

Machining 3

Exam Information	Description
Exam number 583 Items 35 National Career Cluster Advanced Manufacturing Certification available Yes	The Machining 3 industry certification exam assesses technical knowledge and skills to plan and manufacture projects using machine lathes, mills, drill presses, and other equipment in safe working conditions to promote the manufacturing industries.

Exam Blueprint and Performance Skills

Standard	Percentage of exam score
1. Personal Development	0%
2. Workplace Readiness	0%
3. Safe Practices	9%
4. Mathematical Concepts	11%
5. Engineering Documents	16%
6. Measurement Inspections	31%
7. CNC Matching Processes	33%

Standard 1 - Personal Development (0% of exam score)

Candidates will participate in personal and leadership development activities through SkillsUSA or another appropriate career and technical student organization

Objective 1 Candidates will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior

1. Set and meet goals
2. Prioritize, plan, and manage work to complete on time.

Objective 2 Candidates will be accountable for results

1. Standard Workflow
2. Accurately and constantly perform documentation professionally
3. File a regular written report on progress toward completion of timeline.
4. Demonstrate ethics, e.g. fair, honest.

Objective 3 Be familiar with the legal requirements and expectations of the course.

1. Be familiar with the course disclosure statement and all requirements for successful completion of the course.
2. Demonstrate workplace ethics, e.g. fair, honest, disciplined

Standard 2 - Workplace Readiness (0%)

Candidates will participate in workplace readiness activities.

Objective 1 Candidates will demonstrate employability skills.

1. Use a career search network to find career choices.
2. Write a resume for a career in machining.

Objective 2 Candidates will participate in a work-based learning experience outside the classroom.

1. Candidates will plan and implement a work-based learning experience aligned with their career goal.

Standard 3 - Safe Practices and Procedures (9%)

Candidates will be able to understand safe practices and professional machine shop procedures.

Objective 1 Follow safety manuals and all safety regulations and requirements.

Objective 2 Use PPE (personal protective equipment).

1. Use PPE - Personal Protective Equipment.
2. Maintain and use appropriate protective guards and equipment on machinery.
3. Demonstrate safe machine operations at all times.

Objective 3 Maintain a clean and safe work environment.

1. Keep work areas clean.
2. Clean machine and hand tools when work is completed.
3. Put tools away when work is finished.
4. Keep aisles clear of equipment and materials.
5. Perform preventive maintenance as required.
6. Understand chemical hazards and the use of Material Safety Data Sheets (MSDS).
7. Keep storage rooms well organized and free of clutter.

Standard 4 - Mathematical Concepts (11%)

Candidates will be able to apply mathematical concepts.

Objective 1 Perform basic trigonometric functions.

1. Solve for unknown angles.
2. Solve for unknown sides.
3. Calculate bolt hole patterns.
4. Calculate surface foot
5. Calculate gauge blocks up to 5" and 10" sine plates.

Objective 2 Calculate speeds and feeds for machining.

1. Given appropriate reference materials, calculate RPM for various metals and tools.
2. Given appropriate reference materials, calculate the proper feed for various metals, tools, and depths of cut.

Objective 3 Locate basic machining points from a Datum Point.

1. Identify points using the Cartesian coordinate system.
2. Identify points using the absolute dimensioning system.

Standard 5 - Engineering Documents (16%)

Candidates will be able to interpret engineering drawings and control documents.

Objective 1 List the purpose of each type of drawing.

1. Identify and describe the purpose of orthographic (three views) drawings.

Objective 2 Practice geometric dimensioning and tolerancing (GD&T) methodology.

1. Describe the purpose of GD&T.

2. Understand and demonstrate the use of basic GD&T symbols and functions.

Standard 6 - Measurement Inspections (31%)

Candidates will be able to properly measure and inspect parts according to drawing and document specifications.

Objective 1 Select proper measurement tools as they best relate to part characteristics and specified accuracy.

1. Discuss how measurement tool selection can contribute to part accuracy/inaccuracy.
2. Demonstrate proper use and care of precision measuring tools.
3. Demonstrate proper use of a optical comparator.
4. Demonstrate first article inspection vs first piece inspection vs In-process vs sampling.

Objective 2 Accurately perform measurements with/for:

1. Calipers
2. Micrometer
3. Height gage
4. Surface plate
5. Part squareness
6. Thread measurement
7. Dial indicators
8. Optical comparator
9. Bore gage
10. Gage pins
11. Go/no-go (Ring and Plug)
12. Datums
13. Flatness
14. Parallelism
15. Runout
16. Squareness
17. Positional
18. Concentricity
19. Gage blocks

Standard 7 - CNC Matching Processes (33%)

Candidates will be able to understand CNC machining processes.

Objective 1 Demonstrate proper planning for CNC machining.

1. Prepare and plan for CNC machining operations.
2. Demonstrate proper cleaning, care lubrication and operation of CNC machines.
3. Properly identify common types of CNC machines and describe their size and general applications.
4. Demonstrate ability to read and interpret complex blueprints.
5. Create a plan of operation for CNC machining.
6. Calculate speeds, feeds, and depths of cut for CNC machine operations.

7. Use the Machinery's Handbook as a reference for CNC machining applications.

Objective 2 Select and use CNC tooling systems.

1. Describe the machinability index and how it affects CNC machining.
2. Identify tooling components and discuss their specific applications.
3. Based on geometry, identify common carbide inserts and discuss their general applications.
4. Based on material to be machined and part characteristics, select an appropriate insert and tooling system.
5. Demonstrate ability to properly change inserts and set up tooling systems to industry standards.
6. Identify common CNC operations.
7. Identify common CNC machine control systems and describe their major differences and applications.
8. Demonstrate the proper applications of absolute and incremental coordinate systems.
9. Create a plan of operation and manually write programs for CNC mills.
10. Create a plan of operation and manually write programs for CNC lathes.
11. Using a CAD-CAM system, post and load a pre-existing program onto a controller.
12. Using a CAD-CAM system, create a drawing for a part and create a machine program for that part. load it on to a controller and take all necessary steps to create the part.

Objective 3 Demonstrate proper use of CNC Machining Equipment.

1. Demonstrate the proper care, setup, lubrication, and operation
2. Select and properly install and align appropriate work holding devices to applicable standards.
3. Demonstrate proper loading and aligning materials into the machine.
4. Demonstrate proper loading of tools into the machine.
5. Install soft jaws as required.
6. Demonstrate proper techniques of establishing accurate tool offsets for each tool.
7. Demonstrate proper techniques of establishing accurate work offsets if needed.
8. Establish/set machine and part references to within appropriate tolerances.
9. Load programs into a controller.
10. Demonstrate working knowledge of all controls.
11. Demonstrate proper operation of CNC machine to include single block, and final production.
12. Edit CNC programs for accuracy.
13. Operate machine in DNC mode, if that capability exists. (optional)

Objective 4 Program CNC machines using CAD-CAM systems.

1. Create a plan of operation for machining assigned parts.
2. Construct part geometry.
3. Program tool path for roughing and finishing operations.
4. Verify tool path.
5. Generate CNC code.
6. Prove program.
7. Generate part to match required specifications.
8. Inspect part to verify accuracy.

Performance Skills Evaluation

Exam name: Machining 3

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Performance Skills

- Use PPE - personal protective equipment.
- Maintain a clean and safe work environment.
- Each candidate should earn a score of 100% on a required safety exam relating to general shop safety and
- each machine tool he/she will be operating
- Convert fractions to decimal equivalents as needed.
- Calculate speeds and feeds for machining.
- Identify basic layout of drawings.
- Identify basic types of drawings.
- Select proper measurement tools as they best relate to part characteristics and specified accuracy.
- Apply proper measuring techniques for accuracy based off the blueprint specifications.
- Accurately perform measurements with hand-held instruments.
- Demonstrate proper use of hand tools.
- Demonstrate proper use of grinding (abrasive) machines.
- Demonstrate proper use of band saws.
- Demonstrate proper use of conventional lathes.
- Demonstrate the ability to use the Machinery Handbook as a reference for technical information related to turning and drilling.

Pass:

Evaluator Name:

Date:
