# Automation, Robotics, and Manufacturing

## Engineering Technology (ETEC), Manufacturing Technology (MTEC), and Machine Tool Technology (MTT) Program Level Student Learning Outcomes

**ETEC Technology Program Level SLOS**

1. Upon completion of the courses in this discipline, the student will be able to identify the phases of a product lifecycle.

2. Upon completion of the courses in this discipline, the student will be able create a list of tests that a new product should be subjected to.

3. Students will apply principles from mathematics, physics, and chemistry to solve applied problems in engineering.

## Course Level Student Learning Outcomes

**ETEC 10 Principles of Engineering Technology:** Students will research engineering and engineering technology careers and create a report as directed in activity 1.3A.

**ETEC 10A Principles of Engineering Technology I:** Students will research engineering and engineering technology careers and create a report as directed in activity 1.3A.

**ETEC 10B Principles of Engineering Technology II:** Students will build an automated marble sorter as directed by activity 4.5K.

**ETEC 12 Introduction to Engineering Design:** Given a simple set of design constraints, the student shall be able utilize AutoCad Inventor software to produce a design package including two-dimensional drawings and three-dimensional models.

**ETEC 12A Introduction to Engineering Design I:** Given a simple set of design constraints, the student shall be able utilize AutoCad Inventor software to produce a design package including two-dimensional drawings and three-dimensional models.

**ETEC 12B Introduction to Engineering Design II:** Given a simple design problem statement and set of design constraints, the student shall be able utilize AutoCad Inventor software to produce a design package including two-dimensional drawings and three-dimensional models.

**ETEC 14 Electronics for Engineering Technologists:** SLO #1. Students will be able to use NAND and NOR Gates to configure and test logic equivalencies of: NOT, AND, OR, Exclusive OR and Exclusive NOR logic functions.

**ETEC 14 Electronics for Engineering Technologists:** SLO #2. Using discrete TTL or CMOS Logic Gates to design, construct, and demonstrate a logic circuit which displays the students Birth Date using three toggle switches, various logic gates, and a single seven segment common anode LED display.

**ETEC 14A Electronics for Engineering Technologists I:** Students will be able to use NAND and NOR Gates to configure and test logic equivalencies of: NOT, AND, OR, Exclusive OR and Exclusive NOR logic functions.

**ETEC 14B Electronics for Engineering Technologists II:** Using discrete TTL or CMOS Logic Gates to design, construct, and demonstrate a logic circuit which displays the students Birth Date using three toggle switches, various logic gates, and a single seven segment common anode LED display.

**ETEC 16 Computer Integrated Manufacturing:** Students will measure and solid model a provided assembly.

**ETEC 16A Computer Integrated Manufacturing I:** Students will measure and solid model a provided assembly.

**ETEC 16B Computer Integrated Manufacturing II:** Students program a robot arm to palletize parts.
**ETEC 18 Engineering Design and Development: SLO #1.** Students will develop and maintain an engineering notebook. This legal document contains all the information that is relevant to its purpose of original design. It includes contact information, correspondence, telephone logs, sketches and drawings, reference citations, collected data, and a chronological listing of the events dates and time, connected to the journal’s purpose. Documentation is a vital part of engineering. In the case of liability suits, good documentation has kept many engineering firms out of court because it proved there was no wrong doing on their part.

**ETEC 18 Engineering Design and Development: SLO #2.** The student will work as part of an engineering group to develop an engineering concept that is new in nature, safe, cost effective, reliable, and could be mass produced.

**ETEC 18A Engineering Design and Development I: SLO #1.** Students will develop and maintain an engineering notebook. This legal document contains all the information that is relevant to its purpose of original design. It includes contact information, correspondence, telephone logs, sketches and drawings, reference citations, collected data, and a chronological listing of the events dates and time, connected to the journal’s purpose. Documentation is a vital part of engineering. In the case of liability suits, good documentation has kept many engineering firms out of court because it proved there was no wrong doing on their part.

**ETEC 18A Engineering Design and Development I: SLO #2.** The student will work as part of an engineering group to develop an engineering concept that is new in nature, safe, cost effective, reliable, and could be mass produced.

**ETEC 18B Engineering Design and Development II: SLO #2.** The student will work as part of an engineering group to develop an engineering concept that is new in nature, safe, cost effective, reliable, and could be mass produced.

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**MTEC Technology Program Level SLOS**

1. Upon completion of the courses in this discipline, the student will be able to identify different digital and analog sensor technologies.

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**Course Level Student Learning Outcomes**

**MTEC 2 Materials/Proc of Manufacturing:** Students will correctly match engineering materials with their appropriate processing methods.

**MTEC 70 Basic Robotics:** Students correctly draw a 4 block flowchart of a computer/robot including: input, processor, memory, and output.

**MTEC 75 Integrated Robotic and Automated Technologies:** Students will correctly program a robot to travel 5 feet turn 180 degrees and return to the start point.

**MTEC 75A Integrated Robotic and Automated Technologies I:** Students will correctly program a robot to travel 5 feet turn 180 degrees and return to the start point.

**MTEC 75B Integrated Robotic and Automated Technologies II:** Students will correctly program a robot to travel a total of 10 feet. Within the travel the robot will reach maximum velocity by smoothly accelerating and deaccelerating.
MTT Technology Program Level SLOS

1. Upon completion of a course of study in Machine Tool Technology, a student will demonstrate an ability to read prints and be proficient at shop calculations.

2. Upon completion of a course of study, a Machine Tool Technology student will be able to troubleshoot machine tool problems using proper setup technique, RPMs and feed calculations.

3. Upon completion of a course of study in Machine Tool Technology, a student will practice safety in basic machine tool operations including lathe, milling, grinding machines and hand tools.

4. Upon completion of a course of study, Machine Tool Technology will successfully compete for jobs in the machine tool technology job market.

Course Level Student Learning Outcomes

MTT 2 Manufacturing Print Reading  SLO #1: Student will correctly sketch a part in orthographic orientation.

MTT 2 Manufacturing Print Reading  SLO #2: Student will correctly sketch a part in orthographic orientation.

MTT 2 Manufacturing Print Reading  SLO #3: Gain a basic understanding of GD&T (Geometric Dimensioning and Tolerancing) practices. Presented with a Feature Control Frame, students will calculate total positional tolerance of a hole utilizing Maximum Material Condition, Least Material Condition and Regardless of Feature Size Modifiers.

MTT 10A Introduction to CAD/CAM: Student will calculate the correct rotations per minute (RPM) for a high speed steel end mill using the correct cutting speed and end mill diameter.

MTT 10B Computer Numerical Control Programming: Student will input a program into Computer Numerical Control (CNC) machine.

MTT 10J Numerical Control Graphics Programming: Student will create geometric elements such as points, lines, and circles.

MTT 10K 3D Numerical Control Graphics Programming: Student will correctly create a 3D solid model in CAD software and practice roughing the 3D surface using CAM software.

MTT 11abcd Numerical Control Graphics Programming with CATIA: Student can complete a solid object incorporating extrusions, surfaces and blueprints.

MTT 16ab General Metals: Student will calculate the correct rotations per minute (rpm) for a high speed steel end mill using the correct cutting speed and end mill diameter.

MTT 40 Machine Shop Calculations: Student will calculate the correct feed per minute for a high speed steel (HSS) end mill using the correct feed per tooth (CL), rotations per minute (RPM), and number of teeth. There is no MTT 40 in the catalog.

MTT 46 Basic Machine Tool Operation: Student will calculate the correct rotations per minute (rpm) for a high speed steel end mill using the correct cutting speed and end mill diameter. Then the student will demonstrate setting the speed of the milling machine.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>MTT 47abcd</td>
<td>NIMS Level I Credential Preparation</td>
<td>Student will calculate the correct rotations per minute (rpm) for a high speed steel end mill using the correct cutting speed and end mill diameter. Then the student will demonstrate setting the speed of the milling machine.</td>
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<tr>
<td>MTT 48abcd</td>
<td>Machining for Robotics Preparation</td>
<td>Students will layout center line location of two holes that need to be drilled.</td>
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<tr>
<td>MTT 101abcd</td>
<td>Introduction to Conventional and CNC Machining</td>
<td>SLO #1. Given a ground steel block of known and verified dimensions, measure and record the three dimensions of the block using a micrometer to a precision of .001 inches.</td>
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<tr>
<td>MTT 101abcd</td>
<td>Introduction to Conventional and CNC Machining</td>
<td>SLO #2. Given a Blue Print student will use all manufacturing equipment available to manufacture the project on the Blue Print to noted specifications.</td>
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<tr>
<td>MTT 103abcd</td>
<td>Conventional and CNC Turning</td>
<td>Students will turn a part on the lathe to a given drawing dimension to an accuracy of +/- .001 inches.</td>
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<tr>
<td>MTT 105abcd</td>
<td>Conventional and CNC Milling</td>
<td>Given a rough-cut aluminum block, square the block using a milling machine, cutters and measurement tools.</td>
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<tr>
<td>MTT 107abcd</td>
<td>Advanced Manufacturing Processes</td>
<td>Record the benefits and downsides of the following processes: Waterjet cutting, EDM wire cutting, Plasma cutting and Laser cutting</td>
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