machine tool technician

Technical Diploma
Program Code: 32-420-1
Total Credits: 56-57

The Machine Tool Technician program prepares graduates for machining positions, an in-demand skill set at the heart of industrial production. Additional training and experience often lead to supervisory, quality assurance, and tool maker positions. In this program you will learn to shape various materials into intricate, precise, usable parts. You'll also work from blueprints and written specifications to select the proper machinery, materials, and tools, and you'll gain proficiency with machine tools such as lathes, mills, grinders, computers, and computerized numerical control (CNC) machines.

Estimated tuition and fees: mstc.edu/programcosts

ACADEMIC ADVISOR
To schedule an appointment with an academic advisor, call 715.422.5300. Academic advisors will travel to other campuses as necessary to accommodate student needs. For more information about advising, visit **mstc.edu/advising**.

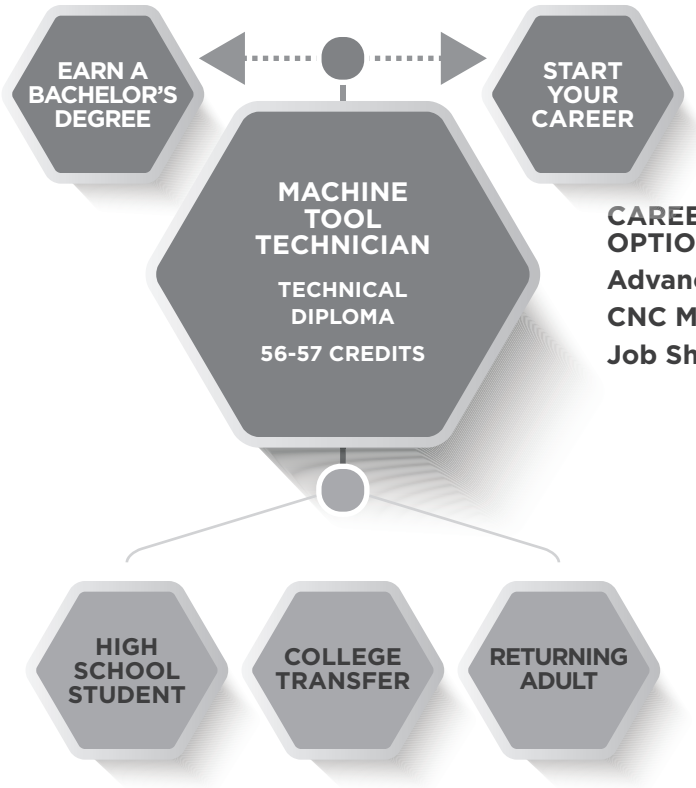
CHECKLIST:
This section will be completed when meeting with your academic advisor.

- ❑ FAFSA (www.fafsa.gov)
- ❑ Financial Aid Form(s)
  Form(s): _____
- ❑ Follow-Up Appointment:
  Where: _____
  When: _____
  With: _____
- ❑ Official Transcripts
  Mid-State Technical College
  Attention CPL Coordinator
  500 32nd Street North
  Wisconsin Rapids, WI 54494
- ❑ Other: _____
  _____

career pathway

BACHELOR'S DEGREE OPTIONS

For more information and additional opportunities, visit mstc.edu/transfer.



CAREER OPTIONS

Advanced Machine Operator
CNC Machine Operator
Job Shop Machinist

College Credit • Dual Credit • Military Experience • Work Experience
Learn about Credit for Prior Learning at mstc.edu/cpl.

BEGIN AT ANY POINT IN THE PATHWAY

OTHER OPTIONS

RELATED PROGRAMS

- Industrial Mechanical Technician
- Stainless Steel Welding
- Welding

APPRENTICESHIP OPPORTUNITIES

- Machinist Apprenticeship

PROGRAM OUTCOMES

Employers will expect you, as a Machine Tool Technician graduate, to be able to:

- Apply basic safety practices in the machine shop.
- Interpret industrial/engineering drawings.
- Apply precision measuring methods to parts inspection.
- Perform basic machine tool equipment setup and operation.
- Perform programming, setup, and operation of CNC machine tools.
- Perform advanced CNC machining operations.

TECHNICAL SKILLS ATTAINMENT

The Wisconsin Technical College System (WTCS) has implemented a requirement that all technical colleges measure program outcomes attained by students. This requirement is called Technical Skills Attainment (TSA). The main objective of TSA is to ensure graduates have the technical skills needed by employers. Students are notified of TSA reporting in their final few courses of the program.

NOTES:

STUDENT HANDBOOK

Visit **mstc.edu/studenthandbook** to view Mid-State's student handbook, which contains information about admissions, enrollment, appeals processes, services for people with disabilities, financial aid, graduation, privacy, Mid-State's Student Code of Conduct, and technology.

GRADUATION REQUIREMENT

The GPS for Student Success course is required for all Mid-State students and must be completed prior to obtaining 12 credits. (Not counted in the total credit value for this program.)

GPS for Student Success
10890102 .....1 credit
Integrate necessary skills for student success by developing an academic plan, identifying interpersonal attributes for success, adopting efficient and effective learning strategies, and utilizing Mid-State resources, policies, and processes. This course must be completed prior to obtaining 12 credits and as a graduation requirement.

ADDITIONAL COURSES AS NEEDED

The following courses may be recommended or required if the student does not achieve minimum Accuplacer scores.

Intro to College Reading
10838104 .....2 credits
Provides learners with the opportunities to develop and expand reading skills, including comprehension and vocabulary skills. Learners apply reading skills to academic tasks and read to acquire information from a variety of sources.

Intro to College Writing
10831103 .....3 credits
Introduces basic principles of composition, including organization, development, unity, and coherence in paragraphs and multi-paragraph documents. The purpose of this course is to prepare students for successful entry into required program courses. This course is tuition bearing and under certain circumstances may qualify for financial aid. This course cannot be used to satisfy program completion requirements at Mid-State.
Prerequisite: Accuplacer Sentence Skills score of 60 or equivalent. Proficiency in word processing skills recommended.

Pre-Algebra
10834109 .....3 credits
Provides an introduction to algebra. Includes operations on real numbers, solving linear equations, percent and proportion, and an introduction to polynomials and statistics. Prepares students for elementary algebra and subsequent algebra-related courses.
Prerequisite: Accuplacer Math score of 65, Accuplacer Algebra score of 30, ABE Math Prep V 76854785 and ABE Math Prep VI 76854786 with a grade of "S." (Note: ABE Math Prep V and VI courses cannot be used to satisfy program completion requirements at Mid-State.)

SAMPLE FULL-TIME CURRICULUM OPTION

Term		**14-15 credits**
10462114	Metals & Machining **-or-**	
10462132	Machine Shop Fundamentals	3
10623104	Print Reading for Industry	3
32420302	Conventional Machining Practices	2
32420312	Metals Science	2
32420320	Math for Manufacturing **-or-**	2
10804107	College Mathematics	3
32420372	Precision Machining Foundations	2

Term		**14 credits**
32420304	Milling Machines Operations	3
32420308	Basic Lathe Operation	3
32420310	Introduction to Solid Modeling	2
32420362	CNC Lathes/Manual Programming	2
32420364	CNC Mills/Manual Programming	2
32420371	Inspection Techniques	2

Term		**14 credits**
10102130	Career Development **-or-**	
10801199	Employment Strategies	3
32420335	Lathes-Advanced	2
32420336	Mills-Advanced	2
32420368	Computer Aided Machine Tool Programming	3
32420373	CNC Lathes Set Up and Operation	2
32420374	CNC Mills Set Up and Operation	2

Term		**14 credits**
10623112	Manufacturing Practices	2
32420307	Non-Traditional Machine Operations	2
32420322	Geometric Dimensioning & Tolerancing	2
32420375	Multi Axis CNC	2
32420366	CNC Controls	3
32420376	Advanced CNC Programming Techniques	3

Total credits 56-57

Please Note:
- This curriculum sequence is only for student planning. Actual student schedules will vary depending on course availability.
- Program completion time may vary based on student scheduling and course availability. For details, go to **mstc.edu/classfinder**.

SAMPLE PART-TIME CURRICULUM OPTION

Term		**7 credits**
10462114	Metals & Machining **-or-**	
10462132	Machine Shop Fundamentals	3
3242032	Conventional Machining Practices	2
3242372	Precision Machining Foundations	2

Term		**8 credits**
32420304	Milling Machines Operations	3
32420308	Basic Lathe Operations	3
32420310	Introduction to Solid Modeling	2

Term		**7-8 credits**
10623104	Print Reading for Industry	3
32420312	Metals Science	2
32420320	Math for Manufacturing **-or-**	2
10804107	College Mathematics	3

Term		**6 credits**
32420362	CNC Lathes/Manual Programming	2
32420364	CNC Mills/Manual Programming	2
32420371	Inspection Techniques	2

Term		**7 credits**
32420373	CNC Lathes Set Up and Operation	2
32420374	CNC Mills Set Up and Operation	2
10102130	Career Development **-or-**	
10801199	Employment Strategies	3

Term		**7 credits**
32420366	CNC Controls	3
10623112	Manufacturing Practices	2
32420322	Geometric Dimensioning & Tolerancing	2

Term		**7 credits**
32420335	Lathes-Advanced	2
32420336	Mills-Advanced	2
32420368	Computer Aided Machine Tool Programming	3

Term		**7 credits**
32420307	Non-Traditional Machine Operations	2
32420375	Multi Axis CNC	2
32420376	Advanced CNC Programming Techniques	3

Total credits 56-57

Advanced CNC Programming Techniques
32420376.....3 credits
Students participating in this course will expand on CNC programming techniques with an emphasis on efficiency. Classroom presentations and lab activities will introduce students to techniques with multi axis mills, live tooling lathes, machine probing, and an introduction to macros programming.
Prerequisite: Computer Aided Machine Tool Programming 32420368

Basic Lathe Operation
32420308 .....3 credits
This course is devoted to helping learners understand concepts, terms, and operations of the basic manual lathe. Safety must be practiced continuously. This course emphasizes safety and the development of safe work habits. This course expands and enhances the learner's working skills on the individual machine tools through exercises and projects. The classroom instruction emphasis is placed on the manual lathe.

Career Development
10102130 .....3 credits
Prepares learners for the process of gaining employment. Learners assess their personal background; practice finding career opportunities through the job search process; develop a cover letter, resume, and thank you letter, and complete a job application; participate in a mock interview; and demonstrate how to deal with interpersonal situations found in a work environment. NOTE: To enroll, you must have completed 50 percent of technical program credits or receive department approval. See program advisor, program faculty, program counselor, or department dean/associate dean to register.

CNC Controls
32420366 .....3 credits
Provides the skills needed to navigate common CNC machine control panels. Students learn common methods to set tool offsets and work offsets as well as perform common part setup practices. Focuses on accuracy, repeatability, and efficiency in the operations of CNC machine tools.
Prerequisites: CNC Lathes/Manual Programming 32420362 and CNC Mills/Manual Programming 32420364

CNC Lathes Set Up and Operation
32420373.....2 credits
In this introductory Computer Numerical Control (CNC) machining course, students will practice the skills needed to setup and operate CNC lathes. Classroom presentations and lab projects will focus on safety, theory, terminology as it relates to completing machine setups in the CNC lathe. Topics covered will be tool and work offset setting, work holding and quality. Learners will work with proven CNC part programs and setup documents to create parts to specifications and ensure all parts of a production run maintain quality throughout the run.
Prerequisite: CNC Lathes/Manual Programming 32420362

CNC Lathes/Manual Programming
32420362 .....2 credits
Covers NC/CNC terminology, and introduces students to computers and components of NC/CNC lathes. All programming is manual word address (G+M Code) basics. Includes basic CNC lathe operation.
Corequisite: Basic Lathe Operations 32420308

CNC Mills Set Up and Operation
32420374.....2 credits
In this introductory Computer Numerical Control (CNC) machining course, students will practice the skills needed to setup and operate CNC milling machines. Classroom presentations and lab projects will focus on safety, theory, terminology as it relates to completing machine setups in the CNC milling machine. Topics covered will be tool and work offset setting, work holding and quality. Learners will work with proven CNC part programs and setup documents to create parts to specifications and ensure all parts of a production run maintain quality throughout the run.
Prerequisite: CNC Mills/Manual Programming 32420364

CNC Mills/Manual Programming
32420364 .....2 credits
Covers NC/CNC terminology, and introduces students to computers and components of NC/CNC mills. All programming is manual word address (G+M code) basics. Includes basic CNC mill operation.
Corequisite: Milling Machine Operations 32420304

College Mathematics
10804107 .....3 credits
Designed to review and develop fundamental concepts of mathematics pertinent to the areas of: 1) arithmetic and algebra; 2) geometry and trigonometry; and 3) probability and statistics. Special emphasis is placed on problem solving, critical thinking and logical reasoning, making connections, and using calculators. Topics include performing arithmetic operations and simplifying algebraic expressions, solving linear equations and inequalities in one variable, solving proportions and incorporating percent applications, manipulating formulas, solving and graphing systems of linear equations and inequalities in two variables, finding areas and volumes of geometric figures, applying similar and congruent triangles, converting measurements within and between US and metric systems, applying Pythagorean Theorem, solving right and oblique triangles, calculating probabilities, organizing data and interpreting charts, calculating central and spread measures, and summarizing and analyzing data.
Prerequisite: High School GPA of 3.0 or Accuplacer Arithmetic of 250 and QAS 234 or ACT of 17 or Pre-Algebra 834109 with a grade of "C" or better or equivalent. Students are encouraged to bring transcripts for further evaluation if they do not meet these requirements.

Computer Aided Machine Tool Programming
32420368 .....3 credits
This course introduces students to Computer-Aided Drafting/Design (CAD) and Computer-Aided Machining/ Manufacturing (CAM). This course consists of demonstrations and hands-on use of CAD/CAM software and hardware. Major emphasis is placed on geometry creation and editing functions, process planning, proper cutter selection, feed and speed selection, and tool path generation along with post processing to specific CNC machines. Some basic machine set-up and operation are included to verify program operation. Students should have knowledge of drafting/ design, machining processes and procedures, and computer operating systems (MS Windows).
Prerequisites: CNC Lathes/Manual Programming 32420362 and CNC Mills/Manual Programming 32420364

Conventional Machining Practices
32420302 .....2 credits
Participants in this course will build skill on the foundations of machine tool setups and operations. Classroom presentations and lab activities will help students work more efficiently and more accurately with smaller tolerances for error as a standard. Special attention will be placed on cutting tool selection, work holding and final part accuracy.
Corequisite: Machine Shop Fundamentals 10462132

Employment Strategies
10801199 .....3 credits
A course designed to assist students in securing employment. This communication-based course helps develop an awareness of personal and academic skills as they relate to the job seeking process. Topics of study include personal and skill assessments, research of employment sources, completion of application forms, formation of professional resumes, composition of various business letters, interviewing skills, and job offer evaluation. NOTE: To enroll you must have completed 50 percent of technical program credits or receive department approval. See program advisor, program faculty, program counselor, or department dean/associate dean to register.

Geometric Dimensioning & Tolerancing
32420322.....2 credits
Provides fundamentals of geometric dimensions and tolerancing per the ASME Y14.5 standard. Focuses on developing the technical knowledge and skills required for application and interpretation of GD&T.
Prerequisite: Admission to Machine Tool program 324201 or consent of instructor

Inspection Techniques
32420371 .....2 credits
Participants in this course will be introduced to the principles of dimensional metrology. Lab activities and classroom presentations will provide insight into the use of direct and indirect measuring tools, instrument calibration, and the use of Coordinate Measuring Machines, and quality documentation. Emphasis of the course will be on using metrology fundamentals to ensure manufactured components meet design specifications.

Introduction to Solid Modeling
32420310.....2 credits
Introduces students creating computer-aided drafting (CAD) represented solid models for use in the manufacturing arena. As an introductory course in three-dimensional modeling, learners use computer software to develop two-dimensional sketches and use modeling tools to create solid models on the computer. Students also use the models to create and detail two-dimensional engineering drawings for use on the manufacturing floor. Computer knowledge and prior knowledge of drawing/ drafting techniques is recommended.

Lathes-Advanced
32420335.....2 credits
Students receive further insight into lathe concepts. Includes safety review and covers advanced cutting tool materials such as carbides, ceramics, cubic boron nitride (CBN), and polycrystalline diamonds (PCD). Tooling, speeds and feeds, cutting tool selection, and advanced machine practices such as multi-operations and process planning are also covered.
Prerequisite: Basic Lathe Operations 32420308

Machine Shop Fundamentals
10462132.....3 credits
Students participating in this class will be introduced to common machine tools and their functions. Classroom activities and hands-on lab exercises will be used to introduce participants to some of the most common applications in machining. Lab activities will introduce students to shop safety and identification of machine tools. Students will also gain understanding of the basic processes performed with different machine tools and basic machine set up and operations.

Manufacturing Practices
10623112.....3 credits
As competition for market share continues to increase, manufacturers rely on innovations in technology, methods, and practices to give them the edge they need. To remain competitive globally, the watchwords are productivity, efficiency, and quality. In this course, students examine some of the practices that many manufacturing operations have come to rely on to make their operations competitive, efficient, and cost-effective. Topics covered in this class include the principles of lean manufacturing, value versus non-value added waste, 5S methodology, value stream mapping, setup reduction and quick changeover, cellular flow, building a lean culture, total productive maintenance, and statistical process control (SPC).

Math for Manufacturing
32420320 .....2 credits
Studies machine tool problems involving calculations with fractions, decimals, and percentage. Includes work with the metric system, measurement conversion, geometry, trigonometry of right triangles, and use of a scientific calculator. Formulas with application to the trades are also studied.
Prerequisite: Admission into Machine Tool Technician program 324201, Welding program 314421, Gas Metal Arc Welding (Stainless Steel) program 304427, or consent of instructor

Metals & Machining
10462114 .....3 credits
A two-part class that introduces the basics of metal science and machine shop practice. Introduces metallurgical concepts of steel and iron production, properties of metals, testing of metals, carbon and its rule, heat-treating, steel designations, and cast iron and non-ferrous metals. Students participate in lab exercises examining the properties of metal, an introduction to machine shop practices of safety, measurement, and machining through the use of hand tools, drilling machines, saws, and engine lathes. Students are introduced to concepts by both classroom presentation and hands-on shop experiences.

Metals Science
32420312 .....2 credits
Introduces the field of metallurgy. Covers sources of common metals, including both ferrous and non-ferrous methods of ore extraction, and refining and classification of these metals and the alloy systems. The heat treatment of various metals and properties of metals are studied, including lab work on shear, compression, tensile strength, and corrosion.

Milling Machines Operations
32420304 .....3 credits
Participants in this course will develop additional skills needed for effective milling machine operations. Common work holding and fixturing tools will be utilized to create parts accurately. Classroom presentation and lab activities will be utilized to hone the student's skills with manual milling machines. Attention will be on the use of advanced cutting tools and work holding techniques.

Mills-Advanced
32420336 .....2 credits
Provides greater insight into milling machine concepts. Places major emphasis on milling machine terminology, work-holding methods, location principles, tooling, and cutting tool selection, in addition to operations and process planning. Includes rotary tables and indexing methods such as direct, simple, and angular.
Prerequisite: Milling Machines Operations 32420304

Multi Axis CNC
32420375.....2 credits
Multi-Axis CNC machines have become standard in the machining industry. Participants in this course will become familiar with the set-up procedures for 4 and 5 axis milling machines, manual programming techniques, and advanced CAM programming for multi-axis positioning and contouring. Lab activities and classroom presentations will prepare students for the added machining versatility of multi-axis machines.
Prerequisite: Computer Aided Machine Tool Programming 32420368

Non-Traditional Machine Operations
32420307 .....2 credits
Students explore a variety non-traditional machining operations and gain knowledge of the theory and operation of electrical discharge machining (EDM) and use of a coordinate measuring machine. Focuses on the cutting-edge processes that are becoming the mainstream of modern machining.
Prerequisites: Lathes-Advanced 32420335 and Mills-Advanced 32420336

Precision Machining Foundations
32420372.....2 credits
Students taking this course will build a foundation in precision machining. Classroom presentations and lab projects will focus on safety, theory, terminology, machine tool setups, calculations and machine operations. Assigned student projects will be built using conventional machine tools including milling machines, lathes, drill presses, band saws and surface grinders. Special attention will be on safety, print reading, layout, inspection and shop math.
Corequisite: Machine Shop Fundamentals 10462132

Print Reading for Industry
10623104 .....3 credits
Engineering drawings are the heart of the manufacturing process. This course will develop proficiency with the visualization of multi-view orthographic projection drawings, interpretation of print symbols, dimensioning standards, tolerance standards, assembly drawings, section and auxiliary views. Included in this course will be hands on drawing and interpretation of prints as well as classroom presentations.