SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: Technology Education Independent Study	**Length of Course:** 30 cycles
Grade Level(s): 9-12	**Periods Per Cycle:** 6
Units of Credit: 1	**Length of Period:** 43 minutes
Classification: Elective	**Total Instructional Time:** 129 hours

Course Description

The purpose of this course is to enhance the students' experiences and abilities prior to post-secondary education and to provide additional enrichment for students who have completed Technology Education courses offered at Spring Grove Area High School. The course is based on the students' desires to develop experiences and skills within the technology framework. The course will offer an additional educational experience for students who have a desire to explore and expand their knowledge in a technology-based area of study.

Instructional Strategies, Learning Practices, Activities, and Experiences

Teacher Demonstrations	Independent Research	Bell Ringers
Constructive Response	Project Construction	
Journal Logs	Posted Objectives and Agenda	

Assessments

Journal Entries	Independent Projects	Project Slide Shows

Materials/Resources

Technology Laboratory Procedures and Equipment as Provided by Instructor	Technology Resources and Equipment as Needed to Meet Student Goals

Adopted: 6/30/2011
Revised: 5/21/18; 12/9/20

Designing and Materials Selection	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Design and Function B. Materials Estimation <u>Related Vocabulary</u>: dimension scale <u>Essential Question</u>: What methods are used to design, select and fabricate materials into a useful object?	**3.4.12.A2** ~ Describe how management is the process of planning, organizing, and controlling work. **3.4.12.A3** ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.A2** ~ Interpret how systems thinking applies logic and creativity with appropriate comprise in complex real-life problems. **3.4.10.A3** ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.10.C1** ~ Apply the components of the technological design process. **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. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it. **3.4.12.E6** ~ Compare and contrast the importance of science, technology, engineering, and math (STEM) as it pertains to the manufactured world.

Product Selection and Research	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Research Guidelines B. Materials Classification and Utilization C. Testing with Engineering Principles <u>Related Vocabulary</u>: component composite forming inventory optimization pattern problem-solving process prototype structured materials system tension profile subassembly <u>Essential Questions</u>: How can a product be produced using safe, research-based, and manufacturing technology? What principles of engineering apply to the design of a product? How can a design be tested for workability?	**3.4.12.A2** ~ Describe how management is the process of planning, organizing, and controlling work. **3.4.12.A3** ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.A2** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3** ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.10.C1** ~ Apply the components of the technological design process. **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. **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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Materials Processing and Fabrication	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Designing a Materials List B. Machine and Tool Safety C. Personal Safety <u>Related Vocabulary</u>: route separating shear simulation constraints protective dangerous hazard guidelines working drawing <u>Essential Questions</u>: How can you produce a cut list from your design plans and materials lists? Do I know how to safely operate the hand tools and power equipment needed to fabricate my project? What are the safety rules for the area that I am working in?	**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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Product Development and Construction	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Production Timelines B. Charts and Work Logs Related Vocabulary: assembly product configuration productivity strength time and place utility tooling-up universal design documentation flowchart Essential Questions: How will I create a production timeline and schedule? Why is it important to chart your progress while the project is under construction? What are several ways to log your activities?	**3.4.12.A2** ~ Describe how management is the process of planning, organizing, and controlling work. **3.4.12.A3** ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.A2** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3** ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.10.C1** ~ Apply the components of the technological design process. **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. **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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Construction and Fabrication - 1	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Project Records B. New Materials and Processes <u>Related Vocabulary</u>: value analysis allowances cartesian coordinate system clearance element fixture <u>Essential Questions</u>: How can a work log aid your project's success? What safety components do you use when working with new materials? What research methods can you use to find the best fabrication process?	**3.4.12.A2** ~ Describe how management is the process of planning, organizing, and controlling work. **3.4.12.A3** ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.C1** ~ Apply the components of the technological design process. **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. **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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Construction and Fabrication - 2	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Product Research and Design B. Construction and Fabrication <u>Related Vocabulary</u>: bench mark proportion tolerance metallurgy scheduling unity troubleshooting brainstorming <u>Essential Questions</u>: On what components of your project research would you like to expand? How can you apply your knowledge of construction and fabrication in completing the Independent Study project?	**3.4.12.A2** ~ Describe how management is the process of planning, organizing, and controlling work. **3.4.12.A3** ~ Demonstrate how technological progress promotes the advancement of science, technology, engineering, and mathematics (STEM). **3.4.10.A2** ~ Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems. **3.4.10.A3** ~ Examine how technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function. **3.4.10.C1** ~ Apply the components of the technological design process. **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. **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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Construction and Fabrication - 3	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Fastening Methods Related Vocabulary: gage number keyway machine bolt cotter pin carriage bolt lock washer rivet case-harden thread pitch Essential Questions: How will fasteners be used in the construction of your project? How can you apply your knowledge of construction and fabrication in completing the Independent Study project?	**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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Construction and Fabrication - 4	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Product Hardware Related Vocabulary: locks knobs cylinder lever countersink hasp Essential Questions: What hardware will you need to complete your project? How can you apply your knowledge of construction and fabrication in completing the Independent Study project?	**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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Construction and Fabrication - 5	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Product Finish Related Vocabulary: surface finish buffing painting grinding enameled primer powder-coating electroplating contamination chemical lacquer solvent corrosion Essential Questions: What methods of finishing are best suited to your project? How can you apply your knowledge of construction and fabrication in completing the Independent Study project?	**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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.

Compare, Contrast and, Evaluate the Projects Success	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
A. Research and Construction B. Researching Careers C. Product Utilization Related Vocabulary: evaluation feedback impact visualization accuracy inspection apprentice journeyman technician computer numerically controlled Essential Questions: What new fabrication processes have you learned through your research and construction? What careers are related to what you have learned throughout the project? How can you utilize the knowledge that you have gained through the project to continue your lifelong learning?	**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. **3.4.10.D1** ~ Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of a final product. **3.4.10.D2** ~ Diagnose a malfunctioning system and use tools, materials, and knowledge to repair it.