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 3 percent from 2019 to 2029, about as fast as 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.

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 $33,820, and the highest 10 percent earned more than $77,940.

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 *

<table>
<thead>
<tr>
<th>Award</th>
<th>Length</th>
<th>Credit Hours</th>
<th>Tuition/Fees</th>
<th>Books</th>
<th>Tools</th>
<th>Supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Degree</td>
<td>6 Terms</td>
<td>72</td>
<td>$11,448</td>
<td>$600</td>
<td>$1,150</td>
<td>0</td>
</tr>
<tr>
<td>Certificate</td>
<td>5 Terms</td>
<td>59</td>
<td>$9,381</td>
<td>$600</td>
<td>$1,150</td>
<td>0</td>
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<tr>
<td>Short Term Certificate</td>
<td>2 Terms</td>
<td>25</td>
<td>$3,975</td>
<td>$300</td>
<td>Optional</td>
<td>0</td>
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<tr>
<td>Short Term Certificate(2)</td>
<td>2 Terms</td>
<td>19</td>
<td>$3,021</td>
<td>$300</td>
<td>Optional</td>
<td>0</td>
</tr>
</tbody>
</table>

* 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.

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
CIS-146  Microcomputer Applications  3
ADM-291  MSSC Safety Course  3
CNC-112  Basic CNC Turning  3
CNC-113  Basic CNC Milling  3
CNC-241  CNC Milling Lab I  3
CNC-242  CNC Milling Lab II  3
CNC-243  CNC Turning Lab I  3
CNC-244  CNC Turning Lab II  3
MTT-100  Machining Technology I  6
MTT-147  Intro - Machine Shop I  6
MTT-148  Intro-Machine Shop I Lab  6
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  6
MTT-134  Lathe Operations I  6
MTT-135  Lathe Operations I Lab  6
MTT-136  Milling Operations  6
MTT-137  Milling I  6
MTT-138  Milling I Lab  6
MTT-221  Adv Blueprint Reading - Machinists  3
MTT-286  Co-op  1

Area V Credit Hours:  56
Total Credit Hours:  72
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-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
CNC-112 Basic CNC Turning 3
CNC-113 Basic CNC Milling 3
CNC-241 CNC Milling Lab I 3
CNC-242 CNC Milling Lab II 3
CNC-243 CNC Turning Lab I 3
CNC-244 CNC Turning Lab II 3
MTT-100 Machining Technology I 6
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 6
MTT-134 Lathe Operations I and MTT-135 Lathe Operations I Lab
MTT-136 Milling Operations 6
MTT-221 Adv Blueprint Reading - Machinists 3
MTT-286 Co-op 1

Elective:
CIS-146 Microcomputer Applications 3

Area V Credit Hours: 53
Total Credit Hours: 59
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.)

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
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
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.)

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
MTT-121 Basic Blueprint Rdg for Machinists 3
MTT-136 Milling Operations 6

Area V Credit Hours: 16 Total Credit Hours: 19
### Course Descriptions
#### Automotive/Advanced Manufacturing
#### Precision Machining

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM-291</td>
<td>MSSC SAFETY COURSE</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
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<tr>
<td>CNC-112</td>
<td>BASIC CNC TURNING</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
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<tr>
<td>CNC-113</td>
<td>BASIC CNC MILLING</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
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<tr>
<td>CNC-241</td>
<td>CNC MILLING LAB I</td>
<td>3</td>
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<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
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<tr>
<td>CNC-242</td>
<td>CNC MILLING LAB II</td>
<td>3</td>
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<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>This course covers advanced (including 4-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 CNC milling machine (including 4-axis) to produce a specified part. Related safety and inspection and process adjustment are also covered</td>
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<tr>
<td>CNC-243</td>
<td>CNC TURNING LAB I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
<td></td>
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<tr>
<td>CNC-244</td>
<td>CNC TURNING LAB II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>This course covers advanced computer numeric control (CNC) turning machine setup and operating procedures. Upon completion, the student should be able to load a CNC program and setup and operate a CNC turning machine to produce a specified part. Related safety and inspection and process adjustment are also covered</td>
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<tr>
<td>INT-102</td>
<td>INDUSTRIAL MAINTENANCE CUTTING/WELDING</td>
<td>2</td>
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<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<td></td>
<td>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</td>
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<tr>
<td>Course #</td>
<td>Course Title</td>
<td>Credit Hours</td>
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</tr>
<tr>
<td>MTT-100</td>
<td>MACHINING TECHNOLOGY I</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
<td></td>
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<tr>
<td></td>
<td>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.</td>
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</tr>
<tr>
<td>MTT-111</td>
<td>INTRODUCTION TO INJECTION MOLDING LAB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>Students learn to safely operate an injection molding machine. Students learn to properly startup, set machine controls and shutdown a molding machine.</td>
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<tr>
<td>MTT-113</td>
<td>INJECTION MOLD DESIGN LAB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-121</td>
<td>BASIC PRINT READING FOR MACHINISTS</td>
<td>3</td>
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<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-129</td>
<td>LATHE OPERATIONS</td>
<td>6</td>
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<tr>
<td></td>
<td>PREREQUISITE: MTT-100</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-134</td>
<td>LATHE OPERATIONS I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
<td></td>
</tr>
<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-135</td>
<td>LATHE OPERATION I LAB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
<td></td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-136</td>
<td>MILLING OPERATIONS</td>
<td>6</td>
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<tr>
<td></td>
<td>PREREQUISITE: MTT-100</td>
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<tr>
<td></td>
<td>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.</td>
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<tr>
<td>MTT-137</td>
<td>MILLING I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>PREREQUISITE: None</td>
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<tr>
<td></td>
<td>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</td>
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</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>Course #</th>
<th>Course Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>MTT-138</td>
<td>MILLING I LAB</td>
<td>3</td>
</tr>
<tr>
<td>PREREQUISITE: None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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.</td>
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</tbody>
</table>

| MTT-147   | INTRODUCTION TO MACHINE SHOP I                    | 3            |
| 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. |

| MTT-148   | INTRODUCTION TO MACHINE SHOP I LAB                 | 3            |
| 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. |

| MTT-221   | ADVANCED BLUEPRINT READING FOR MACHINISTS          | 3            |
| 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. |

| MTT-286   | CO-OP                                             | 1            |
| 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. |