SPRING GROVE AREA SCHOOL DISTRICT

PLANNED COURSE OVERVIEW

Course Title: STEM Design and Fabrication	**Length of Course:** Half Year
Grade Level(s): 9	**Periods Per Cycle:** 6
Units of Credit: .5	**Length of Period:** 40 Minutes
Classification: Elective	**Total Instructional Time:** 60 Hours

Course Description

This class explores the essential elements of STEM theory, problem solving, building, and design. Students will apply the design process in real-world situations. Examples may include, but are not limited to, construction, computer science, electronics, robotics, transportation, manufacturing, audio/visual, information technology, etc. This course is a building block of the STEM Department. This course will encourage students, based on their aspirations and interests, to examine their role in a global work force that requires advanced technological training, a post-secondary degree, or other field specific certification(s). Students will rotate through different areas involving the theory, practice, design, and fabrication process. Students will participate in final projects that are student and teacher led based on their interests in a particular field of study. As students gain minimum competency skills in various fields, they will gain a better understanding of where their talents and interests lie. This course is a building block of the STEM Department. This course will encourage students, based on their aspirations and interests, to examine their role in a global work force that requires advanced technological training, a post-secondary degree, or other field specific certification(s).

Instructional Strategies, Learning Practices, Activities, and Experiences

Build Upon and Develop Minimum Competency Skills (MICS) Develop Advanced Competency Skills Design and Self-Reflect for Action Steps	Independent Research Project Construction Posted Objectives and Agendas	Bell Ringers Design, Build, Practice, Assess Process Journal Logs Constructive Responses

Assessments

Journals Weekly Checkpoints Small Group Discussions	Independent Projects Group Projects Panels of Experts	Competition Judges Competition Results Interviews with Local Businesses and Organizations

Materials/Resources

Technology Procedures and Equipment Instructor Provided Rubrics	Daily, Weekly, and Monthly Student Created Objectives Daily, Weekly, and Monthly Teacher Created Objectives	Competition Guidelines Various Materials Determined by Student(s') Needs

Adopted: 5/22/23

Determine and Define the Problem	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 1: Determine and Define the Problem Design Process Introduction to STEM, Problem-Solving, Engineering	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Students Collect Information	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 2: During individual STEM units of study (1-3 cycles), students will complete objectives to acquire minimum competency skills and knowledge. Students will explore the materials and resources and materials they will utilize through the design and build process.	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Students Brainstorm and Analyze Ideas	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 3: Students will use the MICS for each unit of study to develop action steps, propose possible successes and failures, and propose their expectations.	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Students Develop Solutions/Build Model(s)	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 4: For each unit of STEM, students will implement their design and solution to gauge their failures, weaknesses, and strengths to create well-informed decisions.	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Students Present Ideas to Others for Feedback	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 5: Reflection. Students will present their completed projects to others (examples: teachers, students, experts in the field, businesses, organizations, or another group as determined by the teacher and students). Students will explain their designs, actions steps, and future applications for modification(s).	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Students Synergize All Steps and Make Recommendations	
CONTENT/KEY CONCEPTS	**OBJECTIVES/STANDARDS**
Step 6: Students will make improvements and recommendations regarding their design, builds, or projects. The goal is to continue to develop an appreciation for STEM skills and knowledge as they continue to grow through each unit of study.	HS-ETS1-1 - Analyze a major global or District challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. HS-ETS1-4 - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.