MACHINIST

APPENDIX A

O*NET CODE 51-4041.00

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

	Approximate Hours
A. Work Station and Tool Crib	**150**
1. Keeping the duty station clean and safe for work.	
2. Keeping the tools, workbenches, and manual equipment clean, maintained, and safe for work.	
3. Learning names of raw materials, and names and uses of tools, holding devices, and measuring devices.	
4. Learning calibration of tools.	
B. Drill Press	**250**
1. Safety practices	
2. Job process planning	
3. Layout	
4. Learning power and radial drilling	
5. Tapping, reaming, lapping, couterboring, coutersinking	
6. Grinding drills	
7. Selecting proper speeds and feeds	
8. Selecting and applying lubricants and coolants	
9. Familiarization with quality instrumentation and processes	
C. Lathe	**1,900**
1. Safety practices	
2. Job process planning	
3. Layout	
4. Centering, facing, straight turning, shoulder turning, taper turning with taper attachment, threading, knurling, chuckwork (drilling, boring, reaming, finishing, chuck and face plate turning), steady rest and follower rest, offset	

tailstock and compound, bottoming, necking and recessing, filing, lapping, polishing, form turning, eccentric turning, tapping and spring winding, grinding lathe tools and centers.

5. Selecting proper speeds and feeds
6. Selecting and applying lubricants and coolants
7. Familiarization with quality instrumentation and processes
8. Care and cleaning of machine

D. Milling Machine (Horizontal, Vertical and Universal) **1,900**

1. Safety practices
2. Job process planning
3. Layout
4. Selecting cutters
5. Holding work by various methods (vise, clamps, dividing head, rotary table)
6. Tramming; indicating work holding
7. Rough milling, plain or slab milling, surface milling
8. Sawing, boring, flycutter milling, using slotting attachment and vertical head, keyway cutting, slotting, gang milling, form milling, taper and face milling, internal milling, radius cutting
9. Spline milling, rack cutting, cutter milling, gear cutting, indexing (suggested)**
10. Selecting proper speeds and feeds
11. Selecting and applying lubricants and coolants
12. Familiarization with quality instrumentation and processes
13. Care and cleaning of machine

E. Grinders **450**

1. Safety practices
2. Job process planning
3. Layout
4. Selecting and inspecting grinding wheels
5. Mounting wheels
6. Using magnetic chuck
7. Holding work by various other methods

8. Dressing wheels
9. Grinding (for example: straight; surface, squaring, taper, face, angle, hole, cutter grinding, end mill grinding)
10. Selecting proper speeds and feeds
11. Selecting and applying lubricants and coolants
12. Familiarization with quality instrumentation and processes
13. Care and cleaning of machine

F. NC/CNC Machines **1,000**

1. Safety practices
2. Setting up
3. Operating
4. Programming

G. Power Sawing (Optional)** **200**

1. Safety
2. Job process planning
3. Layout
4. Learning vertical and horizontal power sawing skills
5. Selecting and applying lubricants and coolants
6. Familiarization with quality instrumentation and processes
7. Care and cleaning of machinery

H. EDM (Optional)** **100**

1. Safety practices
2. Familiarization with conventional and wire EDM
3. Job process planning; layout
4. Setting up
5. Operating
6. Familiarization with quality instrumentation and processes
7. Care and cleaning of machinery

I. Jig Bore (Optional)** **200**

1. Safety practices
2. Job process planning; layout
3. Setting up
4. Operating

5. Familiarization with quality instrumentation and processes.
6. Care and cleaning of machinery.

J. Heat Treatment (Optional) 200**

1. Safety practices
2. Learning kinds of steel
3. S.A.E. classification
4. Hardening, drawing, case and pack hardening, and annealing
5. Using pyrometer and color chart
6. Hardness tests (Brinnel & Rockwell)
7. Quenching baths

K. Bench Work 500

1. Safety practices
2. Filing, scraping, chipping, using coated abrasives, deburring
3. Lapping, tapping, threading, honing
4. Dowel fitting
5. Laying out and assembling
6. Verifying dimensions and alighment using devices such as gauge blocks, dial indicator, height gauge, thread gauge, pin gauge
7. Familiarization with other quality instrumentation and processes
8. Using proper lubricants and coolants

L. General Machinery Repair (Optional) 600**

1. Safety practices
2. Inspecting, adjusting, and lubricating
3. Removing and replacing broken and worn parts of machine tools
4. Scraping bearings and ways
5. Rebuilding machines
6. Welding

M. Sheetmetal Work (Optional) 500**

1. Safety practices

2. Measurement
3. Shearing
4. Layout
5. Punching
6. Bending

N. Quality **50**

1. Using various measuring devices
2. Caring for measuring devices
3. Calibrating gauges
4. Dimensioning and tolerance interpretation
5. Statistical Process Control
6. True positioning

Approximate Total Hours **8,000**

**If optional or suggested components are not selected, the hours should be devoted to further mastery of required components.

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to https://dol.ny.gov/public-work-and-prevailing-wage .

MACHINIST

APPENDIX B

RELATED INSTRUCTION

Safety

1. Personal protective equipment
2. Handling, storing, and disposing of job-related hazardous materials
3. Trade safety, including all applicable OSHA and EPA regulations, standards and rules
4. First Aid (minimum 6.5 hours every 3 years)
5. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

Blueprint Reading and Drawing

1. Blueprint reading and mechanical drawing
2. Geometric tolerancing (optional)
3. Fundamentals of computer-aided design (CAD) (optional)

Mathematics

1. Intermediate algebra
2. Geometry
3. Trigonometry
4. Shop math I and II
5. Applied statistics (optional)

Industrial and Labor Relations (20 hours)

1. History and background (6 hours, 1st year)
2. Current laws and practices (14 hours, 2nd year)

Trade Theory and Science

1. Practical metallurgy (including plastic, ceramic, other materials)
2. Introduction to machine tools
3. Machining processes
4. Dimensional metrology (utilization of measuring devices)

5. Introduction to numerical control/computer numerical control

Suggested Additional Courses

1. Physics
2. Geometric dimensioning and tolerancing
3. Statistical process control
4. Drill Point Geometry
5. Machine Design
6. Fixture design
7. Welding
8. Heat treatment
9. Sheetmetal working
10. Keyboarding
11. NC/CNC programming
12. Familiarization with computer software (word processing,data base, spreadsheet, graphics)
13. Written and oral communications
14. Team building
15. Decision making
16. Problem solving
17. ISO 9000 quality system

Other related courses as necessary

A Minimum of 144 Hours of Related Instruction are Required for Each Apprentice for Each Year.

Appendix B topics are approved by New York State Education Department.