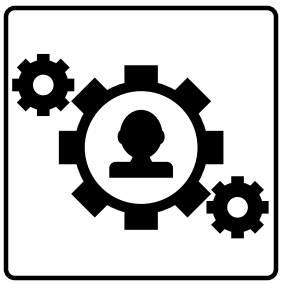

PRECISION MACHINING TECHNICIAN

Technical Diploma
Program Code: 31-420-10
Total Credits: 52-53

The Precision Machining 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**.

NEW STUDENT CHECKLIST

Complete the following steps to prepare for your New Student Advising appointment with your academic advisor:

- ❑ Submit a Mid-State application at **mstc.edu/apply**.
- ❑ Send official transcripts to:
  Mid-State Technical College
  Student Services
  1001 Centerpoint Drive
  Stevens Point, WI 54481
- ❑ Complete the Free Application for Federal Student Aid (FAFSA) at **fafsa.gov**. Mid-State's Financial Aid team is available to assist with your FAFSA application and to answer your financial aid questions. Contact Financial Aid or schedule an appointment at **mstc.edu/financial-aid**.
- ❑ Set up student MyCampus account at **mstc.edu/mycampus-assistance**.
- ❑ Schedule a New Student Advising appointment at **mstc.edu/advising**.

CAREER PATHWAY • BEGIN AT ANY POINT

CREDIT FOR PRIOR LEARNING AND EXPERIENCE

- Certifications and Licenses
- High School Credit
- Military Experience
- National/Standardized Exams
- Transfer Credit
- Work and Life Experience

Learn about Credit for Prior Learning at **mstc.edu/cpl**.

PRECISION MACHINING TECHNICIAN

Technical Diploma • 52-53 Credits

Start Your Career

- Advanced Machine Operator
- CNC Machine Operator
- Job Shop Machinist
- Apprenticeship

BACHELOR'S DEGREE OPTIONS

For those interested in continuing their education, Mid-State offers transfer agreements with various four-year colleges and universities. For more information and additional opportunities, visit **mstc.edu/transfer**.

OTHER OPTIONS

RELATED PROGRAMS

- Advanced Manufacturing Technology
- Industrial Mechanical Technician
- Manufacturing Operations Management
- Metal Fabrication
- Stainless Steel Welding
- Welding

APPRENTICESHIP OPPORTUNITIES

- Machinist Apprenticeship

OUTCOMES

Employers will expect you, as a Precision Machining 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 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 program students and is recommended to be completed before obtaining 12 credits. (Not counted in the total credit value for this program.) Some students are exempt from this requirement. Please see your program advisor for more information.

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 is recommended to be completed prior to obtaining 12 credits and is a graduation requirement unless you receive an exemption from your program advisor.

ADDITIONAL COURSES AS NEEDED

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

College Reading and Writing 1
10831104 .....3 credits
Provides learners with opportunities to develop and expand reading and writing skills to prepare for college-level academic work. Students will employ critical reading strategies to improve comprehension, analysis, and retention of texts. Students will apply the writing process to produce well-developed, coherent, and unified written work.

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.

SAMPLE FULL-TIME CURRICULUM OPTION

Term		14-15 credits
31804305	Applied Mathematics	2
	-OR-	
10804107	College Mathematics ✎	3
32420311	Safety, Measurement, and Layout	1
32420326	Introduction to Turning Machines	2
32420329	Intermediate Turning Applications	5
32420331	Print Reading for Precision Machining	2
32420373	CNC Lathes Set Up and Operation ✎	2

Term		12 credits
31801368	Workplace Communication	1
32420310	Introduction to Solid Modeling	2
32420337	Introduction to Milling Machines	2
32420340	Intermediate Milling Applications	5
32420374	CNC Mills Set Up and Operation ✎	2

Term		12 credits
32420325	Inspection with Geometric Dimensioning	2
32420330	Advanced Turning Applications	3
32420332	Materials and Machinability	2
32420362	CNC Lathes/Manual Programming ✎	2
32444377	CNC Lathes Computer Aided Programming	2
32623301	Manufacturing Principles	1

Term		14 credits
32420341	Advanced Milling Applications	3
32420364	CNC Mills/Manual Programming	2
32420380	Multi-Axis Machining Processes	3
32444378	CNC Mills Computer Aided Programming	3
32444379	Advanced CNC Milling Operations	3

Total credits 52-53

✎ This course has options available to receive credit for prior learning (CPL) or work experience. Visit the website at **mstc.edu/cpl** or contact your advisor for details.

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/schedule**.

SAMPLE PART-TIME CURRICULUM OPTION

Term		7 credits
32420311	Safety, Measurement, and Layout	1
32420326	Introduction to Turning Machines	2
32420331	Print Reading for Precision Machining	2
32420332	Materials and Machinability	2

Term		6-7 credits
31804305	Applied Mathematics	2
	-OR-	
10804107	College Mathematics ✎	3
32420310	Introduction to Solid Modeling	2
32420337	Introduction to Milling Machines	2

Term		6 credits
32420329	Intermediate Turning Applications	5
32623301	Manufacturing Principles	1

Term		7 credits
32420340	Intermediate Milling Applications	5
32420374	CNC Mills Set Up and Operation ✎	2

Term		6 credits
31801368	Workplace Communication	1
32420325	Inspection with Geometric Dimensioning	2
32420330	Advanced Turning Applications	3

Term		8 credits
32420341	Advanced Milling Applications	3
32420364	CNC Mills/Manual Programming	2
32444378	CNC Mills Computer Aided Programming	3

Term		6 credits
32420373	CNC Lathes Set Up and Operation ✎	2
32420362	CNC Lathes/Manual Programming ✎	2
32444377	CNC Lathes Computer Aided Programming	2

Term		6 credits
32420380	Multi-Axis Machining Processes	3
32444379	Advanced CNC Milling Operations	3

Total credits 52-53

MULTIPLE MEASURES	
Multiple Measures Writing (MMW): High school GPA of 2.6 and successful completion of 2.0 credits of high school writing courses with a "C" or better	**Multiple Measures Reading (MMR):** High school GPA of 2.6 and successful completion of 2.0 credits of high school literature courses with a "C" or better
Multiple Measures Math 1 (MMM_1): High school GPA of 2.6 and successful completion of 1.0 credits of high school math (Algebra 1 or equivalent) with a "C" or better	**Multiple Measures Math 2 (MMM_2):** High school GPA of 2.6 and successful completion of 2.0 credits of high school math including Algebra 1 and Algebra 2 with a "C" or better
Multiple Measures Science 1 (MMS_1): High school GPA of 2.6 and successful completion of 1.0 credits of high school lab science course with a "C" or better	**Multiple Measures Science 2 (MMS_2):** High school GPA of 2.6 and successful completion of 1.0 credits of high school chemistry with a "C" or better

Past high school and college transcripts are used in making course placement decisions.

COURSE DESCRIPTIONS

Advanced CNC Milling Operations
32444379 .....3 credits
This course will utilize classroom presentations, discussions and hands-on lab activities to build on the skills from previous classroom experiences to equip learners to follow the entire process of manufacturing from print to part and through final inspection using CNC milling machines. Learners will explore in-process automated part inspection with the use of machine based probing systems. Additionally, students will become accustom to the use of Wire EDM machines and Coordinate Measuring Machines as they progress through the course.
Corequisite: CNC Mills/Manual Programming 32420364

Advanced Milling Applications
32420341.....3 credits
Students in this class will receive further insight into milling machine concepts. This course places major emphasis on work-holding methods with the use of jigs and fixtures. Jig and fixture design elements for location and rigid work holding in both a production environment as well as single piece runs, and advanced cutting tools and cutting processes will be explored to focus on manufacturing efficiency.
Prerequisite: Intermediate Milling Applications 32420340

Advanced Turning Applications
32420330 .....3 credits
Students in this class will receive further insight into turning machine concepts. This course includes a safety review and adds depth in advanced cutting tool materials such as ceramics, cubic boron nitride (CBN), and polycrystalline diamonds (PCD). Learners will explore differing fixturing and tooling needs for a production environment as well as planning for single piece runs.
Prerequisite: Intermediate Turning Applications 32420329

Applied Mathematics
31804305.....2 credits
Students taking Applied Mathematics make and convert various measurements. Students use formulas to solve problems. They compute dimensions of geometric shapes. Students use statistical tools to represent and analyze data. They analyze various financial situations. Students use basic right triangle trigonometry to solve problems. In each topic area, students solve application problems.

CNC Lathes Computer Aided Programming
32444377.....2 credits
This course introduces learners to Computer-Aided Machining/Manufacturing (CAM). Demonstrations and hands-on use of CAD/CAM software and hardware will be used. 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 CNC lathes. Some basic machine set-up and operation are included to verify program operation.
Prerequisite: Introduction to Solid Modeling 32420310

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.

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.

CNC Mills Computer Aided Programming
32444378.....3 credits
This course introduces learners to Computer-Aided Machining/Manufacturing (CAM). Demonstrations and hands-on of CAD/CAM software and hardware will be used. 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 CNC milling machines and machining centers. Some basic machine set-up and operation are included to verify program operation.
Prerequisite: Introduction to Solid Modeling 32420310

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.

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.

COURSE DESCRIPTIONS

College Mathematics
10804107 .....3 credits
This course is designed to review and develop fundamental concepts of mathematics in the areas of algebra, geometry, trigonometry, measurement and data. Algebra topics emphasize simplifying algebraic expressions, solving linear equations and inequalities with one variable, solving proportions and percent applications. Geometry and trigonometry topics include; finding areas and volumes of geometric figures, applying similar and congruent triangles, applying Pythagorean Theorem, and solving right triangles using trigonometric ratios. Measurement topics emphasize the application of measurement concepts and conversion techniques within and between U.S. customary and metric system to solve problems. Data topics emphasize data organization and summarization skills, including: frequency distributions, central tendency, relative position and measures of dispersion. Special emphasis is placed on problem solving, critical thinking and logical reasoning, making connections, and using calculators.
Prerequisite: High School GPA of 2.6 and MMM_1 or Accuplacer Arithmetic of 250 and QAS 234 or ACT Math score of 17 or Pre-Algebra 10834109 with a "C" or better

Inspection with Geometric Dimensioning
32420325.....2 credits
This course will familiarize learners with interpreting Geometric Dimensioning and introduce dimensional metrology. 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 interpretation of Geometric Dimensioning and using metrology fundamentals to ensure manufactured components meet design specifications.

Intermediate Milling Applications
32420340 .....5 credits
This course will develop additional skills needed for effective milling machine operations. Common work holding and fix turing tools will be utilized to create parts accurately and efficiently. Classroom presentation and lab activities will be utilized to hone the learner's skills with manual milling machines. Attention will be on safety, machine setups, operations, calculations, and inspection.
Corequisite: Introduction to Milling Machines 32420337

Intermediate Turning Applications
32420329 .....5 credits
Students enrolled in this course will build additional skills from previous classroom experiences related to turning machines. Presentations and lab activities will focus on machine setups, metal removal techniques, and common calculations encountered on the job. Lab projects will be created using techniques to ensure accuracy, efficiency, and repeatability with an introduction to CNC. Emphasis will be put on common turning procedures with inspection processes to produce quality components.
Corequisite: Introduction to Turning Machines 32420326

Introduction to Milling Machines
32420337.....2 credits
Explore the fundamentals of basic operations and safety of manual mills. Through the utilization of classroom and lab activities learners will acquire a basic understanding of the Milling Machine components as well as the cutting tools and basic work holding devices that may be used on the machine. The importance of proper tool selection and usage as utilizing the Milling Machines components properly will be the concentration.

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.

Introduction to Turning Machines
32420326 .....2 credits
This course will introduce functions and capabilities of turning machines known as lathes. Activities and hands-on lab exercises will be used to introduce learners to the most common applications of lathes in the machine shop. Shop safety, terminology, and identification of turning machines and related equipment in a machine shop environment will be introduced. Learners will also gain an understanding of basic setup and metal cutting processes performed on turning machines.

Manufacturing Principles
32623301 .....1 credit
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).

Materials and Machinability
32420332.....2 credits
This course covers sources, strengths, and industry uses for common metals and materials.

COURSE DESCRIPTIONS

Multi-Axis Machining Processes
32420380 .....3 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.
Prerequisites: CNC Lathes Set Up and Operation 32420373 and CNC Mills Set Up and Operation 32420374

Print Reading for Precision Machining
32420331 .....2 credits
Learners are introduced to interpreting multi-view orthographic projection drawings, callouts and symbols, GD&T, dimensioning, tolerancing standards, and assembly drawings in relationship to the machining industry.

Safety, Measurement and Layout
32420311 ..... 1 credits
In this course students become familiar with the machine shop environment. An overview of safety is covered with emphasis in lathes, mills, cut-off machines, and grinders. Learners are also introduced to measurement with various types of precision measurement tools, including micrometers, height gages, and calipers.

Workplace Communication
31801368 .....1 credit
Analyze workplace communication situations to develop professional verbal and written communication skills. Learners apply verbal and written communication skills, as well as conflict resolution strategies, to improve workplace communication climates and promote personal and professional growth.