SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Materials Fabrication	**Length of Course:** 15 cycles
Grade Level(s): 9-12	**Periods Per Cycle:** 6
Units of Credit: .5	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 64.5 hours

Course Description

This class examines processes used in modern fabrication. Wood, metal, and polymer materials are utilized in conjunction with laboratory safety to explore a variety of manufacturing processes. This class will allow students to learn and experience the fabrication of a variety of materials and processes used in manufacturing. The student will pay a lab fee for this course.

Instructional Strategies, Learning Practices, Activities, and Experiences

Classroom Discussion
Student/Teacher-Made Project Sheets
Teacher/Lecture on Machine Safety
Follow up with Demonstrations
Teacher/Student Discussion
Hand Tool Safety Lessons
Students Working with Hand Tools and Machinery
Teacher/Student Problem-Solving

Assessments

Proper Safety Quizzes
Project Reflections
Constructed Response Prompts
Test Product for Quality Control Using Proven Methods
Project Rubrics
Ability to Measure to the Nearest 1/1000 of an Inch
Final Exam
Manipulative Final Project

Materials/Resources

Fabrication Labs
Tech Ed Resource Library
Materials Testing Equipment
Computer Numerical Control (CNC) Equipment

Adopted: 8/18/08
Revised: 5/21/18; 12/9/20

Machine Safety and Tools	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
The students will demonstrate the knowledge needed to work safely with metal working tools and equipment. • Saws and Cutting Operations • Drilling and Fabrication • Finishing and Hardware • Equipment Safety • Measuring and Quality Control • Reading Plans <u>Related Vocabulary:</u> dimensions tolerance machine guards eye protection materials flow quality control drilling steps coarse/fine threads hardwood/soft woods veneer	**Science and Technology Standards** **3.4.10.A2.**~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **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. **3.4.10.E6.** ~ Illustrate how manufacturing systems may be classified into such as customized production, batch production, and continuous production. **Mathematics Standards** **CC.2.1.HS.F.3** ~ Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.2.1.HS.F.4** ~ Use units as a way to understand problems and to guide the solution of multi-step problems. **English Language Arts Standards** **CC.1.2.9–10.J** ~ Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. **CC.1.3.9–10.J** ~ Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

CNC Machinery	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
The students will understand and apply the principles of automation in a manufacturing environment. • Program CNC Machines • Setup and Production of CNC Parts • Careers in Materials Fabrication <u>Related Vocabulary:</u> assembly line computer-integration manufacturing mass production production cycle production line workstation	**Science and Technology Standards** **3.4.10.A2.** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **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. **3.4.10.E6.** ~ Illustrate how manufacturing systems may be classified into such as customized production, batch production, and continuous production. **3.4.10.D1.** ~ Refine a design by using prototype**s** and modeling to ensure quality, efficiency, and productivity of a final product. **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. **3.4.10.C3.** ~ Illustrate the concept that not all problems are technological and not every problem can be solved using technology.

Engineering	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
The students will apply principles and skills associated with engineering to solve a design problem. • Measuring and Quality Control • Reading Plans • Equipment Safety • Hand Tool Safety <u>Related Vocabulary:</u> quality control blue prints materials list piloting soldering polarity prototype	**Science and Technology Standards** **3.4.10.A2.** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **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. **3.4.10.E6.** ~ Illustrate how manufacturing systems may be classified into such as customized production, batch production, and continuous production. **3.4.10.D1.** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **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. **3.4.10.C3.** ~ Illustrate the concept that not all problems are technological and not every problem can be solved using technology. **Mathematics Standards** **CC.2.1.HS.F.3** ~ Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.2.1.HS.F.4** ~ Use units as a way to understand problems and to guide the solution of multi-step problems.

Production	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
The students will demonstrate the knowledge needed to plan and run a production line project. • Production Types • Moving Materials • Testing Production Solutions <u>Related Vocabulary:</u> assembly line computer-integration manufacturing mass production production cycle production line workstation *Enrichment and Expanded Opportunities: Automation and Robotics Student Guides, Teacher Prepared Information Sheets, Reference Books, Independent Study *Remediation and Intervention Strategies: Teacher Observation of Students, Student/Teacher Conferencing, Notebook and Project Review *Applies to Entire Course	**Science and Technology Standards** **3.4.10.A2.** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **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. **3.4.10.E6.** ~ Illustrate how manufacturing systems may be classified into such as customized production, batch production, and continuous production. **Mathematics Standards** **CC.2.1.HS.F.3** ~ Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data displays. **CC.2.1.HS.F.4** ~ Use units as a way to understand problems and to guide the solution of multi-step problems. **English Language Arts Standards** **CC.1.2.9–10.J** ~ Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college- and career-readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. **CC.1.3.9–10.J** ~ Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.