



University of Pittsburgh Manufacturing Assistance Center

Basic Machining/Advanced CNC/MasterCAM

525 Hours *

This training program combines classroom, shop, and machine time to develop a graduate with manual machining, tooling, Computer Numeric Control (CNC), and MasterCAM skills. Conventional machining including operation of mills, lathes, saws; use of micrometers and calipers; applied math through trig and blueprint reading.

Course Subjects:

- **Gages & Measuring Devices:** The care and use of standard measuring devices are discussed. The students learn how to take measurements using micrometers, calipers, the Vernier scale, gage blocks and others. Process planning and parts layout are introduced.
- **Hand Tools:** Students will learn the proper and common names, care and use of common hand tools such as taps, dies, hacksaws, files, drivers and mallets.
- **Saws:** Students will learn parts nomenclatures of vertical and horizontal saws. Proper maintenance and care of saws and saw blades are covered. Feed and speed calculation, selection of correct saws, cutting angles, grooves arcs, and repeats are discussed.
- **Trade Print Reading:** Topics of discussion include the basic nomenclature of lines, various views represented, how to draw a part in three views, distinct features and print symbology.
- **Material Characteristics:** Characteristics and compositions of commonly machined metals, recommended cutting speeds and feeds, heat-treating and the testing of materials hardness are primary content.
- **Mathematics:** Pertinent technical mathematics including Arithmetic, Algebra, Geometry, and Trigonometry are taught.
- **Introduction to Milling:** Covers the proper care, maintenance and safe use of the manual mill. The student will learn parts nomenclatures, accessory items, speeds and feeds, depth of cut, machine set-ups, conventional and climb milling, face milling, peripheral milling, roughing and finishing cuts.
- **Introduction to Lathes:** Cutting tool characteristics, lathe parts and accessory attachments, types of cutters and the advantages/disadvantages of each, cutting round stock, and cutting arcs are the main topics for discussion. Proper care, maintenance and safety features unique to the lathe are focused on.

- Introduction to Surface Grinding: Proper care, maintenance and safe use, parts nomenclatures of the surface grinder are covered, as well as, micrometer reading, squaring a block, grinding angles, and the selection and care of abrasive wheels.
- Computer Numerical Control (CNC): Students will learn the theory of G-code machine language programming, production set-up, conversational controls, tool selection, and the care and maintenance of the CNC mill and lathe.
- Mastercam: This course will provide students with a thorough knowledge of CAD/CAM theory and understanding. Topics include basic through advanced: CAD Drawing, Geometry Modifications and Transformations, Pocketing, Tool path Modifications and Verifications, and Contouring.

Course Distribution by Hours*

<u>Subject</u>	<u>Hours</u>
Manual Machining	188
Math	80
Print Reading	34
CMM	8
CNC Machining	120
CAD/CAM MasterCAM	80
PC Skills	<u>15</u>
Total Hours	525

35 Hours/Week for 15 Weeks

* Course concentrations/subject matter and hours may be adjusted to accommodate the levels of proficiency of the enrolled students.

PROGRAM SUMMARY FOR BASIC MACHINING / ADVANCED CNC & MASTERCAM

Training Schedule:	5 days/week
Total Number Weeks:	15 weeks
Total Number Hours:	525 hours
Program Outcome:	Certificate of Completion
Entrance Requirements:	High School Diploma or GED, 9 th Grade Math, Mechanical Aptitude, MAC Math Placement Test