

## Curriculum Framework – Computer Integrated Manufacturing

### Unit 2 Manufacturing Processes – Lesson 2.2 How We Make Things

#### Desired Results *(stage 1)*

##### **ESTABLISHED GOALS**

*It is expected that students will...*

- G1 – Demonstrate an ability to identify, formulate, and solve engineering problems.
- G2 – Demonstrate an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- G3 – Demonstrate an ability to design and conduct experiments, as well as to analyze and interpret data.
- G4 – Demonstrate an ability to apply knowledge of mathematics, science, and engineering.
- G5 – Demonstrate an ability to use the techniques, skills, and

##### Transfer

**TRANSFER:** *Students will be able to independently use their learning to ...*

- T1 – Research topics according to accepted academic standards and become a resource to others on a selected topic. (NGSS Engineering Practice 6)
- T2 – Propose a manufacturing process to create a product. (NGSS Engineering Practice 6)

##### Meaning

**UNDERSTANDINGS:** *Students will understand that ...*

- U1 – Prototyping is part of a design process where a physical model can be evaluated to refine the design.
- U2 – Before raw material can be used in manufacturing, it must undergo primary processing.
- U3 – The separating process is one of the oldest manufacturing processes.
- U4 – Milling and shearing utilize the subtractive process to create products.
- U5 – Electrochemical Machining (ECM), Electrical Discharge Machining (EDM), water-cutting, and laser-cutting are using newer technologies to enhance the accuracy and efficiency of material removal.
- U6 – Metals, plastics, and ceramics are types of materials that are well suited to the manufacturing process.
- U7 – The way in which a product is made is dependent upon the properties of the material that will be used.

**ESSENTIAL QUESTIONS:** *Students will keep considering ...*

- Q1 – How can a product be efficiently manufactured?
- Q2 – How can a prototype be used in a design process?

<p>modern engineering tools necessary for engineering practice.</p> <ul style="list-style-type: none"> <li>• G6 – Pursue the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</li> <li>• G7 – Demonstrate an understanding of professional and ethical responsibility.</li> <li>• G8 – Demonstrate an ability to function on multidisciplinary teams.</li> <li>• G9 – Demonstrate an ability to communicate effectively.</li> <li>• G10 – Gain knowledge of contemporary issues.</li> <li>• G11 – Recognize the need for, and develop an ability to engage in life-long learning.</li> </ul>	<p style="text-align: center;"><b>Acquisition</b></p> <p><b>KNOWLEDGE:</b> <i>Students will...</i></p> <ul style="list-style-type: none"> <li>• K1 – Describe common prototyping techniques. U1, U2, U4, U5</li> <li>• K2 – Explain the difference between primary and secondary manufacturing processes. U2</li> <li>• K3 – Describe common manufacturing processes. U1, U2, U3, U4, U5, U6, U7</li> </ul>	<p><b>SKILLS:</b> <i>Students will...</i></p> <ul style="list-style-type: none"> <li>• S1 – Analyze common prototyping techniques. U1</li> <li>• S2 – Identify how manufacturing processes can be used to produce a product. U2, U3, U4, U5, U6, U7</li> </ul>
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Evidence (stage 2)		
Activities (A) Projects (P) Problems(B)	Assessment FOR Learning	Assessment OF Learning
2.2.1.A Creating Prototypes	<ul style="list-style-type: none"> <li>• Essential questions</li> <li>• Research notes</li> </ul>	<ul style="list-style-type: none"> <li>• Responses to the scenario questions</li> <li>• Presentation of research</li> <li>• Conclusion questions</li> </ul>
2.2.2.A Manufacturing Processes	<ul style="list-style-type: none"> <li>• Essential questions</li> <li>• Responses to questions based on the presentation</li> </ul>	<ul style="list-style-type: none"> <li>• Responses to questions based on the presentation</li> <li>• Conclusion questions</li> </ul>
2.2.3.P Manufacturing Research	<ul style="list-style-type: none"> <li>• Essential Questions</li> <li>• Research notes</li> <li>• Responses to labeling peer products</li> </ul>	<ul style="list-style-type: none"> <li>• Research documentation</li> <li>• Presentation of research</li> </ul>

Learning Plan (stage 3)	
Activities (A) Projects (P) Problems(B)	Knowledge and Skills
2.2.1.A Creating Prototypes	K1, S1
2.2.2.A Manufacturing Processes	K2, K3, S2
2.2.3.P Manufacturing Research	K2, K3, S2