SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Materials Design	Length of Course: 30 cycles
Grade Level(s): 11-12	Periods Per Cycle: 6
Units of Credit: 1	Length of Period: 43 minutes
Classification: Elective	Total Instructional Time: 129 hours

Course Description

This is a combined wood and metal materials design class incorporating problem solving techniques in the construction of a product. The students will design and fabricate projects using wood, metal, and polymers. Real-world problems will be solved using the manufacturing techniques and processes. After a solution is proposed, the students will realize that design in a materials lab. This class will replicate the design and fabrication process used in many manufacturing industries.

Instructional Strategies, Learning Practices, Activities, and Experiences

Classroom Discussion Followed up with Demonstrations
Problem-Solving Activities
Constructed Response Questions
Team Challenge Activates
Posted Objectives and Agenda
Bell Ringers
Project Fabrication

Assessments

Article Reviews
Independent Projects
Project Reflections
Final Exam
Unit Projects

Materials/Resources

Fabrication Labs
Online Resources
Materials Testing Equipment
Machine and Hand Tools
Computer Numerical Control (CNC) Equipment

Adopted: 9/28/09

Revised: 5/21/18

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Safety in the Manufacturing Lab	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Personal and Machine Safety B. Materials Profiling and Selection	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Design Elements in the Manufacturing Process	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Design Layout B. Designing with the Computer C. Materials Testing and Simulations <u>Related Vocabulary</u>: aesthetics annotate brainstorming criteria design brief dimensions ergonomics eye protection machine guards material handling model problem solving prototype safety symbols	3.4.12.A3 ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). 3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2 ~ 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 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.12.E6 ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.

Components of a Safe Manufacturing Environment	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. The Modern Fabrication Lab B. The Modern Construction Lab C. Safety Management Plan	3.4.12.A2 ~ Describe how management is the process of planning, organizing, and controlling work. 3.4.10.C1 ~ Apply the components of the technological design process. 3.4.10.D2 ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Problem Solving Techniques in the Manufacturing Process	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Designing and Testing Around a Need B. Problem-Solving Manufacturing Steps C. Collecting and Understanding Research Data <u>Related Vocabulary</u>: goal setting heat transfer innovation inventory productivity project planning quality control safety measures time management troubleshooting	3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2 ~ 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 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product.

Production Lines	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Single Run B. Mass Production C. Assembly Line	3.4.10.C2 ~ Analyze a prototype and/or create a working model to test a design concept by making actual observations and necessary adjustments. 3.4.12.C2 ~ Apply the concept that engineering design is influenced by personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly.

Automation in the Manufacturing Process	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Working with CNC Machines B. Incorporating Robotics in the Manufacturing Process C. Careers in Manufacturing Automation <u>Related Vocabulary:</u> assembly line computer integration feasibility flowchart logistics manufacturing mass production production cycle production line workstation	3.4.12.C2 ~ 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 ~ Apply the concept that many technological problems require a multi-disciplinary approach. 3.4.10.D1 ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. 3.4.12.E6 ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.