



# Automotive/Advanced Manufacturing Precision Machining

## Program Information

Almost every product made by American industry contains metal parts or is manufactured by machines made with metal parts. With high demand for this type of equipment, Trenholm State Community College offers a highly specialized program to prepare students to become general machinists. A machinist must use intricate technology to operate various metal-working machines and machine tools that cut, drill, grind, or otherwise form a piece of metal accurately into precise dimensions.

Trenholm State offers several options in Precision Machining that are designed to equip a student with the skills and technical knowledge needed to be a success in this interesting field. The student is assigned specific lab projects which must be completed while studying the theory directly related to the projects. Additionally, each student is taught to read blueprints, determine sequence of operations, make set-ups, and select the correct machines for the job.

Due to the cost associated with the manufacture of metal components, more businesses are using molded plastic where engineering specifications will allow. As the use of molded components has increased, so has the need for individuals with a background in injection molding. Mold tools are primarily made in machine shops so Trenholm State has incorporated injection molding into its program in order to meet this demand.

## Occupational Choices

Employment of machinists is projected to grow 2 percent from 2016 to 2026, slower than the average for all occupations. With improvements in technologies, such as computer numerically controlled (CNC) machine tools, autoloaders, high-speed machining, and lights-out manufacturing, machinists will still be required to set up, monitor, and maintain these systems. Job prospects for machinists and tool

and die makers are expected to be good, primarily because of the number of job openings arising each year from the need to replace workers who retire or leave the occupation.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2026 Edition, 2019 Survey

## Average Full-Time Wage

The median annual wage for machinists was \$44,420 in 2019. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$27,940, and the highest 10 percent earned more than \$66,610.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2026 Edition, 2019 Survey

## Awards Available

Associate of Applied Science  
Automotive/Advanced Manufacturing  
Precision Machining

Certificate  
Automotive/Advanced Manufacturing  
Precision Machining

Short Term Certificate  
Automotive/Advanced Manufacturing  
Precision Machining  
CNC Concentration  
Engine Lathe Concentration  
Milling Concentration

## Program Contact

Danny Carden  
Program Coordinator/Instructor  
334-420-4385  
Location: Patterson Site - Bldg. F

As part of ongoing planning and evaluation, the College regularly evaluates student learning outcomes for each program.

## Estimated Program Length & Cost \*

<b>Award</b>	<b>Length</b>	<b>Credit Hours</b>	<b>Tuition/Fees</b>	<b>Books</b>	<b>Tools</b>	<b>Supplies</b>
Associate Degree	6 Terms	68	\$10,812	\$600	\$1,150	0
Certificate	5 Terms	58	\$9,222	\$600	\$1,150	0
Short Term Certificates	2 Terms	25	\$3,975	\$300	Optional	0
		19	\$3,021			

\* Tax not included. Prices are subject to change without prior notice; cost of books may vary considerably among suppliers. Cost of general education books is in addition to the total listed above. The length of the program is based on full-time status of 12-15 credit hours per term. Enrollment in transitional level general education courses will alter the length of the program.

## Associate of Applied Science Automotive/Advanced Manufacturing Precision Machining

### General Education Requirements (16 hours)

#### Area I - Written Composition (3 hours)

ENG-101	English Composition I	3
ENG-102	English Composition II	3
ENG-130	Technical Report Writing	3

#### Area II - Humanities & Fine Arts (3 hours)

(Humanities and Arts disciplines include but are not limited to: Area/Ethnic Studies, Art and Art History, Foreign Languages, Music and Music History, Philosophy, Ethics, Religious Studies, Theater and Dance.)

**Note:** If SPH-106, SPH-107, SPA-101 or SPA-102 has been taken an additional 3 semester hours in Humanities and Fine Arts must be taken to satisfy requirements in Area II.

#### Arts:

ART-100	Art Appreciation	3
MUS-101	Music Appreciation	3

#### Humanities:

PHL-106	Intro to Philosophy	3
PHL-206	Ethics & Society	3
REL-100	History of World Religions	3
REL-151	Survey of Old Testament	3
REL-152	Survey of New Testament	3
SPA-101	Intro Spanish I	3
SPA-102	Intro Spanish II	3
SPH-106	Fundamentals of Oral Comm	3
SPH-107	Fundamentals of Public Speaking	3

#### Literature:

ENG-251	American Literature I	3
ENG-252	American Literature II	3
ENG-261	English Literature I	3
ENG-262	English Literature II	3
ENG-271	World Literature I	3
ENG-272	World Literature II	3

#### Area III - Natural Science & Mathematics (6-7 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

**Note:** 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

#### Mathematics:

MTH-100	Intermediate Algebra	3
MTH-103	Intro to Technical Mathematics	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116	Mathematical Applications	3

#### Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112	Physical Science II	4
PHY-120	Introduction to Physics	4

#### Area IV - History, Social & Behavioral Sciences (3 hours):

(Social and Behavioral Sciences include, but are not limited to: Anthropology, Economics, Geography, Political Science, Psychology, and Sociology.)

**Note:** Must complete 3 semester hours.

#### History:

HIS-101	Western Civilization I	3
HIS-102	Western Civilization II	3
HIS-121	World History I	3
HIS-122	World History II	3
HIS-201	United States History I	3
HIS-202	United States History II	3

#### Social and Behavioral Sciences:

PSY-200	General Psychology	3
PSY-210	Human Growth and Development	3
SOC-200	Introduction to Sociology	3
POL-200	Introduction to Political Science	3
POL-211	American National Government	3

#### Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

#### College Requirements:

ORI-101	Orientation to College	1
ADM-291	MSSC Safety Course	3
ADM-292	MSSC Quality Practices/Measrmnts	3
CNC-112	Basic CNC Turning	3
CNC-113	Basic CNC Milling	3
CNC-241	CNC Milling Lab I	3
CNC-243	CNC Turning Lab I	3
INT-102	Ind Maintenance Cutting/Welding	2
MTT-111	Intro to Injection Molding Lab	3
MTT-113	Injection Mold Design Lab	3
MTT-121	Basic Blueprint Rdg for Machinists	3
MTT-129	Lathe Operations or MTT-134 Lathe Ops I and MTT-135 Lathe Ops I Lab	6
MTT-136	Milling Operations or MTT-137 Milling I and MTT-138 Milling I Lab	6
MTT-147	Intro to Machine Shop I	3
MTT-148	Intro to Machine Shop I Lab	3
MTT-221	Adv Blueprint Reading - Machinists	3
MTT-286	Co-op	1

#### Elective:

CIS-146	Microcomputer Applications	3
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#### Area V Credit Hours: 52

#### Total Credit Hours: 68

## Certificate Automotive/Advanced Manufacturing Precision Machining

### General Education Requirements (6 hours)

#### Area I - Written Composition (3 hours)

ENG-101	English Composition I	3
ENG-102	English Composition II	3
ENG-130	Technical Report Writing	3

#### Area II - Humanities & Fine Arts (0 hours)

(Humanities and Arts disciplines include but are not limited to: Area/Ethnic Studies, Art and Art History, Foreign Languages, Music and Music History, Philosophy, Ethics, Religious Studies, Theater and Dance.)

**Note:** If SPH-106, SPH-107, SPA-101 or SPA-102 has been taken an additional 3 semester hours in Humanities and Fine Arts must be taken to satisfy requirements in Area II.

#### Arts:

ART-100	Art Appreciation	3
MUS-101	Music Appreciation	3

#### Humanities:

PHL-106	Intro to Philosophy	3
PHL-206	Ethics & Society	3
REL-100	History of World Religions	3
REL-151	Survey of Old Testament	3
REL-152	Survey of New Testament	3
SPA-101	Intro Spanish I	3
SPA-102	Intro Spanish II	3
SPH-106	Fundamentals of Oral Comm	3
SPH-107	Fundamentals of Public Speaking	3

#### Literature:

ENG-251	American Literature I	3
ENG-252	American Literature II	3
ENG-261	English Literature I	3
ENG-262	English Literature II	3
ENG-271	World Literature I	3
ENG-272	World Literature II	3

#### Area III - Natural Science & Mathematics (3 hours)

(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

**Note:** 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

#### Mathematics:

MTH-100	Intermediate Algebra	3
MTH-103	Intro to Technical Mathematics	3
MTH-104	Plane Trigonometry	3
MTH-110	Finite Mathematics	3
MTH-112	Precalculus Algebra	3
MTH-116	Mathematical Applications	3

#### Natural Sciences:

BIO-101	Introduction to Biology I	4
BIO-102	Introduction to Biology II	4
BIO-103	Principles of Biology I	4
BIO-104	Principles of Biology II	4
PHS-111	Physical Science I	4
PHS-112	Physical Science II	4
PHY-120	Introduction to Physics	4

#### Area IV - History, Social & Behavioral Sciences (0 hours):

(Social and Behavioral Sciences include, but are not limited to: Anthropology, Economics, Geography, Political Science, Psychology, and Sociology.)

**Note:** Must complete 3 semester hours.

#### History:

HIS-101	Western Civilization I	3
HIS-102	Western Civilization II	3
HIS-121	World History I	3
HIS-122	World History II	3
HIS-201	United States History I	3
HIS-202	United States History II	3

#### Social and Behavioral Sciences:

PSY-200	General Psychology	3
PSY-210	Human Growth and Development	3
SOC-200	Introduction to Sociology	3
POL-200	Introduction to Political Science	3
POL-211	American National Government	3

#### Area V: Pre-Professional/College Requirements:

(Courses appropriate to the degree requirements and major of the individual student and electives.)

#### College Requirements:

ORI-101	Orientation to College	1
ADM-291	MSSC Safety Course	3
ADM-292	MSSC Quality Practices/Measrmnts	3
CNC-112	Basic CNC Turning	3
CNC-113	Basic CNC Milling	3
CNC-241	CNC Milling Lab I	3
CNC-243	CNC Turning Lab I	3
INT-102	Ind Maintenance Cutting/Welding	2
MTT-111	Introd to Injection Molding Lab	3
MTT-113	Injection Mold Design Lab	3
MTT-121	Basic Blueprint Rdg for Machinists	3
MTT-129	Lathe Operations or MTT-134 Lathe Ops I and MTT-135 Lathe Ops I Lab	6
MTT-136	Milling Operations or MTT-137 Milling I and MTT-138 Milling I Lab	6
MTT-147	Intro to Machine Shop I	3
MTT-148	Intro to Machine Shop I Lab	3
MTT-221	Adv Blueprint Reading - Machinists	3
MTT-286	Co-op	1

#### Elective:

CIS-146	Microcomputer Applications	3
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#### Area V Credit Hours: 52

#### Total Credit Hours: 58

**Short Term Certificate**  
**Automotive/Advanced Manufacturing**  
**Precision Machining**  
**CNC Concentration**

**General Education Requirements (3 hours)**

**Area III - Natural Science & Mathematics (3 hours)**  
(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

**Note:** 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

**Mathematics:**

MTH-116 Mathematical Applications 3

**Area V: Pre-Professional/College Requirements:**  
(Courses appropriate to the degree requirements and major of the individual student and electives.)

**College Requirements:**

ORI-101	Orientation to College	1
CNC-112	Basic CNC Turning	3
CNC-113	Basic CNC Milling	3
CNC-241	CNC Milling Lab I	3
CNC-243	CNC Turning Lab I	3
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-121	Basic Blueprint Rdg for Machinists	3

**Area V Credit Hours: 22**

**Total Credit Hours: 25**

**Short Term Certificate**  
**Automotive/Advanced Manufacturing**  
**Precision Machining**  
**Engine Lathe Concentration**

**General Education Requirements (3 hours)**

**Area III - Natural Science & Mathematics (3 hours)**  
(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

**Note:** 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

**Mathematics:**

MTH-116 Mathematical Applications 3

**Area V: Pre-Professional/College Requirements:**  
(Courses appropriate to the degree requirements and major of the individual student and electives.)

**College Requirements:**

ORI-101	Orientation to College	1
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-121	Basic Blueprint Rdg for Machinists	3
MTT-129	Lathe Operations	6
	OR MTT-134 Lathe Operation I	
	AND MTT-135 Lathe Operation I Lab	

**Area V Credit Hours: 16**

**Total Credit Hours: 19**

**Short Term Certificate**  
**Automotive/Advanced Manufacturing**  
**Precision Machining**  
**Milling Concentration**

**General Education Requirements (3 hours)**

**Area III - Natural Science & Mathematics (3 hours)**  
(In addition to Mathematics, disciplines in the Natural Sciences include: Astronomy, Biological Sciences, Chemistry, Geology, Physical Geography, Earth Science, Physics, and Physical Science.)

**Note:** 3 semester hours in MTH must be completed. Additional hours can be taken in the Natural Science area.

**Mathematics:**

MTH-116 Mathematical Applications 3

**Area V: Pre-Professional/College Requirements:**  
(Courses appropriate to the degree requirements and major of the individual student and electives.)

**College Requirements:**

ORI-101	Orientation to College	1
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-121	Basic Blueprint Rdg for Machinists	3
MTT-136	Milling Operations	6
	OR MTT-137 Milling I	
	AND MTT-138 Milling I Lab	

**Area V Credit Hours: 16**

**Total Credit Hours: 19**



## Course Descriptions Automotive/Advanced Manufacturing Precision Machining

Course #	Course Title	Credit Hours
<b>ADM-291</b>	<b>MSSC SAFETY COURSE</b> PREREQUISITE: None This course is designed to provide students with knowledge and skills related to safety in a manufacturing environment. Topics covered include: work in a safe and productive manufacturing workplace, perform safety and environmental inspections, perform emergency drills and participate in emergency teams, identify unsafe conditions and take corrective action, provide safety orientation for all employees, train personnel to use equipment safely, suggest process and procedures that support safety of work environment, fulfill safety and health requirements for maintenance, installation and repair, monitor safe equipment and operator performance, utilize effective, safety-enhancing workplace practices	<b>3</b>
<b>ADM-292</b>	<b>MSSC QUALITY PRACTICES AND MEASUREMENT COURSE</b> PREREQUISITE: ADM-291 This course is designed to provide students with knowledge and skills related to quality practices and measurement in a manufacturing environment. Topics covered include: participate in periodic internal quality audit activities, check calibration of gages and other data collection equipment, suggest continuous improvements, inspect materials and product/process at all stages to ensure they meet specifications, document the results of quality problems, communicate quality problems, take corrective actions to restore or maintain quality, record process outcomes and trends, Identify fundamentals of blueprint reading, use common measurement systems and precision measurement tools.	<b>3</b>
<b>CNC-112</b>	<b>Basic CNC Turning</b> PREREQUISITE: None This course introduces the programming, setup, and operation of CNC turning centers. Topics include programming formats, control functions, program editing, part production, and inspection. Upon completion, students should be able to manufacture simple parts using CNC turning center.	<b>3</b>
<b>CNC-113</b>	<b>Basic CNC Milling</b> PREREQUISITE: None This course introduces the manual programming, setup, and operation of CNC machining centers. Topics include programming formats, control functions, program editing, part production, and inspection. Upon completion, students should be able to manufacture simple parts using CNC machining centers.	<b>3</b>
<b>CNC-241</b>	<b>CNC Milling Lab I</b> PREREQUISITE: None This course covers basic (3-axis) computer numeric control (CNC) milling machine setup and operating procedures. Upon completion, the student should be able to load a CNC program and setup and operate a 3-axis CNC milling machine to produce a specified part. Related safety, inspection, and process adjustment are also covered.	<b>3</b>
<b>CNC-243</b>	<b>CNC Turning Lab I</b> PREREQUISITE: None This course covers basic computer numeric control (CNC) turning machine setup and operating procedures (inner diameter and outer diameter). Upon completion, the student should be able to load a CNC program and setup and operate a CNC turning machine to produce a simple part. Related safety and inspection and process adjustment are also covered.	<b>3</b>
<b>INT-102</b>	<b>INDUSTRIAL MAINTENANCE CUTTING/WELDING</b> PREREQUISITE: None This course provides instruction in the fundamentals of acetylene cutting and the basic SMAW (stick) welding. Topics covered are acetylene torch cutting equipment, safety and use; welding safety, welding hand tools type of welding machines and welding rods, determining types of metal, welding passes, beads, and joints.	<b>2</b>
<b>MTT-100</b>	<b>MACHINING TECHNOLOGY I</b> PREREQUISITE: None This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, saws, milling machines, grinding machines, and layout instruments. Upon completion, students will be able to perform the basic operations of measuring, layout, grinding, drilling, sawing, turning, and milling. This is a CORE course and is aligned with NIMS certification standards. MTT-147/148 are suitable substitutes for this course.	<b>6</b>

<b>Course #</b>	<b>Course Title</b>	<b>Credit Hours</b>
<b>MTT-111</b>	<b>INTRODUCTION TO INJECTION MOLDING LAB</b> PREREQUISITE: None Students learn to safely operate an injection molding machine. Students learn to properly startup, set machine controls and shutdown a molding machine.	<b>3</b>
<b>MTT-113</b>	<b>INJECTION MOLD DESIGN LAB</b> PREREQUISITE: None Students demonstrate proper and safe techniques to build components of an injection mold such as sprue bushings, runner systems, gates, vents, cavities, inserts and ejection systems.	<b>3</b>
<b>MTT-121</b>	<b>BASIC PRINT READING FOR MACHINISTS</b> PREREQUISITE: None This course covers the basic principles of print reading and sketching. Topics include multi-view drawings; interpretation of conventional lines; and dimensions, notes, and thread notations. Upon completion, students should be able to interpret basic drawings, visualize parts, and make pictorial sketches. This is a CORE course and is aligned with NIMS certification standards.	<b>3</b>
<b>MTT-129</b>	<b>LATHE OPERATIONS</b> PREREQUISITE: MTT-100 This course includes more advanced lathe practices such as set-up procedures, work planning, inner- and outer-diameter operations, and inspection and process improvement. Additional emphasis is placed on safety procedures. Upon completion, students will be able to apply advanced lathe techniques. MTT-134/135 are suitable substitutes for MTT-129. This course is aligned with NIMS standards. This course is also taught as AUT-258.	<b>6</b>
<b>MTT-134</b>	<b>LATHE OPERATIONS I</b> PREREQUISITE: None This course includes more advanced lathe practices such as set-up procedures, work planning, inner- and outer-diameter operations, and inspection and process improvement. Additional emphasis is placed on safety procedures. Upon completion, students will be able to apply advanced lathe techniques. MTT-134/135 are suitable substitutes for MTT-129. This course is aligned with NIMS standards.	<b>3</b>
<b>MTT-135</b>	<b>LATHE OPERATION I LAB</b> PREREQUISITE: None This course includes more advanced lathe practices such as set-up procedures, work planning, inner- and outer-diameter operations, and inspection and process improvement. Additional emphasis is placed on safety procedures. Upon completion, students will be able to apply advanced lathe techniques. MTT- 134/135 are suitable substitutes for MTT-129. This course is aligned with NIMS standards.	<b>3</b>
<b>MTT-136</b>	<b>MILLING OPERATIONS</b> PREREQUISITE: MTT-100 This course covers manual milling operations. Emphasis is placed on related safety, types of milling machines and their uses, cutting speed, feed calculations, and set-up and operation procedures. Upon completion, students should be able to apply manual milling techniques (vertical and horizontal/universal) to produce machine tool projects. MTT 137/138 are suitable substitutes for this course. This course is aligned with NIMS certification standards. This course is also taught as AUT-259.	<b>6</b>
<b>MTT-137</b>	<b>MILLING I</b> PREREQUISITE: None This course covers manual milling operations. Emphasis is placed on related safety, types of milling machines and their uses, cutting speed, feed calculations, and set-up and operation procedures. Upon completion, students should be able to apply manual vertical milling techniques to produce machine tool projects. MTT-137/138 are suitable substitutes for MTT-136. This course is aligned with NIMS certification standards.	<b>3</b>
<b>MTT-138</b>	<b>MILLING I LAB</b> PREREQUISITE: None This course provides basic knowledge of milling machines. . Emphasis is placed on types of milling machines and their uses, cutting speed, feed calculations, and set-up procedures. Upon completion, students should be able to apply milling techniques to produce machine tool projects. This course is aligned with NIMS certification criteria. MTT 137/138 are suitable substitutes for MTT-136.	<b>3</b>

<b>Course #</b>	<b>Course Title</b>	<b>Credit Hours</b>
<b>MTT-147</b>	<b>INTRODUCTION TO MACHINE SHOP I</b>	<b>3</b>
PREREQUISITE: None		
This course introduces machining operations as they relate to the metalworking industry. Topics include machine shop safety, measuring tools, lathes, saws, milling machines, bench grinders, and layout instruments. Upon completion, students will be able to perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This is a CORE course. MTT-100 is a suitable substitute for MTT-147/148. This course is also taught as AUT-150.		
<b>MTT-148</b>	<b>INTRODUCTION TO MACHINE SHOP I LAB</b>	<b>3</b>
PREREQUISITE: None      COREQUISITE: None		
This course provides practical application of the concepts and principles of machining operations learned in MTT 147. Topics include machine shop safety, measuring tools, lathes, saws, milling machines, bench grinders, and layout instruments. Upon completion, students will be able to perform the basic operations of measuring, layout, drilling, sawing, turning, and milling. This is a CORE course. MTT-100 is a suitable substitute for MTT-147/148. This course is aligned with NIMS certification standards. This course is also taught as AUT-151.		
<b>MTT-221</b>	<b>ADVANCED BLUEPRINT READING FOR MACHINISTS</b>	<b>3</b>
PREREQUISITE: None		
This course introduces complex industrial blueprints. Emphasis is placed on auxiliary views, section views, violations of true projection, special views, and interpretation of complex parts and assemblies. Upon completion, students should be able to read and interpret complex industrial blueprints.		
<b>MTT-286</b>	<b>CO-OP</b>	<b>1</b>
PREREQUISITE: As required by program.		
These courses constitute a series wherein the student works on a part-time basis in a job directly related to machine tool technology. In these courses the employer evaluates the student's productivity and the student submits a descriptive report of his work experiences. Upon completion, the student will demonstrate skills learned in an employment setting.		