

Machine Tooling Technics

Program Number: 32-420-5

Two-Year Technical Diploma

Manufacturing Program Cluster

Center for Construction, Manufacturing, Apprenticeship & Transportation

Program offered at Madison Campuses

For information call: (608) 243-4169 or (800) 322-6282 Ext. 4169

About the Program

Emphasis in Machine Tool is on training graduates for employment in tool and die making, mold making, Computer Numerical Control (CNC) Programming or as quality control inspectors or precision and repair machinists. Students utilize CAD/CAM (Computer Aided Design/Computer Aided Manufacturing) and state-of-the-art machining centers, turning centers and Electrical Discharge Machines (EDM). This knowledge is blended with basic hands-on skills learned throughout the two-year program. Students gain the knowledge and skills necessary to design, build and inspect a machined part, injection mold or stamping die. This is the program for students seeking interesting and challenging work in a clean, high tech work environment, job stability and a career that rewards growth and experience.

Program Courses

32-420-304 Intermediate Metrology Applications 1 credit

Course studies precision inspection methods while utilizing optical and electronic precision measuring instruments such as the profilometer, optical comparitor, microscope, laser alignment machines, the Coordinate Measuring Machine and state-of-the-art computerized vision system. Prerequisite: 32-420-351.

32-420-322 Machine Tool 1 4 credits

Introduces the basic concepts and skills using engine lathes, power saws, Drill presses and bench applications. Emphasizes safety and proper operation of tools and machines, speeds, feeds, cutting tools, tool geometry, tool grinding and work-holding devices. Stresses dimensional accuracy, finish and quality as well as team-building and work ethics. Corequisites: 32-420-346 and 32-420-351.

32-420-323 Machine Tool 2 4 credits

Expands on basic concepts and skills using engine lathes, power saws, drill presses, bench applications, CNC setup and operation. Emphasizes safety and proper operation of tools and machines, speeds feeds, cutting tools, tool geometry, tool grinding and work-holding devices. Stresses dimensional accuracy, finish and quality with team-building and work ethics. Prerequisite: 32-420-322 Corequisites: 32-420-346 and 32-420-351.

32-420-324 Machine Tool 3 4 credits

Expands the concepts and skills using engine lathes, power saws, drill presses, bench applications, and advanced CNC setup and operation. Emphasizes safety and proper operation of tools and machines, speeds feeds, cutting tools, tool geometry, tool grinding and work-holding devices. Stresses dimensional accuracy, finish and quality with team-building and work ethics. Prerequisites: 32-420-323, 32-420-346 and 32-420-345. Corequisite: 32-420-304.

Curriculum

FIRST YEAR

First Semester

		Credits	Hrs/week Lec-Lab
32-420-345	Drawing Interpretation 1	2	4-0
32-420-346	Computer Numerical Control 1	2	4-0
32-420-351	Elements of Basic Metrology	2	4-0
32-420-322	Machine Tool 1*	4	4-12
32-420-323	Machine Tool 2*	4	4-12
31-801-356	Communications 1	1	2-0
31-804-381	Machine Tool Mathematics 1	2	4-0
Semester Total		17	

Second Semester

32-420-304	Intermediate Metrology Applications	1	2-0
32-420-324	Machine Tool 3*	4	4-12
32-420-325	Machine Tool 4*	4	4-12
32-420-384	Computer Numerical Control Applications 1	1	1-3
32-420-388	Tool and Fixture Design	1	2-0
32-420-390	Fundamentals of Metallurgy	2	4-0
32-420-397	CNC 3	2	3-1
32-420-347	CNC 2	1	1-0
31-804-382	Machine Tool Mathematics 2	1	2-0
Semester Total		17	

SECOND YEAR

First Semester

32-420-394	Tool Making Theory 1 (Die Making)	2	4-0
32-420-326	Machine Tool 5 (Die Making)*	4	4-12
32-420-327	Machine Tool 6*	5	4-12
32-420-389	Computer Numerical Control Applications 2	2	1-3
32-420-399	CNC 4	2	3-1
31-806-363	Science 1	2	2-2
Semester Total		17	

Second Semester

32-419-300	Hydraulics and Mechanics	2	2-2
32-420-370	CNC 5	1	1-0
32-420-328	Machine Tool 7 (Mold Making)*	4	4-12
32-420-329	Machine Tool 8*	5	4-12
32-420-391	Computer Numerical Control Applications 3	1	1-0
32-420-393	Job Orientation	1	1-0
32-420-395	Tool Making Theory 2 (Mold Making)	2	4-0
32-442-313	Related Welding	1	2-2
Semester Total		17	

* 9 week course

Note: Students are placed in English or mathematics courses based on their scores on the COMPASS or ASSET test or on completion of the appropriate prerequisite/s.

Program Courses (continued)

32-420-325 Machine Tool 4 4 credits

Expands on basic concepts and skills using engine lathes, power saws, drill presses, bench applications, CNC setup and operation. Emphasizes safety and proper operation of tools and machines, speeds feeds, cutting tools, tool geometry, tool grinding and work-holding devices. Stresses dimensional accuracy, finish and quality with team-building and work ethics. Prerequisite: 32-420-323, 32-420-345, 32-420-346 and 32-420-351. Corequisite: 32-420-304.

32-420-326 Machine Tool 5 4 credits

Skills and knowledge necessary for advanced setups and procedures on milling machines, grinders, and lathes. Introduces both tool and cutter grinding and the selection and use of carbide tooling. Special emphasis is given to Electrical Discharge Machine and electrode development. CNC machining applications to complete course projects is enhanced. Safety, precision measurement and craftsmanship are stressed. Prerequisites: 32-420-325, 32-420-384, 32-420-388 and 32-420-397. Corequisites: 32-420-389, 32-420-394 and 32-420-399.

32-420-327 Machine Tool 6 5 credits

Provides the student with the skills and knowledge necessary for advanced setups and procedures on milling machines, grinders, and lathes. Students are also introduced both tool and cutter grinding and the selection and use of carbide tooling. Special emphasis is given to Electrical Discharge Machine and electrode development. CNC machining applications to complete course projects is also enhanced. Building a stamp die. Safety, precision measurement and craftsmanship are stressed. Prerequisites: 32-420-325, 32-420-384, 32-420-388 and 32-420-397. Corequisites: 32-420-389, 32-420-394 and 32-420-399.

32-420-328 Machine Tool 7 4 credits

Set-up and operate a CNC EDM machine, CNC machining center, and select and use superabrasives for grinding and machining. Advanced machining setups, procedures, and operations will be covered to enable students to accomplish the machining projects. Safety, precision measurement, and craftsmanship are stressed. Prerequisites: 32-420-327, 32-420-389, 32-420-394 and 32-420-399. Corequisites: 32-420-391 and 32-420-395.

32-420-329 Machining Tool 8 5 credits

Set-up and operate a CNC EDM machining center, and select and use superabrasives for grinding and machining. Includes advances machining setups, procedures, and operations to accomplish the machining of a small MUD plastic injection mold or special machining project. Safety, precision measurement, and craftsmanship are stressed. Prerequisites: 32-420-327, 32-420-389, 32-420-394 and 32-420-399. Corequisites: 32-420-391 and 32-420-395.

32-420-345 Drawing Interpretation 1 2 credits

Basic principles of engineering drawings and manufacturing procedures. Through interpretation and sketching, students learn to visualize the part, section or assembly. Uses drawings pertinent to the trade with examples.

32-420-346 Computer Numerical Control 1 1 credit

Hands-on and lecture course exposing students to CNC (Computer Numerical Control). Emphasizes CNC vertical milling machines and CNC turning centers. Covers all basics of beginning programming including G-codes, M-codes, Manual and Conversational programming and the Cartesian Coordinate System. Corequisite: 32-420-380.

32-420-351 Elements of Basic Metrology 2 credits

This course introduces the principles of basic dimensional measurement, layout techniques for machines, use of direct and indirect measuring tools as well as the use of length standards relative to calibration of measuring instruments and the basic operation of the Coordinate Measuring Machine.

32-420-370 Computer Numerical Control 4 1 credit

The advanced course requires students to draw complex wire-frame models and produce CAD solids. This geometry is then used to produce three-dimensional toolpaths. Prerequisite: 32-420-326. Corequisites: 32-420-389 and 32-420-399 or consent of instructor.

32-420-384 Computer Numerical Control Applications 1 1 credit

Hands-on instruction using the CNC vertical milling machine and CNC Turning Center. Emphasizes two-dimensional contouring, pocketing, drilling and basic turning and threading. Prerequisites: all first semester courses. Corequisites: 32-420-346 and 32-420-397 or consent of instructor.

32-420-388 Tool and Fixture Design 1 credit

Introduces tool design and gauging. Emphasizes jigs, fixture design, clamping, locating devices and tooling and production methods. Presents preset and qualified tooling for NC/CNC as they relate to conventional practice. Prerequisite: 32-420-322.

32-420-389 Computer Numerical Control Applications 2 2 credits

Advanced CNC Vertical Milling and Machining Center, including three-dimensional parts and multiple machining operations. Introduces the CNC wire cut machine and machines both simple and complex parts. Prerequisites: 32-420-384 and 32-420-397. Corequisites: 32-420-370 and 32-420-399 or consent of instructor.

32-420-390 Fundamentals of Metallurgy 2 credits

Introduces metallurgy, emphasizing applications, selection, identification methods and alloy influences. Studies metal properties using testing, micro-structure interpretation and heat-treatment processes. Covers tool steels, weld heat effects, failure analysis and machinability variations in cast iron, alloy steels and non-ferrous materials in detail.

32-420-391 CNC Applications 3 1 credit

Our most advanced CNC applications course devoted to machining complex toolpaths, including mold cavities and graphite electrodes. Stresses hands-on instruction and operation of CNC turning centers, vertical milling machines, machining centers and advanced CNC wire cut work. Prerequisites: 32-420-346, 32-420-384, 32-420-389, 32-420-397 and 32-420-399. Corequisite: 32-420-383.

32-420-394 Tool Making Theory 1 2 credits

Lecture course supporting Machine Tool 3 lab activities. Major emphasis on the nomenclature, theory, construction features, design, and the technology of stamping and forming dies. Student also will spend time designing and planning a special die, mold or advanced CNC project. Prerequisites: 32-420-381 and 32-420-390.

32-420-395 Tool Making Theory 2 2 credits

Lecture course supporting Machine Tool 4 lab activities. Major emphasis on nomenclature, theory, construction features, design and the technology of mold dies. The seven molding processes will be discussed. Students also will spend time designing and planning a special mold, tool, or CNC project. Prerequisite: 32-420-394.

32-420-397 Computer Numerical Control 2 2 credits

Manual programming of numerical control machines. Covers history, justification and types of control systems. Students program and make a part on a computer numerical control milling and turning center. Includes introduction to two-dimensional CAD-CAM computer programming system. Corequisites: 32-420-346 and 32-420-384 or consent of instructor.

32-420-399 Computer Numerical Control 3 2 credits

Using a CAD-CAM computer programming system, students construct parts from the simple to complex and then download the information to the CNC milling and EDM wire cut machines. Prerequisites: 32-420-397 and 32-420-384. Corequisites: 32-420-370 and 32-420-389 or consent of instructor.

Additional Required Program Courses

32-419-300 Hydraulics and Mechanics 2 credits

32-420-393 Job Orientation 1 credit

32-442-313 Related Welding 1 credit

Career Potential:

- Tool and Die Apprentice
- Mold Making Apprentice
- Millwright Apprentice
- Precision Machinist
- CNC Machinist
- CNC Programmer
- Machine Repair Specialist

With additional education and/or work experience, graduates may find employment as:

- Journey-level Tool and Die Maker
- Journey-level Mold Maker
- Journey-level Millwright
- Shop Owner
- Shop Manager
- Industrial Engineer
- Manufacturing Engineer
- Industrial Sales Engineer
- Die and/or Mold Designer
- Educator

More detailed and updated information on this program may be available at: matcmadison.edu. The college reserves the right to make changes in the regulations and courses announced in this publication without notice.

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