



SPRING GROVE AREA SCHOOL DISTRICT



PLANNED COURSE OVERVIEW

Course Title: STEM Capstone Course Grade Level(s): 12 Units of Credit: 1 Classification: Elective	Length of Course: Full Year Periods Per Cycle: 6 Length of Period: 40 Minutes Total Instructional Time: 120 Hours
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Course Description

This course fosters and develops student led initiatives pertaining to STEM. Students will focus on advanced studies by synthesizing the skills and knowledge he or she has gained in their numerous STEM courses. Students will initiate the research, use their creativity, and hone their skills to create a direct correlation to a career in STEM. Students may work as individuals, or they may work in teams on projects that will have a positive impact on their community, the high school, or another organization. The Capstone Course may focus on the individual student's needs, but the course also has the ability to promote the team concept of synergy—every student relying on each other to complete an impactful mission and/or legacy project. An example could be a go-kart racing team or a community-based project like the Veterans' Memorial at the high school. Pre-requisites: Application Process and Interview is required.

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
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Assessments

Journals Weekly Checkpoints Small Group Discussions	Independent Projects Group Projects Panels of Experts	Competition Judges Competition Results Interviews with Local Businesses and Organizations
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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
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Adopted: 5/22/23

Revised:

Determine and Define the Problem	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>Step 1: Determine and define the problem.</p> <p>Design Process</p> <p>Critical Thinking – Problem-Solving</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>

Students Collect Information	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>Step 2: Students will complete research, analyze their research steps, analyze the resources and materials they will utilize through the design and build process.</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>

Students Brainstorm and Analyze Ideas	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>Step 3: Students will propose their action steps, supply a list of materials, machines, and equipment to utilize. Students will propose possible successes and failures and their expectations. Instructional Strategies, Learning Practices, Activities, and Experiences</p>	<p>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.</p>

Students Develop Solutions/Build Model(s)	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>Step 4: Students will implement their design(s) and solution(s), and gauge their failure(s), weakness(es), and strength(s) to create well-educated and well-informed action steps.</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>

Students Present Ideas to Others for Feedback	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>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).</p>	<p>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.</p>

Students Synergize All Steps and Make Recommendations	
CONTENT/KEY CONCEPTS	OBJECTIVES/STANDARDS
<p>Step 6: Students will make improvements and recommendations regarding their research, design, and building stages to ensure systemic change.</p>	<p>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.</p>