

# MACHINIST (CNC)

## 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

	<b>Approximate Hours</b>
<b>A. Principles of Manual Machining</b>	<b>1,000</b>
1. Lathes, Mills, Grinders, etc.	
<b>B. Principles of CNC Machining</b>	<b>500</b>
1. Principles of safety and shop practice.	
2. Basic CNC language and function of the machine.	
3. Nomenclature and controls of the machine.	
4. Uses and maintenance of inspection equipment.	
5. Fundamentals of lubrication and hydraulic systems.	
6. Fundamentals of inspecting work.	
<b>C. Computer Operations</b>	<b>1,000</b>
1. Safety	
2. Learning all functions of computer which controls axis moves, tool changes, settings, automatic modes, set-up elements, and coolant operation.	
3. Learning to change, add to or edit moves required to build any part required.	
4. Maintaining maximum quality and production of good pieces.	
5. Using computer control key board to load all tools in proper location according to set up instructions for part number being run.	
6. Insuring all tools are of good quality and properly loaded as per manufacturing instructions.	
7. Checking work against blue prints.	
8. Understanding various alarms and how to cancel them.	

<b>D. Assisting Set-Up Person in Adjustments</b>	<b>1,500</b>
<ol style="list-style-type: none"> <li>1. Making physical and programmable adjustments on drills,reamers, mills, die heads, taps, and insert tools.</li> <li>2. Adjusting programmed feeds and speeds.</li> <li>3. Observe grinding and setting boring bars, drill and tap holder, burnishing tools, slotting saws, and mills under the supervision of a set-up person. Tool preset.</li> <li>4. Performing advanced tool grinding using drill grinding attachments, tool grinding and optical comparator under the supervision of a set-up person.</li> </ol>	
<b>E. CNC Language for Tool Offset Procedures</b>	<b>1,000</b>
<ol style="list-style-type: none"> <li>1. Reading a job program.</li> <li>2. Using various G and M codes and subroutines.</li> <li>3. Performing data changes concerning job programs, offsets, tool wear, tool geometry and subroutines.</li> <li>4. Removing, sharpening and replacing of tools.</li> <li>5. Basic operation of computer aided manufacturing.</li> <li>6. Basic computer to CNC control interface.</li> </ol>	
<b>F. CNC Controls</b>	<b>500</b>
<ol style="list-style-type: none"> <li>1. Basic data changes in CNC Controls.</li> <li>2. Putting data in and out of CNC Controls.</li> </ol>	
<b>G. Performing Basic CNC Machine Set-Up Procedures</b>	<b>1,500</b>
<ol style="list-style-type: none"> <li>1. Gathering materials needed such as set-up sheets, part process sheets, blueprints, programs, attachments.</li> <li>2. Grinding all tools.</li> <li>3. Performing easy set-ups from blueprints.</li> </ol>	
<b>H. Writing Basic Programs</b>	<b>500</b>
<ol style="list-style-type: none"> <li>1. Learning to program from blueprints.</li> </ol>	
<b>I. Machine Repair and Maintenance</b>	<b>500</b>
<ol style="list-style-type: none"> <li>1. Machine maintenance.</li> <li>2. Servicing tool changer.</li> <li>3. Preventative maintenance.</li> <li>4. Installing fuses, bleeding oil and hydraulic lines, cooling units.</li> </ol>	
<b>Approximate Total Hours</b>	<b>8,000</b>

*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 (CNC  
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 Dimensioning and Tolerancing
3. Fundamentals of Computer-Aided Design (CAD) (optional)

**Mathematics**

1. Intermediate algebra
2. Geometry
3. Trigonometry
4. Applied statistics (optional)

**Industrial and Labor Relations (20 hours)**

1. History and Background (6 hours, first year)
2. Current Laws and Practices (14 hours, second 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. Statistical Process Control
3. Drill Point Geometry
4. Machine Design
5. Fixture Design
6. Welding
7. Heat Treatment
8. Sheet Metal Working
9. Keyboarding
10. NC/CNC Programming
11. Familiarization with Computer Software (Word Processing, Data Base, Spreadsheet, Graphics)
12. Written and Oral Communications
13. Team building
14. Problem solving
15. ISO 9000 qualifying systems

## **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.