Trenholm State COMMUNITY COLLEGE
The College for Real Careers

Machine Tool Technology (MTT)

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 Technical 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.

TrenholmState offers several options in Machine Tool Technology 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 Machine Tool Technology program in order to meet this demand.

Occupational Choices

Machinists have a number of occupational choices, ranging from operation of basic machine tools such as drill presses to the more advanced classifications of tool and die makers.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2017 Edition, 2015 Survey.

Average Full-Time Wage

The average full-time wage is variable dependent upon the size of the company offering employment. The current average full time wage is $42,110 for machinists/tool and die makers and $34,080 for C.N.C. operators/programmers.

Source: Bureau of Labor and Statistics Occupational Outlook Handbook, 2016-2017 Edition, 2015 Survey.

Awards Available

Associate in Applied Science Degree
Machine Tool Technology

Associate in Applied Science Degree
Machine Tool Technology
Injection Mold Concentration

Certificate
Machine Tool Technology

Short Term Certificate
Machine Tool Technology
CNC Concentration
Engine Lathe Concentration
Milling Concentration

Program Contact

Danny Carden
Program Coordinator/Instructor
334-420-4385
Location: Trenholm Campus - Bldg. F

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

Estimated Program Length & Cost *

Award	Length	Credit Hours	Tuition Fees	Books	Tools	Supplies
Associate Degree	6 Terms	76	$10,868	$600	$1,150	0
Certificate	5 Terms	58	$8,294	$600	$1,150	0
Short Term Cert 1	2 Terms	25	$3,575	$300	Optional	0
Short Term Cert 2	2 Terms	28	$4,004	$300	Optional	0
Short Term Cert 3	2 Terms	22	$3,146	$300	Optional	0

* 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 in Applied Science Degree Machine Tool Technology

Required Technical Courses (54 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-103	Machining Technology II	6
	OR MTT-149 Intro to Machine Shop II	
	AND MTT-150 Intro to Mach Shop II Lab	
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	6
	OR MTT-134 Lathe Operation I	
	AND MTT-135 Lathe Operation I Lab	
MTT-136	Milling Operations	6
	OR MTT-137 Milling I	
	AND MTT-138 Milling I Lab	
MTT-140	Basic Comp Numerical Ctrl Turning I	3
MTT-141	Basic Comp Numerical Ctrl Milling I	3
MTT-221	Adv Blueprint Reading - Machinists	3
MTT-241	CNC Milling Lab I	3
MTT-242	CNC Milling Lab II	3
MTT-243	CNC Turning Lab I	3
MTT-244	CNC Turning Lab II	3

Required General Education (22 credit hours)

Course	Title	Hrs
CIS-149	Introduction to Computers	3
	OR CIS-146 Microcomputer Apps	
ENG-101	English Composition I	3
ENG-130	Technical Report Writing	3
	OR ENG-102 English Comp II	
	OR SPH-106 Fund of Oral Comm	
MTH-103	Intro to Technical Mathematics	3
MTH-104	Plane Trigonometry	3
MUS-101	Music Appreciation	3
	OR ART-100 Art Appreciation	
ORI-101	Orientation to College	1
PSY-200	General Psychology	3

Total Hours: 76 Credit Hours; 2,010 Contact Hours

Associate in Applied Science Degree Machine Tool Technology Injection Mold Concentration

Required Technical Courses (54 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-103	Machining Technology II	6
	OR MTT-149 Intro to Machine Shop II	
	AND MTT-150 Intro to Mach Shop II Lab	
MTT-110	Introduction to Injection Molding	3
MTT-111	Introd to Injection Molding Lab	3
MTT-112	Injection Mold Design	3
MTT-113	Injection Mold Design Lab	3
MTT-114	Advanced Injection Molding	3
MTT-115	Advanced Injection Molding Lab	3
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	
MTT-136	Milling Operations	6
	OR MTT-137 Milling I	
	AND MTT-138 Milling I Lab	
MTT-144	Electrical Discharge Machining I	3
MTT-154	Metallurgy	3
MTT-221	Adv Blueprint Reading - Machinists	3

Required General Education (22 credit hours)

CIS-149	Introduction to Computers	3
	OR CIS-146 Microcomputer Apps	
ENG-101	English Composition I	3
ENG-130	Technical Report Writing	3
	OR ENG-102 English Comp II	
	OR SPH-106 Fund of Oral Comm	
MTH-103	Intro to Technical Mathematics	3
MTH-104	Plane Trigonometry	3
MUS-101	Music Appreciation	3
	OR ART-100 Art Appreciation	
ORI-101	Orientation to College	1
PSY-200	General Psychology	3

Total Hours: 76 Credit Hours; 1,856 Contact Hours

Certificate
Machine Tool Technology

Required Technical Courses (45 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-103	Machining Technology II	6
	OR MTT-149 Intro to Machine Shop II	
	AND MTT-150 Intro to Mach Shp II 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	
MTT-136	Milling Operations	6
	OR MTT-137 Milling I	
	AND MTT-138 Milling I Lab	
MTT-140	Basic Comp Numerical Ctrl Turning I	3
MTT-141	Basic Comp Numerical Ctrl Milling I	3
MTT-241	CNC Milling Lab I	3
MTT-242	CNC Milling Lab II	3
MTT-243	CNC Turning Lab I	3
MTT-244	CNC Turning Lab II	3

Required General Education (13 credit hours)

CIS-130	Introduction to Information Systems	3
	OR CIS-146 Microcomputer Apps	
ENG-101	English Composition I	3
MTH-103	Intro to Technical Mathematics	3
MUS-101	Music Appreciation	3
	OR ART-100 Art Appreciation	
ORI-101	Orientation to College	1

Total Hours: 58 Credit Hours; 1,632 Contact Hours

Short Term Certificate
Machine Tool Technology
CNC Concentration

Required Technical Courses (24 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-140	Basic Comp Numerical Ctrl Turning I	3
MTT-141	Basic Comp Numerical Ctrl Milling I	3
MTT-241	CNC Milling Lab I	3
MTT-242	CNC Milling Lab II	3
MTT-243	CNC Turning Lab I	3
MTT-244	CNC Turning Lab II	3
MTT-244	CNC Turning Lab II	

Required General Education (1 credit hours)

ORI-101	Orientation to College	1

Total Hours: 25 Credit Hours; 784 Contact Hours

Short Term Certificate
Machine Tool Technology
Engine Lathe Concentration

Required Technical Courses (24 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-103	Machining Technology II	6
	OR MTT-149 Intro to Machine Shop II	
	AND MTT-150 Intro to Mach Shp II 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	
MTT-221	Adv Blueprint Reading - Machinists	3

Required General Education (4 credit hours)

MTH-103	Intro to Technical Mathematics	3
ORI-101	Orientation to College	1

Total Hours: 28 Credit Hours; 768 Contact Hours

Short Term Certificate
Machine Tool Technology
Milling Concentration

Required Technical Courses (21 credit hours)

Course	Title	Hrs
MTT-100	Machining Technology I	6
	OR MTT-147 Intro - Machine Shop I	
	AND MTT-148 Intro-Machine Shop I Lab	
MTT-103	Machining Technology II	6
	OR MTT-149 Intro to Machine Shop II	
	AND MTT-150 Intro to Mach Shp II 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	

Required General Education (1 credit hours)

ORI-101	Orientation to College	1

Total Hours: 22 Credit Hours; 672 Contact Hours

Course Descriptions for Machine Tool Technology (MTT)

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours

MTT-100 MACHINING TECHNOLOGY I **2** **12** **6**
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. This course is also taught as AUT 152.

MTT-103 MACHINING TECHNOLOGY II **2** **8** **6**
PREREQUISITE: MTT-100
This course provides additional instruction and practice in the use of measuring tools, lathes, milling machines, and grinders. Emphasis is placed on setup and operation of machine tools including the selection of work holding devices, speeds, feeds, cutting tools and coolants. Upon completion, students should be able to perform intermediate level procedures of precision grinding and advanced operations of measuring, layout, drilling, sawing, turning and milling. This is a CORE course and is aligned with NIMS certification standards. MTT 149/150 are suitable substitutes for MTT 103.

MTT-110 INTRODUCTION TO INJECTION MOLDING **3** **0** **3**
PREREQUISITE: None
Students learn the fundamentals of injection molding operations, including molding terminology, machine part identification, operating safety, machine controls and machine startup and shutdown. Students are taught to identify common part defects such as short shots, flash, warp, surface defects, color changes and shrinkage. Students learn the properties of commonly used molding materials.

MTT-111 INTRODUCTION TO INJECTION MOLDING LAB **0** **6** **3**
PREREQUISITE: None
Students learn to safely operate an injection molding machine. Students learn to properly startup, set machine controls and shutdown a molding machine.

MTT-112 INJECTION MOLD DESIGN **3** **0** **3**
PREREQUISITE: None
Students learn to identify the components of an injection mold such as mold base, sprue bushing, runner system, gates, vents, cavities, inserts and ejection system. Students learn the purpose of each component of an injection mold. Students learn common materials used to build an injection mold.

MTT-113 INJECTION MOLD DESIGN LAB **0** **6** **3**
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.

MTT-114 ADVANCED INJECTION MOLDING **3** **0** **3**
PREREQUISITE: MTT-112
Students learn advanced applications in injection molding, including fill time, cycle time, melt temperature, part size and weight, injection pressure and clamp pressure. Students learn solutions for common part defects such as short shots, flash, warp, surface defects, color changes and shrinkage.

MTT-115 ADVANCED INJECTION MOLDING LAB **0** **6** **3**
PREREQUISITE: None
Students demonstrate advanced techniques in injection molding by adjusting machine settings to fix common molding problems.

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours

MTT-121 BASIC PRINT READING FOR MACHINISTS **3** **0** **3**
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.

MTT-129 LATHE OPERATIONS **2** **12** **6**
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.

MTT-134 LATHE OPERATIONS I **2** **3** **3**
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.

MTT-135 LATHE OPERATION I LAB **0** **9** **3**
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.

MTT-136 MILLING OPERATIONS **2** **12** **6**
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.

MTT-137 MILLING I **2** **3** **3**
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.

MTT-138 MILLING I LAB **0** **9** **3**
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.

MTT-140 BASIC COMPUTER NUMERICAL CONTROL TURNING I **1** **4** **3**
PREREQUISITE: MTT-100
This course covers concepts associated with basic programming of a computer numerical control (CNC) turning center. Topics include basic programming characteristics, motion types, tooling, workholding devices, setup documentation, tool compensations, and formatting. Upon completion, students should be able to write a basic CNC turning program that will be used to produce a part. This course is aligned with NIMS certification standards.

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours

MTT-141 BASIC CNC MILLING PROGRMNG I **1** **4** **3**
PREREQUISITE: MTT-100
This course covers concepts associated with basic programming of a computer numerical control (CNC) milling center. Topics include basic programming characteristics, motion types, tooling, workholding devices, setup documentation, tool compensations, and formatting. Upon completion, students should be able to write a basic CNC milling program that will be used to produce a part. This course is aligned with NIMS certification standards. This course is also taught as AUT 255.

MTT-144 ELECTRICAL DISCHARGE MACHINING I **1** **4** **3**
PREREQUISITE: None
This course introduces the student to the concepts of Electrical Discharge Machining (EDM) and the importance of EDM is an industrial setting. Emphasis is placed on safety procedures and machinist responsibility in the setup and operation of EDM machines and electrode selection. Upon completion, students should be able to produce basic machine products using both the wire-type and plunge-type EDM machines. This course is aligned with NIMS certification standards. This course is also taught as AUT 276.

MTT-147 INTRODUCTION TO MACHINE SHOP I **2** **3** **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 **0** **9** **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-149 INTRODUCTION TO MACHINE SHOP II **2** **2** **3**
PREREQUISITE: None
This course provides additional instruction and practice in the use of measuring tools, lathes, milling machines, and grinders. Emphasis is placed on setup and operation of machine tools including the selection of work holding devices, speeds, feeds, cutting tools and coolants. Upon completion, students should be able to perform intermediate level procedures of precision grinding, measuring, layout, drilling, sawing, turning, and milling. This is a CORE course and is aligned with NIMS certification standards. MTT 149/150 are suitable substitutes for MTT 103.

MTT-150 INTRODUCTION TO MACHINE SHOP II LAB **0** **6** **3**
PREREQUISITE: None
This course provides additional instruction and practice in the use of measuring tools, lathes, milling machines, and grinders. Emphasis is placed on setup and operation of machine tools including the selection of work holding devices, speeds, feeds, cutting tools and coolants. Upon completion, students should be able to perform intermediate level procedures of precision grinding, measuring, layout, drilling, sawing, turning, and milling. This is a CORE course and is aligned with NIMS certification standards. MTT 149/150 are suitable substitutes for MTT 103.

MTT-154 METALLURGY **2** **2** **3**
PREREQUISITE: None
This course covers the production, properties, testing, classification, microstructure, and heat treating effects of ferrous and non-ferrous metals. Topics include the iron-carbon phase diagram, ITT diagram, ANSI code, quenching, senescing, and other processes concerning metallurgical transformations. Upon completion, students should be able to understand the iron-carbon phase diagram, ITT diagram, microstructure images, and other phenomena concerning the behavior of metals. This course is also taught as AUT 154.

Course #	Course Title	Theory Contact Hours/Wk	Lab Contact Hours/Wk	Credit Hours

MTT-213 ADVANCED COMPUTER NUMERICAL CONTROL MILLING 1 6 3
PREREQUISITE: MTT-141
This course covers the used of canned cycles and subprograms in computer numerical control (CNC) milling programs. Upon completing this course, the student should be able to write CNC milling programs using canned cycles and subprograms.

MTT-220 COMPUTER NUMERICAL CONTROL GRAPHICS: MILLING 1 4 3
PREREQUISITE: MTT-141
This course covers techniques involved in writing a program for a multi-axis computerized numeric control (CNC) milling machine using computer assisted manufacturing (CAM) software. In addition, CNC milling machine setup, programming, and operation are detailed. Upon completion, the student should be able to set up, program, and operate a 3-axis CNC milling machine to produce a 2½-axis part using CAM software. This course is aligned with NIMS certification standards. This course is also taught as AUT 260.

MTT-221 ADVANCED BLUEPRINT READING FOR MACHINISTS 3 0 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-241 CNC MILLING LAB I 0 6 3
PREREQUISITE: MTT-100
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. This course is also taught as AUT 256.

MTT-242 CNC MILLING LAB II 0 6 3
PREREQUISITE: MTT-100
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.

MTT-243 CNC TURNING LAB I 0 6 3
PREREQUISITE: MTT-100
This course covers basic 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.

MTT-244 CNC TURNING LAB II 0 6 3
PREREQUISITE: MTT-100
This course covers advanced 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.