
    07. Use CAD software to dimension a drawing. 08.07
    08. Use the UCS command to create a custom 3D coordinate system orientation. 08.08
    09. Create a 3D object using 3D drawing commands. 08.09
    10. Open and change the view of a solid model. 08.10

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0. Perform basic precision measuring operations.--The student will be able to: 09.0
    01. Use appropriate measurement tools. (e.g., machinist's rule, tape measure, calipers, micrometers, vernier and dial indicator. 09.01
    02. Convert between common fraction inches and decimal inches. 09.02
    03. Calibrate a dial caliper. 09.03
    04. Master a dial indicator. 09.04
    05. Read and interpret gage blocks and adjustable gages. 09.05
    06. Implement appropriate testing regimes. 09.06
    07. Use appropriate safety monitoring and testing equipment. 09.07
    08. Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements. 09.08
    09. Research measurement tools for non-mechanical systems and products. (i.e. pH, °Brix) 09.09
0. Sharpen machining tools.--The student will be able to: 10.0
    01. Comply with safe and efficient work practices. 10.01
    02. Hand sharpens cutting tools by using abrasive stones. 10.02
    03. Grind lathe tools to required angles. 10.03
    04. Sharpen drills. 10.04
0. Set up and operate power saws.--The student will be able to: 11.0
    01. Comply with safe and efficient work practices. 11.01
    02. Remove and replace saw blades. 11.02
    03. Select appropriate blades to perform given sawing operations. 11.03
    04. Select and set speeds and feeds for given sawing operations. 11.04
    05. Measure and cut material using a power saw. 11.05
    06. Saw to scribed lines by using a metal band saw. 11.06
    07. Cut and weld band-saw blades for contour sawing. (optional) 11.07
    08. Set up and operate saws for angular cutting. 11.08
0. Set up and operate pedestal grinders.--The student will be able to: 12.0
    01. Comply with safe and efficient work practices. 12.01
    02. Identify the parts of the machine and explain their uses. 12.02
    03. Set up support rests. 12.03
    04. Dress grinding wheels. 12.04

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0. Set up and operate drill presses.--The student will be able to: 13.0
    01. Identify the parts of a drill press and explain their uses. 13.01
    02. Identify and set the machine controls. 13.02
    03. Comply with safe and efficient work practices. 13.03
    04. Select the proper tooling. 13.04
    05. Set up and operate drill press for hole work, center drill, drill, ream, countersink, and counterbore. 13.05
    06. Set drill presses for proper feed and speed for specified operations. 13.06
0. Explain the importance of employability and entrepreneurship skills.--The students will be able to: 14.0
    01. Identify and demonstrate positive work behaviors needed to be employable. 14.01
    02. Develop personal career plan that includes goals, objectives, and strategies. 14.02
    03. Examine licensing, certification, and industry credentialing requirements. 14.03
    04. Maintain a career portfolio to document knowledge, skills, and experience. 14.04
    05. Evaluate and compare employment opportunities that match career goals. 14.05
    06. Identify and exhibit traits for retaining employment. 14.06
    07. Identify opportunities and research requirements for career advancement. 14.07
    08. Research the benefits of ongoing professional development. 14.08
    09. Examine and describe entrepreneurship opportunities as a career planning option. 14.09

Machinist Operator – Course Number: PMT0022

0. Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.--The students will be able to: 15.0
    01. Employ leadership skills to accomplish organizational goals and objectives. 15.01
    02. Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. 15.02
    03. Conduct and participate in meetings to accomplish work tasks. 15.03
    04. Employ mentoring skills to inspire and teach others. 15.04

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0. Solve problems using critical thinking skills, creativity and innovation.--The students will be able to: 16.0
    01. Employ critical thinking skills independently and in teams to solve problems and make decisions. 16.01
    02. Employ critical thinking and interpersonal skills to resolve conflicts. 16.02
    03. Identify and document workplace performance goals and monitor progress toward those goal. 16.03
    04. Conduct technical research to gather information necessary for decision-making. 16.04
0. Solve advanced job-related math problems.--The student will be able to: 17.0
    01. Solve job-related problems using basic formulas, geometry, and trigonometry. 17.01
    02. Convert measurements from English to metric and from metric to English units. 17.02
0. Demonstrate inspection methods.--The student will be able to: 18.0
    01. Comply with safe and efficient work practices. 18.01
    02. Measure with sine bars. 18.02
    03. Take readings with hardness testers. 18.03
    04. Explain the purpose of statistical process control (SPC). 18.04
0. Plan lathe machining operations.--The student will be able to: 19.0
    01. Comply with safe and efficient work practices. 19.01
    02. Perform layout for precision machine work by using layout instruments. 19.02
    03. Describe the importance of quality assurance. 19.03
0. Interpret and apply blueprint for lathe machine operations.--The student will be able to: 20.0
    01. Create shop sketches. 20.01
    02. Read and interpret blueprints that include geometric tolerances. 20.02
    03. Determine and interpret reference information used in performing machine work. 20.03
    04. Comply with safe and efficient work practices. 20.04
    05. Inspect, remove, and replace manufactured parts that need repair or machine work. 20.05
    06. Select the most productive tool and tooling for a given operation. 20.06
    07. Identify the costs involved in product production. 20.07

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0. Operate lathes.--The student will be able to: 21.0
    01. Identify the parts of a lathe and explain their uses. 21.01
    02. Comply with safe and efficient work practices. 21.02
    03. Inspect tooling prior to operations. 21.03
    04. Set up an engine lathe. 21.04
    05. Secure tools, tool holders, and fixtures or attachments. 21.05
    06. Select and set feeds and speeds. 21.06
    07. Set up lathes and face workpieces held in chucks. 21.07
    08. Rough cut and finish cut with lathes. 21.08
    09. Perform lathe filing to deburr parts. 21.09
    10. Drill holes with lathes. 21.10
    11. Countersink holes with lathes. 21.11
    12. Ream holes with lathes. 21.12
    13. Tap threads with lathes. 21.13
    14. Die cut threads with lathes. 21.14
    15. Counterbore holes with lathes. 21.15
    16. Align lathe centers using accurate methods. 21.16
    17. Bore holes with lathes. 21.17
    18. Knurl parts with lathes. 21.18
    19. Cut external threads with lathes. 21.19
    20. Perform contour, angular, or radii cuts with lathes. 21.20
    21. Set up the faceplate and dog. 21.21
0. Use computer-aided design/computer-aided manufacturing (CAD/CAM) processes for lathe operations.--The student will be able to: 22.0
    01. Identify parts of the machine and explain their uses. 22.01
    02. Identify CAD/CAM processes. 22.02
    03. Comply with safe and efficient work practices. 22.03
    04. Create a multidimensional geometry of parts. 22.04
    05. Create a CNC code from parts geometry. 22.05
    06. Identify the basic classification of CNC tooling. 22.06
    07. Set up and manufacture parts. 22.07

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0. Set up and operate a computerized-numerical-control (CNC) machine for lathe operations.--The student will be able to: 23.0
    01. Comply with safe and efficient work practices. 23.01
    02. Set up work holding devices. 23.02
    03. Select proper cutting tools. 23.03
    04. Write a basic program and apply basic programming skills. 23.04
    05. Adjust appropriate cutting tools and tool offsets. 23.05
    06. Machine and create parts to blueprint tolerances. 23.06
0. Plan milling machining operations.--The student will be able to: 24.0
    01. Comply with safe and efficient work practices. 24.01
    02. Perform layout for precision machine work by using layout instruments. 24.02
    03. Describe the importance of quality assurance. 24.03
0. Interpret and apply blueprint for milling machine operations.--The student will be able to: 25.0
    01. Create shop sketches. 25.01
    02. Read and interpret blueprints that include geometric tolerances. 25.02
    03. Determine and interpret reference information used in performing machine work. 25.03
    04. Comply with safe and efficient work practices. 25.04
    05. Lay out radial and bolt hole circles. 25.05
    06. Inspect, remove, and replace manufactured parts that need repair or machine work. 25.06
    07. Select the most productive tool and tooling for a given operation. 25.07
    08. Identify the costs involved in product production. 25.08

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0. Operate milling machines.--The student will be able to: 26.0
    01. Identify the parts of a vertical milling machine and explain their uses. 26.01
    02. Comply with safe and efficient work practices. 26.02
    03. Inspect tooling prior to operations. 26.03
    04. True up the head and align milling fixtures. 26.04
    05. Select and set feeds and speeds for milling work. 26.05
    06. Square up workpieces with a table vise. 26.06
    07. Perform end milling. 26.07
    08. Perform fly-cutting operations. 26.08
    09. Drill holes with milling machines. 26.09
    10. Perform reaming operations. 26.10
    11. Perform form milling. 26.11
    12. Mill an external radius. 26.12
    13. Mill an angle. 26.13
    14. Use an edge finder and wiggler. 26.14
    15. Identify the parts of vertical and horizontal milling machines and explain their uses. 26.15
    16. Select the correct set up and operation for different milling machines. 26.16
    17. Cut external keyways. 26.17
    18. Bore holes with boring head. 26.18
    19. Mill cylindrical work. 26.19
    20. Set up and perform slab mill operations. 26.20
    21. Use digital readouts. 26.21
    22. Set up and operate power tapping head. 26.22
0. Use computer-aided design/computer-aided manufacturing (CAD/CAM) processes for milling operations.--The student will be able to: 27.0
    01. Identify parts of the machine and explain their uses. 27.01
    02. Identify CAD/CAM processes. 27.02
    03. Comply with safe and efficient work practices. 27.03
    04. Create a multidimensional geometry of parts. 27.04
    05. Create a CNC code from parts geometry. 27.05
    06. Identify the basic classification of CNC tooling. 27.06
    07. Set up and manufacture parts. 27.07

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0. Set up and operate a computerized-numerical-control (CNC) machine for milling operations.--The student will be able to: 28.0
    01. Comply with safe and efficient work practices. 28.01
    02. Set up work holding devices. 28.02
    03. Select proper cutting tools. 28.03
    04. Write a basic program and apply basic programming skills. 28.04
    05. Adjust appropriate cutting tools and tool offsets. 28.05
    06. Machine and create parts to blueprint tolerances. 28.06

Machinist Setup Operator – Course Number: PMT0024

0. Perform advanced milling operations.--The student will be able to: 29.0
    01. Perform indexing operations using a dividing head. 29.01
    02. Set up and operate rotary tables. 29.02
    03. Design and use jigs and fixtures (optional) 29.03
0. Perform advanced lathe operations.--The student will be able to: 30.0
    01. Rechase threads with lathes. 30.01
    02. Cut internal threads with lathes. 30.02
    03. Set up and perform taper turning with the compound rest. 30.03
    04. Cut internal tapered surfaces. 30.04
    05. Set up and use follower and steady rests. 30.05
0. Use advance techniques to operate a computerized-numerical-control (CNC) machine.--The student will be able to: 31.0
    01. Identify parts of a CNC machine and explain their uses. 31.01
    02. Follow safe and efficient work practices, including procedures sheets. 31.02
    03. Identify unusual machine noises. 31.03
    04. Adjust machine speeds and feeds according to specifications. 31.04
    05. Inspect parts for correct dimensions. 31.05
0. Perform advanced set up and operation of a computerized-numerical-control (CNC) machine.--The student will be able to: 32.0
    01. Comply with safe and efficient work practices. 32.01
    02. Set up work holding devices. 32.02
    03. Select proper cutting tools. 32.03
    04. Write an advanced program and apply basic programming skills. 32.04
    05. Adjust appropriate cutting tools and tool offsets. 32.05
    06. Machine and create parts to blueprint tolerances. 32.06

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achinist – Course Number: PMT0025

0. Operate grinding machines.--The student will be able to: 33.0
    01. Identify the parts of a grinding machine and explain their uses. 33.01
    02. Comply with safe and efficient work practices. 33.02
    03. Set up and grind parallel flat surfaces. 33.03
    04. Select the proper wheel. 33.04
    05. Inspect, balance, dress, and true grinding wheels. 33.05
    06. Attach and align workpieces for grinding operations. 33.06
    07. Set up and grind four sides square. 33.07
    08. Select and set feeds and speeds of power-feed grinding machines. 33.08
    09. Cut or part workpieces with grinding machines. 33.09
    10. Set up and use angle plates. 33.10
    11. Grind to a shoulder. 33.11
    12. Grind a taper. 33.12
0. Operate and set up electrical discharge machine (EDM).--The student will be able to: 34.0
    01. Identify parts of the machine and explain their uses. 34.01
    02. Comply with safe and efficient work practices. 34.02
    03. Follow procedure sheets. 34.03
    04. Set up and adjust machine controls according to specifications. 34.04
    05. Select and manufacture electrode. 34.05
    06. Select flushing techniques. 34.06
    07. Create part according to specifications. (optional) 34.07
    08. Perform EDM programming. 34.08
0. Set up and operate heat-treating furnaces.--The student will be able to: 35.0
    01. Identify the parts of the machine and explain their uses. (optional) 35.01
    02. Identify and select proper machine controls. (optional) 35.02
    03. Comply with safe and efficient work practices. (optional) 35.03
    04. Select and identify proper heat-treatment processes. (optional) 35.04
    05. Perform a basic heat-treatment process to blueprint specifications. (optional) 35.05
0. Perform advanced grinding operations.--The student will be able to: 36.0
    01. Explain up grinders to run workpieces between centers. (optional) 36.01
    02. Explain up and use radius dressers. (optional) 36.02
    03. Explain cylindrical grinders. (optional) 36.03
    04. Explain operate inside diameter (ID) grinders. (optional) 36.04

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Welding Technology (J400400) **Welder Assistant 1 – Course Number: PMT0070**

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0. Demonstrate an understanding and apply workplace safety and workplace organization.--The student will be able to: WT.01.0
    01. Locate and use Safety Data Sheets (SDS). WT.01.01
    02. Demonstrate knowledge of first aid or first response procedures. WT.01.02
    03. Identify safety procedures in case of smoke or chemical inhalation. WT.01.03
    04. Demonstrate knowledge of material handling techniques to safely move materials. WT.01.04
    05. Demonstrate the proper techniques for lifting. WT.01.05
    06. Proactively respond to a safety concern and notify the instructor. WT.01.06
    07. Demonstrate knowledge of emergency exits and signage. WT.01.07
    08. Demonstrate knowledge of various emergency alarms and procedures WT.01.08
    09. Perform emergency drills and participate in emergency teams. WT.01.09
    10. Demonstrate knowledge of clean-up procedures. WT.01.10
    11. Explain Lock Out/Tag Out requirements procedures, including confined space awareness. WT.01.11
    12. Demonstrate knowledge of machinery and equipment safety functions to determine if all safeguards are operational. WT.01.12
    13. Identify procedures for handling hazardous material. WT.01.13
    14. Develop safety checklists. WT.01.14
    15. Determine the appropriate corrective action after an unsafe condition is identified. WT.01.15
    16. Demonstrate knowledge of safety requirements for manual, electrical-powered, and pneumatic tools. WT.01.16
    17. Demonstrate knowledge of safety requirements for operation of automated machines. WT.01.17
    18. Perform safety and environmental inspections. WT.01.18
    19. Demonstrate skill in performing leak checks to determine if toxic or hazardous material is escaping from a piece of equipment. WT.01.19
    20. Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations. WT.01.20
    21. Demonstrate knowledge of equipment shutdown procedures. WT.01.21
    22. Identify-safety related maintenance procedures. WT.01.22
    23. Selecting and use personal protective equipment (PPE). WT.01.23
    24. Demonstrate knowledge of ergonomic impact of work techniques. WT.01.24
    25. Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA)). WT.01.25

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26. Apply Occupational Safety Health Administration (OSHA) safety standards properly. WT.01.26
27. Research and identify class A, B, and C type fires. WT.01.27
28. Demonstrate and apply the proper procedures for extinguishing class A, B, and C type fires. WT.01.28
29. Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices. WT.01.29
30. Describe "Right-to-Know" Law as recorded in (29 CFR-1910.1200) WT.01.30

0. Demonstrate basic knowledge of industrial and manufacturing processes.--The student will be able to: WT.02.0
   01. Demonstrate knowledge of the use of current manufacturing processes as related to the welding industry. WT.02.01
   02. Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment. WT.02.02
   03. Understand the processes of separating, forming, conditioning, fabricating, and finishing of materials. WT.02.03
   04. Explain the difference between primary and secondary manufacturing processes. WT.02.04
0. Describe and identify metals and their properties accurately.--The student will be able to: WT.03.0
   01. Describe and understand the steelmaking process. WT.03.01
   02. Describe and understand the differences between ferrous and nonferrous metals. WT.03.02
   03. Describe and understand casting, alloys and forging. WT.03.03
   04. Identify and understand metallurgical processes related to metals such as galvanized iron and steel, aluminum stainless steel, sheet metal, copper and brass. WT.03.04
   05. Identify, understand, and describe thermal properties of metals. WT.03.05
   06. Identify and describe common gages, shapes and dimensions of metals. WT.03.06

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0. Demonstrate and apply basic knowledge of drawing and interpreting AWS welding symbols.--The student will be able to: WT.04.0
    01. Interpret, understand, and apply elements of a drawing or sketch. WT.04.01
    02. Interpret, understand, and apply welding symbol information. WT.04.02
    03. Design and create a drawing using welding symbology. WT.04.03
    04. Identify a specified weld using a welding symbol. WT.04.04
    05. Draw welding symbols using given variables. WT.04.05
    06. Use and apply appropriate mathematical practices to the design and creation of drawings using welding symbols. WT.04.06
0. Apply basic oxy-fuel gas cutting principles and practices.--The student will be able to: WT.05.0
    01. Perform external inspections of equipment and accessories. WT.05.01
    02. Make minor repairs to equipment and accessories. WT.05.02
    03. Set up manual OFC operations for plain carbon steel. WT.05.03
    04. Operate manual oxy-fuel cutting equipment. WT.05.04
    05. Perform straight cutting operations using manual oxy-fuel cutting process on plain carbon steel. WT.05.05
0. Create a product using basic oxy-fuel gas cutting principles and practices.--The student will be able to: WT.06.0
    01. Design and create a basic work of art or project utilizing material and skills developed. WT.06.01
    02. Produce a product using drawings with tolerances and specifications. WT.06.02
    03. Create and deliver a presentation to communicate project results. WT.06.03

Welder Assistant 2 – Course Number: PMT0071

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0. Apply intermediate oxy-fuel gas cutting principles and practices.--The student will be able to: WT.07.0
    01. Apply intermediate manual oxy-fuel gas cutting skills. WT.07.01
    02. Perform shape cutting operations on plain carbon steel. WT.07.02
    03. Perform bevel cutting operations on plain carbon steel. WT.07.03
    04. Remove weld metal on plain carbon steel using weld washing techniques. WT.07.04
    05. Apply machine oxy-fuel gas cutting (track burner) skills. WT.07.05
    06. Perform safety inspections of equipment and accessories. WT.07.06
    07. Make minor external repairs to equipment and accessories. WT.07.07
    08. Set up for plain carbon steel machine OFC (track burner) operations. WT.07.08
    09. Operate machine oxy-fuel gas cutting (track burner) equipment. WT.07.09
    10. Perform straight cutting operations on plain carbon steel. WT.07.10
    11. Perform bevel cutting operations on plain carbon steel. WT.07.11
0. Demonstrate plasma arc cutting principles and practices.--The student will be able to: WT.08.0
    01. Apply Manual Air (Carbon Arc Gouging) and Cutting (CAC-A) skills. WT.08.01
    02. Perform safety inspections of equipment and accessories. WT.08.02
    03. Make minor external repairs to equipment and accessories. WT.08.03
    04. Set up manual air carbon arc gouging and cutting operations. WT.08.04
    05. Operate manual air carbon arc cutting equipment. WT.08.05
    06. Perform metal removal operations. WT.08.06
    07. Apply manual Arc Gouging and Arc Cutting (AC) skills. WT.08.07
    08. Make minor repairs to equipment and accessories. WT.08.08
    09. Set up for using plasma arc cutting operations. WT.08.09
    10. Operate manual plasma arc cutting equipment. WT.08.10
    11. Perform shape cutting operations using plasma arc cutting process. WT.08.11
0. Demonstrate a basic understanding of shielded metal arc welding (SMAW).--The student will be able to: WT.09.0
    01. Perform external inspections of SMAW equipment and accessories. WT.09.01
    02. Make minor repairs to SMAW equipment and accessories. WT.09.02
    03. Set up shielded metal arc welding operations on plain carbon steel. WT.09.03
    04. Operate shielded metal arc welding equipment. WT.09.04
    05. Make pad welds, all positions, on plain carbon steel. WT.09.05

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0. Create a product using oxy-fuel gas cutting and introductory shielded metal arc welding (SMAW) principles and practices.--The student will be able to: WT.10.0
    01. Design and create a work of art or project utilizing material and skills learned. WT.10.01
    02. Create a working drawing or blue print using welding symbols. WT.10.02
    03. Design a product from a working drawing or blue print created. WT.10.03
    04. Fabricate a product using the skills learned related to oxy-fuel gas cutting and introductory shielded metal arc welding (SMAW). WT.10.04
    05. Create and deliver a presentation to communicate project results. WT.10.05

Welder, SMAW 1 – Course Number: PMT0072

0. Apply basic shielded metal arc welding (SMAW) skills.--The student will be able to: WT.11.0
    01. Perform external inspections of SMAW equipment and accessories. WT.11.01
    02. Make minor repairs to SMAW equipment and accessories. WT.11.02
    03. Set up shielded metal arc welding operations on plain carbon steel. WT.11.03
    04. Operate shielded metal arc welding equipment. WT.11.04
    05. Make pad welds, all positions, on plain carbon steel. WT.11.05
    06. Make fillet welds, all positions, on plain carbon steel. WT.11.06
    07. Make groove welds, all positions, on plain carbon steel. WT.11.07
0. Demonstrate and apply Carbon Arc Gouging (GAC) principles and practices.--The student will be able to: WT.12.0
    01. Perform safety inspections of equipment and accessories. WT.12.01
    02. Repair unacceptable weld profiles. WT.12.02
    03. Properly set up equipment, accessories, and machine for Carbon Arc Gouging (GAC) WT.12.03
0. Apply visual examination skills.--The student will be able to: WT.13.0
    01. Examine cut surfaces and edges of prepared base metal parts. WT.13.01
    02. Examine tack, intermediate pass and cover pass. WT.13.02
0. Create a product using Carbon Arc Gouging and basic shielded metal arc welding (SMAW) principles and practices.--The student will be able to: WT.14.0
    01. Design and create a work of art or project utilizing material and skills learned. WT.14.01
    02. Create a working drawing or blue print using welding symbols. WT.14.02
    03. Design a product from a working drawing or blue print created. WT.14.03
    04. Fabricate a product using the skills learned related to Carbon Arc Gouging and basic shielded metal arc welding (SMAW). WT.14.04
    05. Create and deliver a presentation to communicate project results. WT.14.05

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Welder, SMAW 2 – Course Number: PMT0073

0. Demonstrate an understanding of employability skills and career opportunities related to the welding industry.--The student will be able to: WT.15.0
    01. Demonstrate knowledge of good workplace behavior and how to address improper workplace behavior. WT.15.01
    02. Discuss motivation and human behavior. WT.15.02
    03. Develop a personal stress management plan. WT.15.03
    04. Demonstrate knowledge of ways to improve reading, listening and writing skills. WT.15.04
    05. Demonstrate knowledge of techniques for making effective presentations. WT.15.05
    06. Use different forms of technology communication. WT.15.06
    07. Provide effective feedback and make suggestions. WT.15.07
    08. Demonstrate appropriate customer service skills and techniques. WT.15.08
    09. Demonstrate knowledge of roles and responsibilities of team members. WT.15.09
    10. Align team goals (that are specific, documented, measurable and achievable) to customer and business production needs. WT.15.10
    11. Effectively communicate production and process information. WT.15.11
    12. Develop personal career plan that includes goals, objectives, and strategies. WT.15.12
    13. Examine licensing, certification, and industry credentialing requirements. WT.15.13
    14. Evaluate and compare employment opportunities that match career goals. WT.15.14
    15. Identify and exhibit traits for retaining employment. WT.15.15
    16. Identify opportunities and research requirements for career advancement. WT.15.16
    17. Research the benefits of ongoing professional development. WT.15.17
    18. Examine and describe entrepreneurship opportunities as a career planning option. WT.15.18

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0. Apply intermediate shielded metal arc welding (SMAW) skills.--The student will be able to: WT.16.0
    01. Make single "V" groove welds, all positions (visual inspection criteria, using current and applicable welding industry codes) on plain carbon steel with backing. WT.16.01
    02. Perform 1G - 4G limited thickness qualification (bend) tests on plain carbon steel plate (using current and applicable welding industry codes). WT.16.02
    03. Perform destructive root and face bend specimens (using current and applicable welding industry codes). WT.16.03
    04. Understand WPS and PQR. WT.16.04
0. Create a product using intermediate shielded metal arc welding (SMAW) principles and practices.--The student will be able to: WT.17.0
    01. Design and create a work of art or project utilizing material and skills learned. WT.17.01
    02. Create a working drawing or blue print using welding symbols learned. WT.17.02
    03. Design a product from a working drawing or blue print created. WT.17.03
    04. Fabricate a product using the skills learned related to intermediate shielded metal arc welding (SMAW). WT.17.04
    05. Repair products of ferrous and non-ferrous metals. WT.17.05
    06. Create and deliver a presentation to communicate project results. WT.17.06

Welder – Course Number: PMT0074

0. Apply basic gas metal arc welding (GMAW) skills.--The student will be able to: WT.18.0
    01. Perform external inspections of GMAW equipment and accessories. WT.18.01
    02. Make minor repairs to GMAW equipment and accessories. WT.18.02
    03. Set up gas metal arc welding operations for plain carbon steel. WT.18.03
    04. Operate gas metal arc welding equipment. WT.18.04
    05. Make short-circuiting transfer fillet welds, all positions, on plain carbon steel. WT.18.05
    06. Make Pad welds, all positions, on plain carbon steel. WT.18.06

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0. Apply intermediate gas metal arc welding (GMAW) skills.--The student will be able to: WT.19.0
    01. Make Fillet Spray transfer welds, in flat and horizontal positions, on plain carbon steel. WT.19.01
    02. Make 1G Groove Spray transfer welds on plain carbon steel. WT.19.02
    03. Set up (GMAW) gas metal arc welding equipment for aluminum, stainless steel. WT.19.03
    04. Make groove welds 1G Groove position on aluminum. WT.19.04
    05. Make fillet welds 1F position on stainless. WT.19.05
    06. Make groove welds 1G position on stainless. WT.19.06
0. Apply basic flux-cored arc welding (FCAW) skills.--The student will be able to: WT.20.0
    01. Perform safety inspections of equipment and accessories. WT.20.01
    02. Make minor repairs to equipment and accessories. WT.20.02
    03. Set up for plain carbon steel FCAW operations. WT.20.03
    04. Operate flux cored arc welding equipment, self-shielded process. WT.20.04
    05. Make Pad welds, all positions, on plain carbon steel. WT.20.05
0. Apply Intermediate flux-core arc welding (FCAW) skills.--The student will be able to: WT.21.0
    01. Make fillet welds and groove welds in all positions on plain carbon steel. WT.21.01
    02. Operate flux core arc welding equipment, gas-shielded process, to make fillet welds, all positions, on plain carbon steel. WT.21.02
    03. Operate flux core arc welding equipment to make groove welds all positions, on plain carbon steel. WT.21.03
0. Apply basic gas tungsten arc welding (GTAW) skills.--The student will be able to: WT.22.0
    01. Perform external inspections of GTAW equipment and accessories. WT.22.01
    02. Make minor repairs to GTAW equipment and accessories. WT.22.02
    03. Set up for plain carbon steel, aluminum and stainless steel GTAW operations. WT.22.03
    04. Operate gas tungsten arc welding equipment. WT.22.04
    05. Make fillet welds, all position, on plain carbon steel. WT.22.05

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0. Apply intermediate gas tungsten arc welding (GTAW) skills.--The student will be able to: WT.23.0
    01. Make 1G - 2G Groove welds on plain carbon steel. WT.23.01
    02. Make 1F - 3F Fillet welds on aluminum. WT.23.02
    03. Make 1G Groove welds on aluminum. WT.23.03
    04. Make 1F - 3F Fillet welds on stainless steel. WT.23.04
    05. Make 1G - 2G Groove welds on stainless steel. WT.23.05
0. Demonstrate and understanding of pipe welding principles and practices.--The student will be able to: WT.24.0
    01. Research and understand employability opportunities associated with advanced welding skills such as careers in pipe welding. WT.24.01
    02. Set up welding equipment for shielded metal arc welding (SMAW) processes for pipe welding on carbon steel pipe. WT.24.02
    03. Tack and weld carbon steel in the 1G position. WT.24.03

Welding Technology - Advanced (J400410)

Advanced Welder 1 - Course Number: PMT0075

0. Apply intermediate shielded metal arc welding (SMAW) pipe welding (Class-B Pipe Welder) skills.--The student will be able to: WTADV.01.0
    01. Make SMAW equipment ready for open-root V-groove pipe welds. WTADV.01.01
    02. Identify and explain open-root V-grove pipe welding techniques with SMAW equipment. WTADV.01.02
    03. Perform open-root V-groove pipe welds in the following positions using SMAW equipment. 1-GR, 2-G, 5-G, 6-G, 6-GR WTADV.01.03
0. Apply and understand fabrication techniques using pipe fitting techniques.--The student will be able to: WTADV.02.0
    01. Apply and understand pipe fitting take-outs / take-offs for pipe fittings. WTADV.02.01
    02. Identify and explain the different types of pipe fittings and their usage. WTADV.02.02
    03. Identify and explain welding symbols and a standard legend on mechanical drawings. WTADV.02.03
    04. Identify elevations and directions on a set of mechanical drawings. WTADV.02.04

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0. Apply advanced gas-tungsten arc welding (GTAW) pipe skills.--The student will be able to: WTADV.03.0
    01. Prepare GTAW equipment to create welds with low alloy (Carbon Steel), stainless steel pipe, and filler metal. WTADV.03.01
    02. Identify and explain open-root V-groove pipe welding techniques with GTAW equipment. WTADV.03.02
    03. Perform open-root V-groove welds on low alloy (carbon steel) and stainless steel pipe in the following positions using GTAW equipment. 1-GR, 2-G, 5-G, 6-G, 6G-R WTADV.03.03
0. Apply advanced gas-tungsten arc welding (GTAW) and shielded metal arc welding (SMAW) heavy-wall pipe skills.--The student will be able to: WTADV.04.0
    01. Identify and explain open-root V-groove pipe welding techniques on heavy wall pipe with GTAW/SMAW equipment. WTADV.04.01
    02. Identify and explain Pre and Post weld heat treatment on the different types of alloy metals. WTADV.04.02
    03. Make open-root V-groove welds on heavy wall carbon steel pipe root and hot pass using different techniques and filler metals such as, Key holing, washing or soaking, back feeding in the 1-G, 2-G,5-G, 6-G positions with GTAW equipment. WTADV.04.03
    04. Make V-groove multi-pass welds on heavy wall pipe using the GTAW/SMAW welding processes in the 2-G, 5-G, 6-G positions. WTADV.04.04

Advanced Welder 2 – Course Number: PMT0076

0. Apply emerging welding technologies.--The student will be able to: WTADV.05.0
    01. Research and identify careers and workforce needs that employ emerging welding technologies. WTADV.05.01
    02. Identify the skills required to work within careers that use emerging welding technologies. WTADV.05.02
    03. Apply skills and competencies needed to successfully use emerging welding technologies such as, but not limited to: Pulse Welding, Robotics, Submerged Welding, Adaptive Welding, Hybrid Laser-Arc Welding (HLAW), etc. WTADV.05.03