

Precision Machining (2026)

PROFESSIONAL ORGANIZATIONS AND LEADERSHIP 1.0

1 Student Leadership in Career Technical Student Organizations (CTSO) and Professional Associations 1.1

- 1 Explore the role of professional organizations and/or associations in the Precision Machining Industry. 1.1.1
 - 2 Define the values, roles, and opportunities provided through career technical student organizations. 1.1.2
 - 3 Engage in career exploration and leadership development. 1.1.3
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2 Career Exploration 1.2

- 1 Describe mindsets and traits that are most important for career success in the precision machining industry (e.g., attention to detail, troubleshooting). 1.2.1
 - 2 Identify local and national career opportunities in precision machining. 1.2.2
 - 3 Describe education and certification or training requirements related to career pathways in the precision machining industry. 1.2.3
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**FUNDAMENTAL
MACHINING SKILLS 2.0**

1 Safety 2.1

- 1 Complete a safety test on general shop safety rules and procedures. 2.1.1
 - 2 Describe the role of the Occupational Safety and Health Administration (OSHA) in regard to workplace safety and incidents. 2.1.2
 - 3 Describe requirements for personal protection equipment (PPE), to include safety glasses, ear protection, gloves, and clothing in the workplace. 2.1.3
 - 4 Describe safety guidelines for using any machining tool or piece of equipment. 2.1.4
 - 5 Identify marked safety areas, related signage and their meanings. 2.1.5
 - 6 Identify the location and the types of fire extinguishers and other fire safety equipment. 2.1.6
 - 7 Describe procedures for using fire extinguishers and other fire safety equipment. 2.1.7
 - 8 Identify the location of and the procedures for using eye-wash stations. 2.1.8
 - 9 Describe the requirements for and location of the posted evacuation routes. 2.1.9
 - 10 Describe general electrical safety. 2.1.10
 - 11 Describe lockout/tagout (LOTO) procedures and rationale. 2.1.11
 - 12 Identify the location of safety data sheets (SDS), describing the information they contain. 2.1.12
 - 13 Maintain clean and orderly work areas. 2.1.13
 - 14 Dispose of scrap metal chips, shavings, oil, and coolant. 2.1.14
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2 Blueprint Reading 2.2

- 1 Interpret line types, title blocks, orthographic projections, and revision control. 2.2.1
 - 2 Sketch a part. 2.2.2
 - 3 Interpret blueprints, including geometric dimensioning and tolerancing (i.e., GD&T basics). 2.2.3
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3 Planning 2.3

- 1 Access reference information used in performing machining work. 2.3.1
 - 2 Describe the significance of following an order of operations. 2.3.2
 - 3 Select machines and tooling, based on work orders. 2.3.3
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4 Machine and Tool Maintenance 2.4

- 1 Lubricate equipment parts, as needed. 2.4.1
 - 2 Clean and store hand tools, cutters, fixtures, jigs, and attachments. 2.4.2
 - 3 Inspect hand tools for defects, verifying safe use. 2.4.3
 - 4 Inspect equipment for safe operational conditions. 2.4.4
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**BENCHWORK
SKILLS 3.0**

1 Hand Tools 3.1

- 1 Describe safety precautions and procedures for using tools. 3.1.1
 - 2 Select hammer types by operation. 3.1.2
 - 3 Select punches, stamps, and chisels, by operation. 3.1.3
 - 4 Select assembly tools (e.g., allen wrenches, screwdrivers, wrenches) for assembly operations. 3.1.4
 - 5 Describe the applications for saw blades with different ratios of tooth pitch. 3.1.5
 - 6 Saw materials by hand with a hacksaw. 3.1.6
 - 7 Describe the use of the three taps used for threading a blind hole. 3.1.7
 - 8 Cut internal and external threads with a tap or die. 3.1.8
 - 9 Describe the use of helicoil and thread inserts. 3.1.9
 - 10 Ream holes, using adjustable and non-adjustable reamers. 3.1.10
 - 11 Describe drill sizes as they relate to the various sizes of reamers. 3.1.11
 - 12 Describe the purpose of easy outs and tap extractors. 3.1.12
 - 13 Remove damaged screws. 3.1.13
 - 14 Describe procedures for cutting splines and keyways, using broaches, bushings, shims and arbor presses. 3.1.14
 - 15 Press bushings, pins, and bearings, using an arbor press. 3.1.15
 - 16 Select deburring tool by operation. 3.1.16
 - 17 Deburr workpieces to required tolerances. 3.1.17
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POWER SAWS 4.0

1 Power Saw Setup 4.1

- 1 Describe safety precautions for using power saws. 4.1.1
 - 2 Select the power saw (e.g., horizontal bandsaw, vertical bandsaw, cold saw) based on the cutting operation. 4.1.2
 - 3 Select power saw blade based on the material and cutting operation. 4.1.3
 - 4 Select the cutting speed for specific material. 4.1.4
 - 5 Replace blades in power saws. 4.1.5
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2 Power Saw Operation 4.2

- 1 Measure material to be cut. 4.2.1
 - 2 Cut materials to layout specifications. 4.2.2
 - 3 Describe the procedures for cutting and welding (i.e., cut to length, anneal after welding, grind) a band saw blade. 4.2.3
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DRILL PRESSES 5.0

1 Drill Press Setup 5.1

- 1 Describe safety precautions for using drill presses. 5.1.1
 - 2 Identify types of drill presses. 5.1.2
 - 3 Identify the components of drill presses. 5.1.3
 - 4 Adjust the table height based on workpiece and operation. 5.1.4
 - 5 Calculate the RPM (Revolutions Per Minute) for various sizes of drills and materials. 5.1.5
 - 6 Select the RPM settings and feed settings, based on materials and operation. 5.1.6
 - 7 Describe procedures for using the drill chuck and Morse tapered spindle. 5.1.7
 - 8 Describe procedures for using drill press work-holding devices. 5.1.8
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2 Drill Press Operation 5.2

- 1 Center drill a workpiece. 5.2.1
 - 2 Drill a workpiece. 5.2.2
 - 3 Ream a hole in a workpiece. 5.2.3
 - 4 Counterbore a workpiece. 5.2.4
 - 5 Spot face a workpiece. 5.2.5
 - 6 Countersink a hole in a workpiece. 5.2.6
 - 7 Hand tap a hole in workpiece. 5.2.7
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PEDESTAL GRINDERS AND HAND SHARPENING CUTTING TOOLS 6.0

1 Pedestal Grinder Setup 6.1

- 1 Describe safety precautions and guards used with pedestal grinders. 6.1.1
 - 2 Identify major parts of the pedestal grinder and their functions. 6.1.2
 - 3 Select wheel type based on grinding operation. 6.1.3
 - 4 Determine if a wheel is cracked before mounting. 6.1.4
 - 5 Identify blotters on the wheel and the information they contain. 6.1.5
 - 6 Describe safety precautions and clearances (i.e., rake, relief, radius) used when sharpening cutting tools. 6.1.6
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2 Pedestal Grinder and Cutting Tools Sharpening 6.2

- 1 Mount grinding wheels. 6.2.1
 - 2 Set up tool rests. 6.2.2
 - 3 Select wheel, based on material being grinded. 6.2.3
 - 4 Dress grinding wheels. 6.2.4
 - 5 Grind high-speed tool bits. 6.2.5
 - 6 Grind brazed-carbide tool bits. 6.2.6
 - 7 Grind drill bits. 6.2.7
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LATHES 7.0

1 Lathe Setup 7.1

- 1 Describe safety precautions for using lathes. 7.1.1
 - 2 Identify the parts of the lathe. 7.1.2
 - 3 Set up an engine lathe. 7.1.3
 - 4 Secure tools, tool holders, and fixtures or attachments. 7.1.4
 - 5 Select and set feeds and speeds, based on materials and operation. 7.1.5
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2 Lathe Operation 7.2

- 1 Set up lathes. 7.2.1
 - 2 Align lathe centers, using methods (e.g., point-to-point, center ground bar) to ensure accuracy. 7.2.2
 - 3 Turn and face workpieces held in chucks. 7.2.3
 - 4 Rough cut and finish cut with lathes. 7.2.4
 - 5 Deburr workpieces on a lathe. 7.2.5
 - 6 Perform hole-making operations (e.g., drilling, countersinking, reaming, tapping, counterboring). 7.2.6
 - 7 Bore holes with lathes. 7.2.7
 - 8 Knurl parts with lathes. 7.2.8
 - 9 Cut external and internal threads with lathes. 7.2.9
 - 10 Chase threads with lathes. 7.2.10
 - 11 Describe procedures for taper turning with taper attachments. 7.2.11
 - 12 Describe procedures for taper turning with compound rest. 7.2.12
 - 13 Describe procedures for performing contour, angular, or radius cuts with lathes. 7.2.13
 - 14 Describe the procedures for using follower and steady-rests. 7.2.14
 - 15 Describe procedures for setting up face plates and lathe dogs. 7.2.15
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MILLING MACHINES 8.0

1 Milling Machine Setup 8.1

- 1 Describe safety precautions for using milling machines. 8.1.1
- 2 Identify the parts of the horizontal and vertical milling machines and their functions. 8.1.2
- 3 Lubricate milling machines. 8.1.3
- 4 Tram the head. 8.1.4
- 5 Align fixtures/vises. 8.1.5

2 Milling Machine Operation 8.2

- 1 Locate the workpiece edge, using an edge finder and reference coordinates along the X, Y, and Z axes relative to the defined datum. 8.2.1
- 2 Locate an existing hole, using an indicator. 8.2.2
- 3 Set feeds and speeds for milling work, based on materials and operation. 8.2.3
- 4 Square up workpieces. 8.2.4
- 5 Perform end milling on a workpiece. 8.2.5
- 6 Perform facing operations on a workpiece. 8.2.6
- 7 Drill holes with a milling machine. 8.2.7
- 8 Perform reaming operations on a workpiece. 8.2.8
- 9 Cut external keyways on a workpiece. 8.2.9
- 10 Bore holes with milling machines. 8.2.10
- 11 Perform form milling on a workpiece, using tools (e.g., slitting saws, key cutters, dovetails, corner-rounders, chamfers). 8.2.11
- 12 Perform indexing operations on a workpiece, using a dividing head. 8.2.12
- 13 Set up and operate rotary tables. 8.2.13

INSPECTION AND PRECISION MEASURING 9.0

1 Gages, Scales, and Tools 9.1

- 1 Select the inspection gages and tools based on inspection operation. 9.1.1
 - 2 Identify steel rules and calipers and when they are used. 9.1.2
 - 3 Identify micrometers and when they are used. 9.1.3
 - 4 Identify Vernier tools and when they are used. 9.1.4
 - 5 Identify dial indicators and when they are used. 9.1.5
 - 6 Identify a surface plate and when it is used. 9.1.6
 - 7 Identify go/no-go gages and when they are used. 9.1.7
 - 8 Identify the following gages and their uses: radius, thread-pitch, angle, thread, pin, ring. 9.1.8
 - 9 Identify surface finishes, tolerances, and measuring procedures for surface finish inspection. 9.1.9
 - 10 Validate calibration of gages and tools against a standard. 9.1.10
 - 11 Measure accurately, using inspection gages and tools. 9.1.11
 - 12 Document results of inspection. 9.1.12
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**CNC (COMPUTER
NUMERICAL CONTROL)
INTRODUCTION** 10.0

1 Machines, Components, and Control Functions Orientation 10.1

- 1 Describe machine orientation and functions of CNC machines. 10.1.1
 - 2 Describe CNC machine tools and components. 10.1.2
 - 3 Describe control functions (e.g., tool offsets, part offsets). 10.1.3
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2 Operations and Processes 10.2

- 1 Describe precautions for CNC machine and tool use safety (e.g., compressed air, coolant management). 10.2.1
- 2 Describe the procedures for machine startup. 10.2.2
- 3 Describe the procedures for loading and unloading parts. 10.2.3
- 4 Describe the procedures used to run a simple program using G-code. 10.2.4
- 5 Describe the procedures for conducting in-process inspection. 10.2.5