

Machine Technology

Curriculum Guide

Program Description

MCTI's Machine Technology Program is run like a small machine/fabrication shop. Students are taught to run various equipment including manual lathes, milling machines, welding equipment, and grinders. Students use hand tools to layout, finish, fit, and assemble parts. Students may also learn setup and operation of CNC turning and machining centers. Advanced students learn to use CAD/CAM software to generate G-code for CNC machining.

Program Admissions Requirements:

None

U.S. Department of Labor Occupational Profile:

Students who most closely match the occupational profile for a Machinist are selected for enrollment.

- **Aptitude/Abilities:** Average learning ability, spatial and form perception, motor and fine finger dexterity. Demonstrated ability of mechanical reasoning, computer literacy, and the ability to problem solve and compute dimensions.
- **Work Keys:** Reading – 3, Locating Information/Applied Math – 4
- **CASAS Scaled Scores:** Reading 216-225 & Math 226-235
- **Environment:** Loud, hazardous machines
- **Physical Demands:** Medium
- **Temperament:** Perform precision work and a variety of tasks

Certificate of Completion Programs (SOC Code):

- Machine Operator (51-4034)
- Production Welder (51-4122)
- Fabrication Welder (51-4122)
- CNC Operator (51-4011)
- CNC Machinist (51-4012)

The Machine Technology Program is two to four term and students are expected to earn at least a Production Welder or CNC Operator certificate.

At the end of the first term, the instructor invites those students who demonstrate academic progress by maintaining an accumulated grade point average or 2.0 or better and good employability skills to advance to the next term for either the Welding Track or the CNC Track.

Students who have successfully completed the first term with an accumulated grade point average of 2.0 and good employability skills, but did not meet the requirements for the Fabrication Welder or CNC operator track may enter the Production Welder track.

At the end of the second term, those students who successfully complete MT 207 and MT 208 with an accumulated grade point average of 2.0 or better may be considered for the CNC Operator program.

Students who successfully complete the CNC Operator program by maintaining an accumulated grade point average or 3.0 or better and good employability skills will be invited to advance to the CNC Machinist Program.

Those students who have successfully completed the first term with an accumulated grade point average of 2.0 and good employability skills, and are unable to continue to the second term may receive the Machine Operator certificate.

Machine Technology - Required Courses for Certification

Students must demonstrate academic progress (satisfactory grade point average) and good employability skills to advance from term to term.

Machine Operator Core (First Term)

Course Number	Course Name	Credits
MT 107	Machine Tool 1	2
MT 108B	Machine Shop Practices	7

Required for CNC track or Fabrication Welder Certificate

MT 105	Blueprint Reading	3
EC 130	Technical Math for MT and DR	2

WELDING TRACK

Production Welder (Second Term)

Course Number	Course Name	Credits
MT 211	Production Welding	12

Fabrication Welder (Third Term)

Course Number	Course Name	Credits
MT 309	Weldment Print Reading	3
MT 311	Welding Fabrication	9

CNC TRACK

Core Courses (Second Term)

Course Number	Course Name	Credits
EC 115	Algebra	2
MT 207	Machine Tool II	3
MT 208	Machine Shop Practices II	7
MT 220	Introduction to CNC Programming	2

CNC Operator (Third Term)

MT 315	CAD/CAM	3
MT 320A	CNC Operations I	9
EC 239	Geometry/Trigonometry	2

CNC Machinist (Fourth Term)

MT 420	CNC Machine Operator II	4
MT 425	CAM	8

Electives

MT 102	Intro to Welding	1
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Instructors, program managers, and/or the referring counselor may recommend employability skills and elective classes based on the student's needs, abilities, interest and behaviors. Job Seeking Skills is required for all students anticipating to graduate from MCTI.

EC 115: Algebra

Students learn basic algebra that is needed for training in any technical/ vocational field or testing including GED, college entrance, civil service, and military entrance. **Topics covered:** signed numbers and order of operations, powers, roots, and scientific notation, algebraic expressions and formulas, one-step equations, multi-step equations, special equations, graphing equations, polynomials.

EC 130: Technical Math for Machine Technology and Drafting

This course is for students seeking a job in machine technology or drafting. Students work with problems similar to those found in machine trade handbooks and engineered drawings. Students solve realistic industry-related problems and use actual industrial applications that progress from simple to relatively complex. **Topics covered:** application of basic arithmetic operations of fractions and decimals, calculator, blueprint dimensions as working dimensions, formulas.

EC 239: Geometry/Trigonometry

Students who can solve basic math problems will learn advanced math skills needed to work in machine technology. The course introduces the students to the basics of geometry and trigonometry as applied to machine technology. **Topics covered:** basic geometric figures, angles, triangles, circles, basic trigonometry functions, calculating sides and angles of right triangles, practical machine applications, and calculating sides and angles of oblique triangles.

MT 102: Intro to Welding

This course is designed to introduce students to the MIG and ARC welding processes. Students learn to weld various joints in mild steel using the basic MIG and ARC process. **Topics covered:** MIG and ARC welding, mild steel

MT 105: Blueprint Reading

This course is for students with little or no knowledge of reading blueprints. Students learn to read dimensions on a blue print, types of lines on blue prints and how to sketch a print as required for the job. Emphasis is on safety and appropriate work/class behaviors. **Topics covered:** drawings, blueprint views, blueprint information, reading dimensions on blueprints, symbols used in prints, orthographic projection, geometric dimensioning and tolerancing styles.

MT 107: Machine Tool I

This course prepares students with little or no machining experience for entry-level employment in the machining career field. Students learn the theories behind the different types of hand tools, measuring tools, and machine tools used. Safety, patience, and personal reliability (class attendance and participation) is emphasized. **Topics covered:** hand tools, measuring devices, conventional machine tools.

MT 108B: Machine Shop Practices

This lab prepares students with little or no machining experience to use hand tools, measuring tools, and machine tools introduced in MT 107... Safety, patience, and personal reliability (class attendance and participation) is emphasized. **Topics covered:** hand tools, measuring devices, conventional machine tools.

MT 207: Machine Tool II

This course builds on MT 107, further preparing the student in the knowledge of operating machine tools and using precision measuring. Safety, patience, and personal reliability (class attendance and participation) are emphasized. **Topics covered:** hand tools, measuring devices, machine tools (manual and CNC), welding, metalworking theory.

MT 208: Machine Shop Practices II

This lab is a continuation of MT 108A. Students continue to gain experience using hand tools, measuring tools, and machine tools commonly used in the machine technology field. Safety, patience, and personal reliability are emphasized. **Topics covered:** hand tools, measuring devices, machine tools (manual and CNC), welding, metalworking theory.

MT 211 Production Welding

This course is designed to introduce students to various welding processes and materials commonly joined using MIG, ARC, TIG, and Oxy-Acetylene processes. Students use various materials including mild steel, stainless steel, and aluminum to hone their welding skills to function in a production environment. **Topics covered:** MIG, ARC, TIG, Oxy-Acetylene welding

MT 220: Introduction to CNC Programming

Students with no previous CNC programming learn the fundamentals of G-code and M-code programming. Focus is on the Haas controller and specific canned cycles associated with Haas Machining and Turning centers. Students manually program drawings and test their programs using the simulator functions of the Haas machines. **Topics covered:** G-codes and M-codes, programming sequence, X,Y,Z coordinate system.

MT 309 Weldment Print Reading

This course is designed for students who have a working knowledge/skill level in blueprint reading. This course builds on their knowledge/skill to prepare the students to identify and interpret welding symbols and terminology found on weldment blueprints. **Topics covered:** Welding symbols, terminology

311 Fabrication Welding

This course is designed for students who can already make proficient welds in multiple materials utilizing various welding processes. The course prepares the student for entry-level employment in the welding/fabricating field by developing their ability to assemble complex weldments. **Topics covered:** Hand tools, measuring devices, machine tools (manual and CNC), welding, metalworking theory

MT 315: CAD/CAM

This course is for students with a basic knowledge of CNC programming with CAM software or CNC operations and knowledge of machine shop operations including manual lathe and mill. The course focuses on the basic applications of CNC operation, computer assisted programming using CAM software, and advanced canned program cycles. Programming focus is on the Haas milling and turning controllers with some time spent on the Anilam controller. **Topics covered:** CNC programming, CNC operations, canned cycles, CAM software functionality.

MT 320A: CNC Operations I

An introductory course for students with little or no CNC machining experience. The course focuses on the fundamentals of CNC operation of Haas milling and turning centers, and considerations of part production setup, typical controller operations, setup of tooling offsets, machine maintenance, and manual program editing. **Topics covered:** CNC operation, setting tool offsets, production setups, machine maintenance.

MT 420: CNC Machine Operator II

This course is for students with advanced knowledge of operating machine tools and using precision measuring equipment. Students prepare for entry-level employment in the machining career field using CNC machine tools and expand skills in CNC operation and programming. Safety, patience, and personal reliability are emphasized. **Topics covered:** hand tools, measuring devices, machine tools (manual and CNC), CAD/CAM, and metalworking theory.

MT 425: CAM

This course is for students with advanced knowledge of operating machine tools, using precision measuring equipment and basic knowledge of CAM software. Students expand skill sets in NC programming using CAD/CAM software and G and M codes. **Topics covered:** 2 ½D and 3D programming, CNC operations, computer simulations of machine paths, and advanced 2D and 3D detail drawing.