

CTE Standards Unpacking
Introduction to Manufacturing

Course: Introduction to Manufacturing

Course Description: Introduction to Manufacturing provides entry level exposure and career exploration in the manufacturing industry. This comprehensive course teaches students the various methods used to process and transform materials. Includes skills common to all manufacturing occupations such as reading working drawings, safety, hand and power tools, bonding casting, forming computer automations, LEAN manufacturing, soldering, metallurgy, and various welding processes. Students will learn the business and design process of manufacturing industry.

Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.

Career Cluster: Manufacturing

Prerequisites: None

Program of Study Application: Introduction to Manufacturing is a cluster course in the Manufacturing program of study. Upon completion of Introduction to Manufacturing, a student will be prepared to take an entry pathway course in any of the four manufacturing pathways: welding, machining, design/engineering, or automation.

INDICATOR #IM 1: Career exploration and development.

SUB-INDICATOR 1.1 (Webb Level: 1 Recall): Recognize the various career pathways/occupations that are available in manufacturing process/industry/business.

SUB-INDICATOR 1.2 (Webb Level: 4 Extended Thinking): Design a career path for individual career interest in the manufacturing cluster.

Knowledge (Factual):	Understand (Conceptual):	Do (Application):
-Career opportunities and pathways in manufacturing. -Appropriate apprenticeships	-Education needed for specific career -Importance of Industry certification -Potential job outlook based on location	-Research potential career interests -Interview potential employers or post secondary program specialists -Create Personal Learning Plan: www.sdmylife.com

Benchmarks:

Students will be assessed on their ability to:

- Create a list of career opportunities that are linked to career match maker section of www.sdmylife.com
- Presentation on career choice

Academic Connections	
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>RI.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem</p> <p>W.4 – Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience</p> <p>SL.2. Integrate multiple sources of information presented in diverse formats and media</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Read technical publications</p> <p>-List of occupations</p> <p>-Through the interview process student will form a presentation on career choices.</p>

<p>INDICATOR #IM 2: Plan, manage and perform the processing of materials into intermediate or final products and understand related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.</p>		
<p>SUB-INDICATOR 2.1 (Webb Level: 3 Strategic Thinking): Develop a business plan for manufacturing operations.</p>		
<p>SUB-INDICATOR 2.2 (Webb Level: 1 Recall): Explain trends and issues in the manufacturing industry.</p>		
<p>SUB-INDICATOR 2.3 (Webb Level: 3 Strategic Thinking): Demonstrate a management plan for the manufacturing process for the production of a product and/or business</p>		
<p>Knowledge (Factual):</p> <ul style="list-style-type: none"> -Roles of government in regulating and supporting manufacturing business -Sections of business plan -SWOT (Strengths, Weakness, Opportunities, Threats) analysis 	<p>Understand (Conceptual):</p> <ul style="list-style-type: none"> -Government plays a role in business -Importance of business plan -Effects of social and economical changes on manufacturing businesses -Importance of Risk 	<p>DO (Application):</p> <ul style="list-style-type: none"> -Develop manufacturing business plan http://sdbusinesshelp.com/ -Implement management plan using sections of business plan -Research contemporary issues impacting the

	<p>Management</p> <p>-How materials controls affect product</p>	<p>manufacturing industry.</p>
<p>Benchmarks: <i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Complete all sections of the business plan and present business plan • Implement management plan for the desired product 		
<p>Academic Connections</p>		
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Students will share their presentation on business plans</p>	

<p>INDICATOR #IM 3: Implement manufacturing technology safety practices.</p>		
<p>SUB-INDICATOR 3.1 (Webb Level: 1 Recall): Maintain general safety in accordance with government regulations, health standards, and company and/or school policy.</p>		
<p>SUB-INDICATOR 3.2 (Webb Level: 2 Skill/Concept): Evaluate ergonomic factors associated with the manufacturing industry.</p>		
<p>Knowledge (Factual):</p> <p>-OSHA (Occupational Safety and Health Administration) 10 guidelines</p> <p>-SDS (Safety Data Sheets)</p> <p>-Awareness of ergonomics in the workplace</p>	<p>Understand (Conceptual):</p> <p>-Importance of complying with OSHA 10</p> <p>-Comprehension of SDS</p> <p>-Impacts of environmental and human hazards</p> <p>-The importance of ergonomics in the work environment</p>	<p>Do (Application):</p> <p>-Read and interpret safety data sheets</p> <p>-Complete OSHA 10 seminar</p> <p>-Research and report on ergonomics in manufacturing</p>
<p>Benchmarks:</p>		

Students will be assessed on their ability to:

- Report on findings on safety data sheet
- OSHA 10 certification
- Present the findings of ergonomics research

Academic Connections

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	Sample Performance Task Aligned to the Academic Standard(s):
<p>PS1-2 Construct and revise an explanation for the outcome of a simple chemical reactions and knowledge of the patterns of chemical properties.</p>	<p>-Determine classification of proper fire extinguisher usage. http://www.fire-extinguisher101.com/using.html</p>
<p>SL.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</p>	<p>-Create a power point of chemical reactions</p>

INDICATOR #IM 4: Apply ethical practices in the workplace as they relate to today's society.

SUB-INDICATOR 4.1 (Webb Level: 1 Recall): Identify and display professional practices in the workplace.

Knowledge (Factual):	Understand (Conceptual):	Do (Application):
<p>-Appropriate Personal hygiene</p> <p>-Business policies and procedures/practices</p>	<p>-Personal appearance has an impact at the workplace</p> <p>-Importance of business policies and company handbooks</p>	<p>-Complete Soft Skills Assessment</p> <p>http://www.keytrain.com/softskills.asp</p> <p>-Interview local Human Resource officer</p>

Benchmarks:

Students will be assessed on their ability to:

- Role play appropriate and inappropriate actions in the workplace
- Present findings from interview

Academic Connections

<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>SL.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Role play for interviewing for a job</p>	
<p>INDICATOR #IM 5: Utilize the appropriate tools and equipment used in the manufacturing industry.</p>		
<p>SUB-INDICATOR 5.1 (Webb Level: 2 Skill/Concept): Use basic tools and equipment common to the manufacturing processes.</p>		
<p>Knowledge (Factual):</p> <p>-Tool identification and functions</p> <p>-Equipment operation</p>	<p>Understand (Conceptual):</p> <p>-Appropriate use of tools</p> <p>-Appropriate use of equipment</p>	<p>Do (Application):</p> <p>-Demonstrate tool and equipment use</p> <p>-Read and comprehend equipment manuals</p>
<p>Benchmarks:</p> <p><i>Students will be assessed on their ability to:</i></p> <ul style="list-style-type: none"> • Tool/equipment performance test 		
<p style="text-align: center;">Academic Connections</p>		
<p>ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):</p> <p>RI.4 Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text</p>	<p>Sample Performance Task Aligned to the Academic Standard(s):</p> <p>-Read technical manuals</p>	

INDICATOR #IM 6: Differentiate among a variety of manufacturing industries.		
SUB-INDICATOR 6.1 (Webb Level: 2 Skill/Concept): Research and understand basic concepts of the manufacturing career pathways.		
Knowledge (Factual): -Manufacturing pathways	Understand (Conceptual): -Manufacturing industries can be divided into certain sectors -Mechanical, Physical, or Chemical Transformation of materials into finished goods	Do (Application): -Research the manufacturing process (welding, machining, design/engineering, automation, & assembly)
Benchmarks: <i>Students will be assessed on their ability to:</i> <ul style="list-style-type: none"> • Explain the manufacturing process (each group explain a different manufacturing process) 		
Academic Connections		
ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard): RI.7 Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem W.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	Sample Performance Task Aligned to the Academic Standard(s): -Read for information to develop product -Follow business plan for product development and production	

INDICATOR #CE 7: Design and create a product using the engineering design loop		
SUB-INDICATOR 7.1 (Webb Level: 3 Strategic Thinking): Differentiate products/components in relationship to size, proportion and tolerances.		
SUB-INDICATOR 7.2 (Webb Level: 3 Strategic Thinking): Develop a prototype of a product.		
SUB-INDICATOR 7.3 (Webb Level: 4 Extended Thinking): Test and evaluate a product.		
SUB-INDICATOR 7.4 (Webb Level: 3 Strategic Thinking): Redesign product for final production.		
Knowledge (Factual): -Design loop -3-D printers -CAD (Computer Aided Drafting)	Understand (Conceptual): -Procedures in design loop -Functions of CAD -Various manufacturing materials -Modifications needed for prototype -Importance of collaboration and teamwork on a design	Do (Application): -Follow and use design loop -Read and sketch drawing -Interpret working drawings and schematics -Design a working drawing and/or schematic circuit -Develop prototype product -Test and evaluate prototype -Redesign prototype for final production
Benchmarks: <i>Students will be assessed on their ability to:</i> <ul style="list-style-type: none"> Transform raw materials into finished product following the design loop process. 		
Academic Connections		

ELA Literacy and/or Math Standard (if applicable, Science and/or Social Studies Standard):	Sample Performance Task Aligned to the Academic Standard(s):
<p>PS 3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample</p>	<p>-Knowledge of various materials</p>
<p>W.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.</p>	<p>-Student will document the design loop</p>

Additional Resources

Lake Area Tech (<https://www.lakeareatech.edu/>)

Mitchell Tech (<https://www.mitchelltech.edu/>)

Western Dakota Tech (<https://www.wdt.edu/>)

South Dakota Industry

Please list any resources (e.g., websites, teaching guides, etc.) that would help teachers as they plan to teach these new standards.