TOOLMAKER

APPENDIX A

O*NET CODE 51-4111.00

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.

This training outline is for a general, all-round Toolmaker. For specialities, such as Toolmaker (Gear Cutter), a Work Process Revision must be requested.

WORK PROCESSES

Approximate Hours

A. General Toolmaking **1000**

1. Materials
   a. Types and applications of various raw materials
   b. Identification of metal stock
   c. Methods of testing metal stock
   d. Heat treating ferrous and non-ferrous metals
   e. Metal plating
   f. Metal coating
   g. Plastics
2. Tools
   a. Safety precautions
   b. Names and uses of hand and machine tools,jigs, fixtures
   c. Names and use of measuring instruments
   d. Care and cleaning of tools and instruments.
3. Layout
   a. Studying blueprints, sketches, or tool description
   b. Planning sequence of operations
   c. Measuring, marking and scribing stock
4. Bench Work
   a. Safety
   b. Filing, using abrasive cloths, deburring

c. Lapping, tapping, threading

d. Assembling parts

e. Verifying dimensions and alignment using instruments such as micrometer, height gauge, gauge blocks.

f. Selecting and applying lubricants.

5. Making Jigs and Fixtures
6. Process Adjustment and Improvement
7. Quality Assurance

B. Power Hacksaw and Manual/Power Bandsaw **200**

1. Safety.
2. Selecting cutting blade.
3. Clamping stock.
4. Selecting proper speed.
5. Operation.
6. Care and cleaning of tools.

C. Drill Presses **200**

1. Safety
2. Various types of drill presses
3. Tapping, reaming, lapping, counterboring,countersinking and honing
4. Grinding drills
5. Selecting proper speeds and feeds
6. Selecting and applying lubricants
7. Care and cleaning of machine; checking oil levels (optional)**

D. Lathe **1500**

1. Safety
2. Centering, facing, straight turning, shoulder turning,taper turning, threading, knurling, chuckwork (drilling,boring, reaming, finishing, chuck and face plate turning), steady rest and follow rest, offset tailstock and compound,recessing, filing, lapping, polishing, form turning,tapping, tools and centers.
3. Selecting proper speeds and feeds
4. Selecting and applying lubricants

5. Care and cleaning of machine
6. NC or CNC programming (optional)**

E. Milling Machine (Horizontal, Vertical and Universal) 1500

1. Safety.
2. Selecting cutters.
3. Holding work by various methods (vice, clamps,dividing head, circular table).
4. Rough milling, plain or slab milling, surface milling.
5. 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.
6. Spline milling, rack cutting, cutter milling, gear cutting (optional).**
7. Milling to irregular laid out line.
8. Selecting proper speeds and feeds.
9. Selecting and applying lubricants.
10. Care and cleaning of machine.
11. NC or CNC programming (optional).**

F. Surface Grinder 800

1. Safety.
2. Selecting grinding wheels.
3. Mounting wheels.
4. Magnetic chuck.
5. Dressing wheels.
6. Holding work by various methods.
7. Plain or surface grinding, angle grinding, form grinding,dovetail grinding, squaring.
8. Selecting proper speeds and feeds.
9. Care and cleaning of machine.

G. Universal Grinder, Cylindrical Grinder, Cutter Grinder (Optional) 300**

1. Safety.
2. Selecting, mounting, and dressing wheels, balancing wheels.
3. Setting up attachments.

4. Setting up for clearance and cutting angles.
5. Selecting proper speeds and feeds.
6. Straight, taper, angle, face, form, I.D. and tool grinding.
7. Grinding plain, spiral and end mills, reamers, form cutters and drills.
8. Care and cleaning of machines.

H. Advanced Toolmaking **2500**

1. On-the-job experience in all aspects of the trade. These hours are over and above those which are specifically assigned in the above sections.

Approximate Total Hours **8000**

*The hours listed are over the whole term of the Apprenticeship; they are not necessarily continuous in nature.

**If optional Work Processes are not selected, the hours should be devoted to further mastery of required Work Processes.

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

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APPENDIX B

RELATED INSTRUCTION

Safety

1. Personal Protective Equipment
2. Fundamentals of Trade Safety, including OSHA standards
3. Hazardous Materials
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. Elementary Blueprint Reading and Shop Drawing
2. Advanced Blueprint Reading and Shop Drawing
3. Geometric Dimensioning and Tolerancing
4. Fundamentals of C.A.D. (optional)

Mathematics

1. Fundamentals (algebra, geometry, trigonometry)
2. Applications to the Trade
3. Precision Measurement

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 (Courses to be selected from the following topics)

1. Practical Metallurgy
2. Tools and Machines
3. Layout
4. Production Processes
5. Tool Design
6. Jig and Fixture Design
7. Gauge Design
8. Introduction to CNC/NC Programming
9. Fundamentals of Mechanics (including stresses and loads)

10. Welding
11. Heat Treatment
12. Metal Plating
13. Statistical Process Control

Other Related Courses, as necessary

A minimum of 144 hours of Related Instruction are required for each Apprentice for each year. (Additional Related Instruction may be required by an individual sponsor.

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