

**Course Title:** Manufacturing I

**Board Approval Date:**

**Credit / Hours:** .5 credit

**Course Description:**

Manufacturing I is one of two foundation courses offered in the Engineering, Manufacturing and Industrial Technology (EMIT) Pathway. This course is designed to give students basic knowledge in the areas of shop safety, tool usage, and wood/metal production.

**Learning Activities / Modes of Assessment:**

Large group / Individual instruction	Tests and Quizzes
Worksheets	Checklists/Teacher Observation
Participation & Clean Up	Projects with Rubrics
Individual / Group Work	
Computer Aided Design	
Computer Numeric Controlled Equipment	

**Instructional Resources:**

[www.pacareerzone.com](http://www.pacareerzone.com)  
[www.discoveryeducation.com](http://www.discoveryeducation.com)  
Technology and Engineering Education Association of Pennsylvania  
Online Tutorials  
Technology Student Association  
Project Plans

## Course Pacing Guide

Course: **Manufacturing I**

<b>Course Unit (Topic)</b>	<b>Length of Instruction (Days/Periods)</b>
1. 1M Metalworking Tool Identification	4 days
2. 1W Woodworking Tool Identification	3 days
3. 2M Metal Types, Shapes and Identification	4 days
4. 2W Wood Identification	3 days
5. 3M Metal Working Machine Safety	6 days
6. 3W Woodworking Machine Safety	6 days
7. 4M Wind Chime Production	31 days
8. 4W Woodworking Production	21 days
9. 5W Acrylics	7 days

Topic: 1M Metalworking Tool Identification

Days: 4

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
<p><b>3.4.12.A2. – Essential</b>                      CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.</p> <p><b>3.4.12.C3. – Essential</b>                      RESEARCH &amp; DEVELOPMENT, INVENTION &amp; INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.</p> <p><b>3.4.12.D2. – Important</b>                      USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.</p> <p>Tools</p> <p>Materials</p> <p>Processes</p> <p>Problem</p> <p>Solution</p> <p>Instrument</p>	<p>To complete a task in the most efficient way it is important to choose the correct tool for the job.</p>	<p><b>3.4.12.A2. – Essential</b>                      CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.</p> <p><b>3.4.12.B1. – Essential</b>                      EFFECTS OF TECHNOLOGY - Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.</p> <p><b>3.4.12.C3. – Essential</b>                      RESEARCH &amp; DEVELOPMENT, INVENTION &amp; INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.</p> <p><b>3.4.12.D2. – Important</b>                      USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.</p> <p>Identify proper names of tools.</p> <p>Choose appropriate tool or instrument used for a specific task.</p> <p>Properly read a ruler to the nearest 1/16"</p>

Topic: 1M Metalworking Tool Identification

Days: 4

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

<p>Apparatus</p> <p>What tools would be used to complete a given task?</p> <p>3.4.12.B1. - EFFECTS OF TECHNOLOGY - Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.</p>		
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Topic: 1W Woodworking Tool Identification

Days: 3

Subject(s): Technology, Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:	Understand:	Do:
<p><b>3.4.12.A1. – Important CHARACTERISTICS OF TECHNOLOGY</b> - Compare and contrast the rate of technological development over time.</p> <p><b>3.4.12.C2. – Essential ENGINEERING DESIGN</b> - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.</p> <p><b>3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES</b> - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.</p> <p>The names of all the necessary basic woodworking hand tools used in the Industrial Technology shop.</p>	<p>It is important to know the proper names for all the basic woodworking hand tools in the Industrial Technology shop.</p>	<p><b>3.4.12.A1. – Important CHARACTERISTICS OF TECHNOLOGY</b> - Compare and contrast the rate of technological development over time.</p> <p><b>3.4.12.C2. – Essential ENGINEERING DESIGN</b> - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.</p> <p><b>3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES</b> - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.</p> <p>Identify and describe the basic woodworking hand tools in the Industrial Technology Shop.</p>

Topic: 2M Metal Types, Shapes and Identification

Days: 4

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

The difference between ferrous and non-ferrous metals.

How sparks and a magnet can help identify the type of metal.

What materials they will be using to complete a product.

Understand:

Metal comes in various types and shapes to allow the user to use their properties in the best way.

Do:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Identify the types of metal using a magnet and spark test.

Explain why the chosen metals are used to construct the outdoor wind chime.

Topic: 2W Wood Identification

Days: 3

Subject(s): Technology, Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

The characteristics of hardwood and softwood.

Why certain woods are used for certain products.

What wood they will be using to complete a product.

How to identify types of wood material.

There are different properties for wood.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Identify the different types of wood.

Select the appropriate wood material depending on the project.

Topic: 3M Metal Working Machine Safety

Days: 6

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Correct procedures for using metal working machines.

How to select the appropriate machine for a given task.

Safety should be followed when using all metal working machines.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Demonstrate safe and proper use of all metal working machines.  
Apply techniques demonstrated to practice skills and produce a product.



Topic: 3W Woodworking Machine Safety

Days: 6

Subject(s): Technology, Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

The correct process for each wood working machine.

How to select the right machine to complete an appropriate task.

Understand:

Why should a specific wood working machine be used to complete a given task and safety be followed when using a machine.

Do:

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Demonstrate safe and proper use of all wood working machines.

Apply techniques that are demonstrated to produce a product.

Topic: 4M Wind Chime Production

Days: 31

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

**3.4.12.A2. – Essential**  
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

**3.4.12.A3. – Essential**  
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

**3.4.12.C2. – Essential**  
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential**  
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/ PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

Understand:

There are many metalworking processes involved in making the wind chime project.

Do:

**3.4.12.A2. – Essential**  
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

**3.4.12.A3. – Essential**  
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

**3.4.12.C2. – Essential**  
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential**  
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

**3.4.12.D2. – Important**  
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.E6. – Essential**  
MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Apply concepts of design engineering and production engineering in the organization of and application of manufacturing the wind chime.

Compare and contrast specific construction systems that depend on each other in order to complete a project.

Produce and assemble the parts for the wind chime

Topic: 4M Wind Chime Production

Days: 31

Subject(s): Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

**3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS** - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

What machines should be used to construct the wind chime.

How each step of the production process should be completed.

What tools should be used to construct the wind chime.

Topic: 4W Woodworking Production

Days: 21

Subject(s): Technology, Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

**3.4.12.C2. – Essential ENGINEERING DESIGN** - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING** - Apply the concept that many technological problems require a multi-disciplinary approach.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

What machines would be used to construct the wood product.

There are specific machines and processes that are necessary to produce a wood product.

**3.4.12.C2. – Essential ENGINEERING DESIGN** - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING** - Apply the concept that many technological problems require a multi-disciplinary approach.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

**3.4.12.E7. – Important CONSTRUCTION TECHNOLOGIES** - Analyze the technologies of prefabrication and new structural materials and processes as they pertain to constructing the modern world.

Apply concepts of design, engineering, and production in the organization and construction of the product.

Compare and contrast specific construction systems that depend on each other in order to complete a product.

Topic: 4W Woodworking Production

Days: 21

Subject(s): Technology, Vocations

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

How each step of the production process should be completed.

What tools should be used to construct the wood product.

Topic: 5W Acrylics

Days: 7

Subject(s): Technology

Grade(s): 9th, 10th, 11th, 12th

Know:

**3.4.12.A2. – Essential**  
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

**3.4.12.A3. – Essential**  
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

**3.4.12.C2. – Essential**  
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential**  
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

Understand:

Acrylic plastic has a wide variety of uses and many benefits in industry.

Do:

**3.4.12.A2. – Essential**  
CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.

**3.4.12.A3. – Essential**  
TECHNOLOGY CONNECTIONS - Demonstrate how technological progress promotes the advancement of science, technology, engineering and mathematics (STEM).

**3.4.12.B1. – Essential**  
EFFECTS OF TECHNOLOGY - Analyze ethical, social, economic, and cultural considerations as related to the development, selection, and use of technologies.

**3.4.12.C2. – Essential**  
ENGINEERING DESIGN - Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.C3. – Essential**  
RESEARCH & DEVELOPMENT, INVENTION & INNOVATION, EXPERIMENTATION/PROBLEM SOLVING AND TROUBLESHOOTING - Apply the concept that many technological problems require a multi-disciplinary approach.

**3.4.12.D2. – Important**  
USING AND MAINTAINING TECHNOLOGICAL SYSTEMS - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.E6. – Essential**  
MANUFACTURING TECHNOLOGIES - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

Identify and describe the types of acrylic plastic.

Describe examples of each type of acrylic plastic.

Topic: 5W Acrylics

Days: 7

Subject(s): Technology

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

**3.4.12.D2. – Important USING AND MAINTAINING TECHNOLOGICAL SYSTEMS** - Verify that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

**3.4.12.E6. – Essential MANUFACTURING TECHNOLOGIES** - Compare and contrast the importance of science, technology, engineering and math (STEM) as it pertains to the manufactured world.

What is acrylic plastic?  
 Types of Acrylic Plastic  
 Acrylic Plastic CNC Machines  
 Advantages & Disadvantages of using acrylic plastic  
 3.4.12.A2. - CORE CONCEPTS OF TECHNOLOGY - Describe how management is the process of planning, organizing, and controlling work.  
 3.4.12.B1. - EFFECTS OF TECHNOLOGY - Analyze ethical, social, economic, and cultural considerations as related to the development,

Explain the advantages and disadvantages of acrylic plastic.  
 Manufacture several products using acrylic plastic and other materials.

Topic: 5W Acrylics

Days: 7

Subject(s): Technology

Grade(s): 9th, 10th, 11th, 12th

Know:

Understand:

Do:

selection, and use of technologies.