



## **Manufacturing and Construction - Grade 8**

**Course Information**

<b>Grade(s):</b>	8
<b>Discipline/Course:</b>	Technology Education/ Manufacturing and Construction
<b>Course Title:</b>	Manufacturing & Construction
<b>Prerequisite(s):</b>	N/A
<b>Course Description:</b> <i>Program of Studies</i>	Students learn how products are manufactured from design to assembly. Hands-on practical experiences with hand and power tools are emphasized. Students manufacture products using various materials including hard and soft wood and plastics. Students gain knowledge of proper and safe construction as they develop and build projects of their own design individually and in teams. Students work in teams building scale models of various construction methods and projects using appropriate tools to learn how structures are built. Vertical alignment of the middle school Technology Education program prepares students for advanced approaches to STEM careers at the high school level.
<b>Course Essential Questions:</b>	<ul style="list-style-type: none"> <li>● How can we choose the best tools to use for a particular task or to solve a problem?</li> <li>● What steps can we take to solve a complex problem that seems to have many solutions?</li> <li>● What is manufacturing and why is it important to our economy?</li> <li>● How can manufacturing and construction meet the needs of people?</li> </ul>
<b>Course Enduring Understandings:</b>	<ul style="list-style-type: none"> <li>● There are various approaches to Manufacturing and Construction, and the best approach to use is the one that optimizes the needs of the end user.</li> <li>● Product design involves a series of tradeoffs to optimize solutions that best address constraints and criteria (requirements).</li> <li>● Failure and iteration is an inherent part of the Universal Systems Model.</li> </ul>
<b>Duration:</b> <b>Credit:</b>	10 weeks 0 Credit(s) (Middle School Course)

<b>Course Materials/Resources:</b>	Equipment and consumables.
<b>FPS Course Academic Expectation(s):</b>	EU - Exploring Understanding CC- Creating and constructing
<b>Year at a Glance (Units)</b>	Unit 1 - Course Introduction and Materials Measurement (3 weeks) Unit 2 - Problem Solving and Tool Use (4 weeks) Unit 3 - Assembly & Finishing (3 weeks)

<b>Unit Number and Title:</b>	Unit 1: Course Introduction and Materials Measurement
<b>Duration:</b>	3 weeks
<b>Resource(s):</b>	Equipment and consumables
<b>Unit Overview:</b>	Students gain knowledge of proper and safe construction as they develop and build projects of their own design individually and in teams, using hand and power tools students manufacture products using various materials including hard and soft wood and plastics.
<b>Learning Goals</b>	
<b>Standard(s):</b>	<p>ITEEA (International Technology and Engineering Educators Association) Standards for Technological and Engineering Literacy (STEL)</p> <p>STEL-1J. Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>STEL-1M. Apply creative problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p> <p>STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems.</p> <p>STEL-2N. Illustrate how systems thinking involves considering relationships between every part, as well as how the system interacts with the environment in which it is used</p> <p>STEL-3G. Explain how knowledge gained from other content areas affects the development of technological products and systems</p> <p>STEL-7Q. Apply the technology and engineering design process.</p> <p>STEL-7T. Assess design quality based upon established principles and elements of design.</p> <p>STEL-7U. Evaluate the strengths and weaknesses of different design solutions.</p>
<b>Essential Question(s):</b>	<ul style="list-style-type: none"> <li>● How can we choose the best tools to use for a particular task or to solve a problem?</li> <li>● What steps can we take to solve a complex problem that seems to have many solutions?</li> <li>● What is manufacturing and why is it important to our economy?</li> <li>● How can manufacturing and construction meet the needs of people?</li> </ul>

<b>Enduring Understanding(s):</b>	<ul style="list-style-type: none"> <li>● There are various approaches to Manufacturing and Construction, and the best approach to use is the one that optimizes the needs of the end user.</li> <li>● Product design involves a series of tradeoffs to optimize solutions that best address constraints and criteria (requirements).</li> <li>● Failure and iteration is an inherent part of the Universal Systems Model.</li> </ul>
<b>Learning Goal(s):</b> <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p><b>Content:</b> (Students will know...)</p> <ul style="list-style-type: none"> <li>● methods used to convert raw &amp; recycled materials into usable products.</li> </ul> <p><b>Skills:</b> (Students will be able to...)</p> <ul style="list-style-type: none"> <li>● differentiate between primary and secondary raw materials.</li> <li>● demonstrate the appropriate selection &amp; safe operation of basic hand &amp; power tools.</li> <li>● use measuring devices accurately.</li> </ul>

<b>Unit Number and Title:</b>	Unit 2: Problem Solving and Tool Use
<b>Duration:</b>	4 weeks
<b>Resource(s):</b>	Equipment and consumables
<b>Unit Overview:</b>	This unit offers students experiences related to the construction field and architecture. Students will work in teams to learn how structures are built by actually building scale models of various construction methods projects with appropriate tools. Students then report on their models to further the class's understanding of various construction details, methods and techniques. Hands-on practical experiences will be emphasized.
<b>Learning Goals</b>	
<b>Standard(s):</b>	ITEEA (International Technology and Engineering Educators Association) Standards for Technological and Engineering Literacy (STEL) STEL-1J. Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants. STEL-1M. Apply creative problem-solving strategies to the improvement of existing devices or processes or the development of new approaches. STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems. STEL-2N. Illustrate how systems thinking involves considering relationships between every part, as well as how the system interacts with the environment in which it is used STEL-3G. Explain how knowledge gained from other content areas affects the development of technological products and systems STEL-7Q. Apply the technology and engineering design process. STEL-7T. Assess design quality based upon established principles and elements of design. STEL-7U. Evaluate the strengths and weaknesses of different design solutions.
<b>Essential Question(s):</b>	<ul style="list-style-type: none"> <li>● How can we choose the best tools to use for a particular task or to solve a problem?</li> <li>● What steps can we take to solve a complex problem that seems to have many solutions?</li> <li>● What is manufacturing and why is it important to our economy?</li> </ul>

	<ul style="list-style-type: none"> <li>● How can manufacturing and construction meet the needs of people?</li> </ul>
<b>Enduring Understanding(s):</b>	<ul style="list-style-type: none"> <li>● There are various approaches to Manufacturing and Construction, and the best approach to use is the one that optimizes the needs of the end user. Making is an essential part of Technology and Engineering Design.</li> <li>● Product design involves a series of tradeoffs to optimize solutions that best address constraints and criteria (requirements).</li> <li>● Failure and iteration is an inherent part of the Universal Systems Model.</li> </ul>
<b>Learning Goal(s):</b> <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p><b>Content:</b> (Students will know...)</p> <ul style="list-style-type: none"> <li>● how the Universal Systems model applies to Problem Solving.</li> </ul> <p><b>Skills:</b> (Students will be able to...)</p> <ul style="list-style-type: none"> <li>● select and use properly and safely various Tools and Machines in the Manufacturing Process.</li> <li>● work collaboratively to resolve a Manufacturing or Construction problem.</li> <li>● demonstrate an understanding of design principles.</li> </ul>

<b>Unit Number and Title:</b>	Unit 3: Assembly & Finishing
<b>Duration:</b>	3 weeks
<b>Resource(s):</b>	Equipment and consumables
<b>Unit Overview:</b>	Students learn how products are assembled and finished using various processes. Students gain knowledge of the proper and safe manufacturing of products using various materials including hard and soft wood and plastics. Hands-on practical experiences will be emphasized.
<b>Learning Goals</b>	
<b>Standard(s):</b>	<p>ITEEA (International Technology and Engineering Educators Association) Standards for Technological and Engineering Literacy (STEL)</p> <p>STEL-1J. Develop innovative products and systems that solve problems and extend capabilities based on individual or collective needs and wants.</p> <p>STEL-1M. Apply creative problem-solving strategies to the improvement of existing devices or processes or the development of new approaches.</p> <p>STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems.</p> <p>STEL-2N. Illustrate how systems thinking involves considering relationships between every part, as well as how the system interacts with the environment in which it is used</p> <p>STEL-3G. Explain how knowledge gained from other content areas affects the development of technological products and systems</p> <p>STEL-7Q. Apply the technology and engineering design process.</p> <p>STEL-7T. Assess design quality based upon established principles and elements of design.</p> <p>STEL-7U. Evaluate the strengths and weaknesses of different design solutions.</p>
<b>Essential Question(s):</b>	<ul style="list-style-type: none"> <li>● How can we choose the best tools to use for a particular task or to solve a problem?</li> <li>● What steps can we take to solve a complex problem that seems to have many solutions?</li> <li>● How can manufacturing and construction meet the needs of people?</li> </ul>
<b>Enduring</b>	<ul style="list-style-type: none"> <li>● There are various approaches to Manufacturing and Construction, and the best</li> </ul>



<b>Understanding(s):</b>	<p>approach to use is the one that optimizes the needs of the end user.</p> <ul style="list-style-type: none"> <li>● Product design involves a series of tradeoffs to optimize solutions that best address constraints and criteria (requirements).</li> <li>● Failure and iteration is an inherent part of the Universal Systems Model.</li> </ul>
<b>Learning Goal(s):</b> <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p><b>Content:</b> (Students will know...)</p> <ul style="list-style-type: none"> <li>● manufacturing is an important part of the American economy.</li> <li>● that various parts of the Manufacturing process are interdependent and part of a larger system of production</li> <li>● products can be made with many different types of tools and machines.</li> </ul> <p><b>Skills:</b> (Students will be able to...)</p> <ul style="list-style-type: none"> <li>● use CADD software to produce orthographic and isometric plans of their designs.</li> <li>● use the technology and engineering design process to iteratively solve design challenges.</li> <li>● design within provided criteria and constraints and make appropriate trade-offs for optimization.</li> <li>● select and use correct manufacturing assembly processes.</li> <li>● select and use correct manufacturing finishing processes.</li> </ul>