

# PRECISION MACHINING TECHNICIAN

## Technical Diploma

**Program Code: 31-420-10**

**Total Credits: 51-52**

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](http://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](http://mstc.edu/advising).

### CHECKLIST:

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

- FAFSA ([www.fafsa.gov](http://www.fafsa.gov))
- Financial Aid Form(s)  
Form(s): \_\_\_\_\_
- Follow-Up Appointment:  
Where: \_\_\_\_\_  
When: \_\_\_\_\_  
With: \_\_\_\_\_
- Official Transcripts  
Mid-State Technical College  
Student Services Assistant  
1001 Centerpoint Drive  
Stevens Point, WI 54481
- Other: \_\_\_\_\_  
\_\_\_\_\_

**mstc.edu**  
**888.575.6782**  
**TTY: 711**



**ADAMS CAMPUS**  
401 North Main  
Adams, WI 53910

**MARSHFIELD CAMPUS**  
2600 West 5th Street  
Marshfield, WI 54449

**STEVENS POINT CAMPUS**  
1001 Centerpoint Drive  
Stevens Point, WI 54481

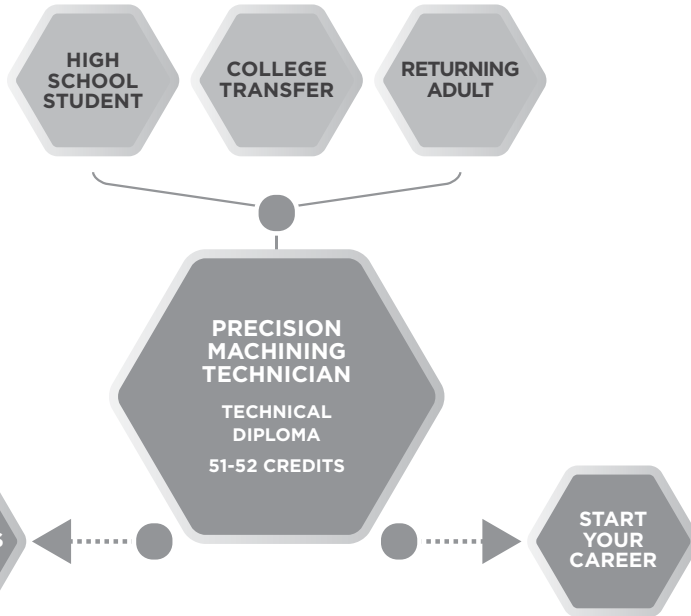
**WISCONSIN RAPIDS CAMPUS**  
500 32nd Street North  
Wisconsin Rapids, WI 54494

# CAREER PATHWAY

## BEGIN AT ANY POINT IN THE PATHWAY

College Credit • Dual Credit  
Military Experience • Work Experience

Learn about Credit for Prior Learning at [mstc.edu/cpl](http://mstc.edu/cpl).



## OTHER OPTIONS

### RELATED PROGRAMS

- Industrial Mechanical Technician
- Manufacturing Operations Management
- Stainless Steel Welding
- Welding

### APPRENTICESHIP OPPORTUNITIES

- Machinist Apprenticeship

### CAREER OPTIONS

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

### BACHELOR'S DEGREE OPTIONS

For more information and additional opportunities, visit [mstc.edu/transfer](http://mstc.edu/transfer).



## SAMPLE FULL-TIME CURRICULUM OPTION

| Term        |                                   | 13-14 credits |
|-------------|-----------------------------------|---------------|
| 31804305    | Applied Mathematics ☑             | 2             |
| <b>-or-</b> |                                   |               |
| 10804107    | College Mathematics ☑             | 3             |
| 32420311    | Safety, Measurement, and Layout   | 1             |
| 32420326    | Introduction to Turning Machines  | 2             |
| 32420329    | Intermediate Turning Applications | 5             |
| 32420373    | CNC Lathes Set Up and Operation   | 2             |
| 32623302    | Print Reading for Machine Tool    | 1             |

| 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 |
|----------|--|------------|
| 32420312 | Metals Science                         | 2          |
| 32420325 | Inspection with Geometric Dimensioning | 2          |
| 32420330 | Advanced Turning Applications          | 3          |
| 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 51-52**

☑ This course has options available to receive credit for prior learning (CPL) or work experience. Visit the website at [mstc.edu/cpl](http://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](http://mstc.edu/schedule).

## SAMPLE PART-TIME CURRICULUM OPTION

| Term        |                                  | 6-7 credits |
|-------------|----------------------------------|-------------|
| 31804305    | Applied Mathematics ☑            | 2           |
| <b>-or-</b> |                                  |             |
| 10804107    | College Mathematics ☑            | 3           |
| 32420311    | Safety, Measurement, and Layout  | 1           |
| 32420326    | Introduction to Turning Machines | 2           |
| 32623302    | Print Reading for Machine Tool   | 1           |

| Term     |                                  | 6 credits |
|----------|----------------------------------|-----------|
| 32420310 | Introduction to Solid Modeling   | 2         |
| 32420312 | Metals Science                   | 2         |
| 32420337 | Introduction to Milling Machines | 2         |

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

| Term     |                                   | 6 credits |
|----------|-----------------------------------|-----------|
| 32420340 | Intermediate Milling Applications | 5         |
| 32623301 | Manufacturing Principles          | 1         |

| 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 51-52**

# 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 accustomed 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 Math I 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

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 10834109 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.*

## 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).

# COURSE DESCRIPTIONS

## 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.

## 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 Machine Tool

**32623302.....1 credit**

Technical 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.

## 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.