

# Machine Tool Technics (Tool & Die Making)

Program Code 324205

## Machine Tooling Technics

### Technical Diploma - Two Years

Offered at the Marinette campus. For information: (715) 735-9361.

Toll-free: (800) 422-NWTC, ext. 5444.

#### Program Description

A second year of advanced Machine Tool - CNC Technician, tool and die, and electrical discharge machining for graduates of the Machine Tool Operation Program.

#### Program Outcomes

- Set-up and operate milling machines.
- Know and apply Statistical Process Control (SPC).
- Set-up and operate computerized electrical discharge machines.
- Design and construct jigs, fixtures, dies and molds.
- Set-up and operate grinding machines.
- Set-up and operate sawing machines.
- Set-up and operate drilling machines.
- Complete basic welding processes.
- Use precision measuring practices.
- Program and operate computerized numerical control milling machines.
- Program and operate computerized numerical control lathes.
- Identify fluid power components.
- Know and apply ISO 9000 quality practices.
- Know and apply mathematics.
- Set-up and operate engine lathes.
- Interpret working drawings.
- Work from blueprints and sketches.
- Know and apply basic metallurgy.
- Know and apply shop safety practices.
- Understand and apply cutting tool speeds and feeds.
- Perform 2-D CAM operations.
- Program 3-D surface machining operations.

#### Profile of Incoming Students

- Problem solvers.
- Likes to work with hands.
- Able to organize information.
- Accurate with numbers.
- Able to work with deadlines.
- Creative thinkers.

#### Requirements for Program Entry

- Completed application.
- High school transcript or equivalent (such as an HSED or GED® Transcript).
- NWTC Academic Skills Assessment or equivalent (See Academic Skills Assessment section for details and equivalents).
- Basic familiarity with Microsoft windows.
- Students should have mastered basic math skills. For a description of basic math, see the Basic Education section of this catalog.

#### Employment Potential

A graduate of the program will have the potential for employment in the following areas:

**CNC Operator:** sets up and operates computer numerical controlled machine tools working from blueprints and set-up sheets; sets up fixturing and tooling; produces and inspects parts; and edits CNC programs on CNC lathes and machining centers.

**Jig and Fixture Apprentice/Trainee:** lays out, fits, and assembles parts to make and repair cutting tools, jigs, fixtures, gauges, or machinist's hand tools by analyzing specifications.

**Machine Set-Up Operator:** sets up and operates a variety of machine tools such as radial drill presses, lathes, milling machines, and grinders; machines metal work pieces such as patterns and machine tool or die parts, usually on a custom basis; analyzes specifications; and determines tooling.

**Machinist Apprentice/Trainee:** sets up and operates machine tools and fits and assembles parts to make or repair metal parts, mechanisms, tools, or machines.

**Maintenance Machinist:** sets up and operates a variety of machine tools; and fits and assembles parts to fabricate or repair machine tools and to maintain industrial machines.

**Mold Maker Apprentice/Trainee:** lays out, machines, fits, assembles, and finishes metal products and metal molds for injection or compression molding of plastic or rubber products.

**Tool and Cutter Grinder:** sets up and operates cutter grinding machines used for sharpening tools and cutters that are needed in the manufacturing industry; and inspects resharpened tooling.

**Tool and Die Apprentice/Trainee:** lays out, machines, fits, assembles, and finishes specialized cutting tools used in the mold and die industry as well as dies used in cutting, stamping, and forging processes.

**Electrical Discharge Machining (EDM) Operator:** sets up and uses Ram or wire EDM machines to manufacture punches, dies, molds, and production parts.

**With additional education and/or work experience, graduates may find other opportunities for employment.**

- All-Around Machinist
- Journey Level Machinist
- Pattern Maker
- Mold Maker
- Tool and Die Maker
- CNC Programmer
- Machine Shop Foreperson/Supervisor

#### Curriculum

The Machine Tool Technics (Tool & Die Making) program is a two-year, four-semester program. Upon graduation, a student will have completed 68 credits.

#### First Semester

Catalog No.	Description	Credits
10-804-106	Intro to College Math	3
31-420-304	CNC Fundamentals 1	3
31-420-345	Machine Shop 1	4
31-420-346	Machine Shop 2	4
31-420-348	Precision Measurement	1
31-420-358	CNC Set-Ups	1
31-421-352	Blueprint Rdg/Sket-Mach 1	2
<b>Semester Total</b>		<b>18</b>

#### Second Semester

31-420-347	Cutting Tool Technology	1
31-420-349	CNC Fundamentals 2	3
31-420-356	Machine Shop 3	4
31-420-357	Machine Shop 4	4
31-421-362	Blueprint Rdg/Sket-Mach 2	2
31-422-359	Metallurgy for Machinist	1
31-801-385	Communicating-Writing	1
<b>Semester Total</b>		<b>16</b>

#### Third Semester

31-442-361	Welding-Machine Trades	1
32-420-300	Mold Die Construction	4
32-420-301	Tool Making	4
32-420-302	Mold Die Design	2
32-420-303	Tooling Design	2
32-420-337	CNC Fundamentals 3	3
<b>Semester Total</b>		<b>16</b>

#### Fourth Semester

10-809-197	Contemporary Amer Society	3
32-420-304	Stamping Die Design	2
32-420-305	Machine Applications-Advanced	4
32-420-306	Stamping Die Construction	4
32-420-307	Machining Theory-Advanced	2
32-420-308	Metrology	1
32-420-342	CNC Fundamentals 4	2
<b>Semester Total</b>		<b>18</b>
<b>Total Credits</b>		<b>68</b>

This program is fully eligible for financial aid.

## Please Note

- Some courses have prerequisites (listed at the end of each course description, if applicable) that need to be taken prior to enrolling in those courses.
- Many courses are offered via our Flexible Learning Options (online, accelerated, ITV, video, weekend, and self-paced) and may be taken in any order as long as prerequisites are met. To find out which program courses are offered through Flexible Learning Options, go to [www.nwtc.edu](http://www.nwtc.edu) or consult a counselor, (920) 498-5444.
- Descriptions of courses not found on this page can be found in the back of this catalog.

## Course Descriptions

*These courses provide an opportunity for students to develop the knowledge, skills, and understanding required for employment in this field.*

**31-420-304 CNC FUNDAMENTALS 1** ...computer controlled milling machines, basic programming operations on computer aided manufacturing (CAM) systems, and fundamental programming of computer numerically controlled (CNC) milling machines. (Prerequisite: Basic Windows Proficiency)

**31-420-345 MACHINE SHOP 1** ...shop safety, measuring tools/layout, power saw theory/operation, basic theory/operation of drilling machines, bench work, basic engine lathe operation, basic vertical, horizontal, CNC milling machine, surface grinder.

**31-420-346 MACHINE SHOP 2** ...safety, measuring tools/layout, powersaw operation, drilling machine operation basic/theory and operation of engine lathes, basic theory/operation vertical/horizontal milling machines; CNC milling, lathe operation, surface grinder operations. (Corequisite: 31-420-345, Machine Shop 1)

**31-420-347 CUTTING TOOL TECHNOLOGY** ...tool materials, tool geometry, lathe tools, milling cutters, cutting speeds/feeds, drills, reamers, taps, threading tools, carbide inserts, and diamond, ceramic, Cermet and polycrystalline cutting tools.

**31-420-348 PRECISION MEASUREMENT** ...how to read/measure english and metric, rules, squares surface plates, micrometers, vernier calipers, height measuring instruments, gage blocks, angular measurement, go-no-go gages, comparison measurement; surface finish measurement. (Corequisite: 31-420-358, CNC Set Ups)

**31-420-349 CNC FUNDAMENTALS 2** ...computer controlled milling machines, basic programming operations on computer aided manufacturing (CAM) systems, fundamental programming of computer numerically controlled (CNC) milling machines, and CNC turning centers. (Prerequisite: 31-420-304, CNC Fun 1)

**31-420-356 MACHINE SHOP 3** ...shop safety, measuring tools/layout, power saws, drilling machine operation, intermediate engine lathed operation and vertical horizontal, CNC milling machine operation, theory/operating grinding machines, operating CNC turning centers. (Prerequisite: 31-420-346, Machine Shop 2)

**31-420-357 MACHINE SHOP 4** ...shop safety, measuring tools, power saw operation, drilling machines, bench work and maintenance, advanced engine lathe operation, advanced vertical horizontal and CNC milling operation, grinding machine operation, and CNC turning centers. (Corequisite: 31-420-356, Machine Shop 3)

**31-420-358 CNC SET-UPS** ...CNC mill and lathe-tool holder selection, loading and unloading tools, work holding, setting part zero, fixture offsets, setting length and dial offsets, boring bars, and bar feeding. (Corequisite: 31-420-348, Prec Msmt)

**31-421-352 BLUEPRINT READING/SKETCHING-MACHINE 1** ...fundamentals of sketching, orthographic projection, auxiliary views, sectional views, dimensioning, precision and non-precision measurement, and general print reading.

**31-421-362 BLUEPRINT READING/SKETCHING-MACHINE TRADES 2** ...blueprint reading, tolerancing, surface finishes, fits (inch & metric), basic welding symbols, casting, stamping, gearing and CAM drawings, and basic geometric tolerancing and dimensioning. (Prerequisite: 31-421-352, Blueprint Reading Sketching-Machine Trades I)

**31-422-359 METALLURGY FOR MACHINIST** ...manufacture of iron and steel, basic composition of metals, metal identification, applied heat treating processes.

**31-442-361 WELDING-MACHINE TRADES** ...oxyacetylene, brazing, soldering, cutting and hardsurfacing, beads and types of joints, plasma arc cutting, gas metal arc, tungsten metal arc welding.

**32-420-300 MOLD DIE CONSTRUCTION** ...squaring plates, boring/milling/turning components, grinding/polishing operations, heat treating, fitting ejector systems, heating/cooling systems, applying fasteners, engraving/stamping, RAM EDM machining, molding machine setup. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-301 TOOL MAKING** ...performing various machining, heat-treating, and assembly operations necessary to produce a tool or fixture to be used in a typical manufacturing process. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-302 MOLD DIE DESIGN** ...interpret mold die prints, types of mold dies; identify mold plates, ejector pins, return pins, sprues, slides, cavities, runners, gates, leader pins/bushings; select material to be molded and design a mold die. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-303 TOOLING DESIGN** ...interpreting tool and fixturing prints, designing a tool or fixture to be used in a typical manufacturing process. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-304 STAMPING DIE DESIGN** ...interpret stamp die prints, types of stamp dies; identify die blocks, punches, punch plates, gages, stops, strippers, die shoes; design stamp die. (Prerequisites: 32-420-303, Tooling Design; 32-420-301, Tool Making; basic Windows proficiency)

**32-420-305 MACHINE APPLICATIONS-ADVANCED** ...maintain/set-up/operate CNC wire/RAM EDM machines, simulate high-speed machining processes, apply superabrasive tooling, 4th axis milling operations, 3 axis turn/mill/drill applications, 3-D surface machining. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-306 STAMPING DIE CONSTRUCTION** ...machine die blocks, punches, punch plates, gages, stops, strippers, die shoes using CNC lathes, CNC mills, CNC wire EDM; assemble components into a working die set; set-up on punch press. (Prerequisites: 32-420-303, Tooling Design; 32-420-301, Tool Making)

**32-420-307 MACHINING THEORY-ADVANCED** ...electrical discharge machining (EDM), high speed machining concepts, rapid setup and quick change over procedures, abrasive waterjet, abrasive flow, chemical machining, laser and plasma, palletizing systems. (Prerequisite: Completion of 1st and 2nd semester courses)

**32-420-308 METROLOGY** ...ISO 9000 concepts, Statistical Process Control (SPC) theory and applications, coordinate measuring machine setup and applications, surface texture measurement concepts, and applications for geometric dimensioning and tolerancing (GD&T), optical comparator and high amplification techniques. (Prerequisite: 31-420-348, Precision Measurement)

**32-420-337 CNC FUNDAMENTALS 3** ...basic AutoCAD, CNC production planning, advanced 2D programming, 3D surface programming, computer assisted CNC programming. (Prerequisite: 31-420-349, CNC Fundamentals 2)

**32-420-342 CNC FUNDAMENTALS 4** ...CNC process modeling, 4th axis indexing, advanced CNC lathe programming, 4th axis CNC wire EDM programming, and CNC fabrication punch/turner programming applications. (Prerequisite: 32-420-337, CNC Fundamentals 3)