MODEL MAKER

APPENDIX A

O*NET CODE 51-4061.00

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. Introduction to Model Making & Machining Processes	**250**
1. Basic shop orientation	
2. Familiarization with all safety procedures and policies	
3. Familiarization with materials selection; handling of materials; cutting of stock	
4. Care and use of tools, machinery, equipment	
B. Operation of Hand Machines	**150**
1. Using bending and punching machines	
2. Using metal cutting shears	
3. Using hand and power tools as required for prototype or low-usage parts	
C. Lathe	**300**
1. Selecting and mounting tool bits or cutters	
2. Setting up and turning all types of material to desired tolerances	
3. Turning, facing, shaping, thread cutting, boring, knurling, drilling, reaming, polishing	
D. Milling Machine	**300**
1. Selecting cutters and staging work	
2. Milling all types of metal, plastics, etc.	
3. Developing feed and speed criteria	
4. Using dividing head, rotary table, and other milling machine attachments	
5. Slab, side, face, slot, concave, convex, angle milling and fly cutting	

6. Developing proficiency in digital read-out operation

E. NC/CNC Programming (if applicable) **350**

1. Developing a knowledge of machine control programming
2. Using conversational and G-code language
3. Developing an advanced understanding/application of D.N.C./networking technology and benefits provided

F. Grinders **300**

1. Selecting, mounting, truing, and using abrasive wheels
2. Internal, external, straight, angle and taper grinding
3. Grinding all materials to required tolerances
4. Sharpening tool bits, drills, small boring tools and fly cutters
5. Custom cutter development (if applicable)

G. Drill Press **300**

1. Selecting cutter; set up
2. Positioning work and clamping
3. Selecting speed and adjusting for depth
4. Simple drilling, reaming, facing, counter boring, counter sinking
5. Power tapping
6. Drilling to close tolerances

H. Metal Forming/Bending **225**

1. Introduction to overall metal forming capabilities
2. Using machine tools and/or laser
3. Understanding the design of unique metal forming dies (if applicable)

I. Jigs and Fixtures **300**

1. Using jigs and fixtures already constructed
2. Constructing new jigs and fixtures as required by blueprints and patterns
3. Assisting in the design and development of custom fixtures

J. CAD/Layout Work **400**

1. Familiarization with Computer Aided Design (CAD)

2. Familiarization with blueprints, and with graphic presentations using computer assisted drafting techniques
3. Using programming techniques for direct solution of drafting/graphic problems
4. Demonstrating a thorough knowledge of 3D surface and solid model drafting; 3D CAD (at option of sponsor*)
5. Planning work as outlined on prints and CAD information; selecting materials; laying out to close tolerances
6. Using precision measuring and marking instruments

K. Bench Work (Simple to Complex) **3300**

1. Measuring and cutting stock
2. Filing, sawing, drilling, bending, polishing
3. Lapping, tapping, threading
4. Fitting as required
5. Sub-assembly
6. Riveting; spot welding
7. Organizing components for final assembly
8. Using precision measuring instruments such as: micrometers, height gages, verniers, dial, indicators, gage blocks, sine plates, surface plates
9. Adjusting instruments
10. Building and/or making modifications to patterns for fit, finish and dimension
11. Building tracing masters providing male or female tooling aids as required
12. Preparing/fine-tuning castings to provide working, close-tolerance assemblies

L. Understanding Costs **20**

1. Demonstrating an understanding of how various materials and processes affect the end cost of the model

M. Record Keeping **20**

1. Keeping accurate, clear, complete, and timely records

N. Rapid Prototyping (at option of sponsor*) **300**

1. Demonstrating an understanding of rapid prototyping techniques

2. Demonstrating a knowledge of basic machine operation and part finishing

O. Welding and Soldering (at option of sponsor*)	**160**
P. Heat Treatment (at option of sponsor*)	**20**
Q. Sample Build and Press Operation (at option of sponsor*)	**750**

1. Setting up and operating machines to fabricate product samples
2. Producing low-volume test run
3. Verifying conformity of products to specifications

R. Electrical Discharge Machine (E.D.M.) (at option of sponsor*)	**50**
S. Model Decoration and Painting (at option of sponsor*)	**250**
T. Laser Cutting (at option of sponsor*)	**50**
U. 3D Scanning (at option of sponsor*)	**95**
V. Model Scheduling/Information Procurement (at option of sponsor*)	**70**
W. Electronics (at option of sponsor*)	**40**
Approximate Total Hours	**8000**

*If optional components are not selected, the hours should be devoted to further mastery of the 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 and Health

1. Personal Protective Equipment (PPE)
2. Right-to-Know/Material Safety Data Sheets (MSDS)
3. Safety in Working Around Machinery
4. Proper Lifting Techniques
5. First Aid – minimum 6.5 hours every 3 years
6. Sexual Harassment Prevention Training – must comply with Section 201-g of the Labor Law

Blueprints

1. Computer Aided Drafting (CAD)

Mathematics

1. Fundamentals
2. Trade or Technical Math
3. Precision Measurement

Trade Theory and Science

1. Materials of the Trade (Properties of Metals and/or Plastics)
2. Tools, Machines and Equipment (Care and Use)
3. Machine Tools (Care and Operation)
4. NC/CNC Programming (if Work Process “E” is completed)
5. Manufacturing Processes
6. Layout
7. Welding and Soldering (if Work Process “O” is selected)
8. Heat Treatment (if Work Process “P” is selected)
9. Basic Electrical Theory (if Work Process “W” is selected)

Other Workplace Skills

1. Fundamentals of Computers
2. Communication Skills

Other Related Courses as Necessary

A minimum of 144 hours of Related Instruction is required for each apprentice for each year.

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