AOPA 9th Grade Aviation STEM Curriculum Standard Alignment

Overview: The ninth-grade course will provide the foundation for advanced exploration in the areas of flying, aerospace engineering, and unmanned aircraft systems. Students will learn about engineering practices, problem solving, and the innovations and technological developments that have made today's aviation and aerospace industries possible. Students will also learn about the wide variety of exciting and rewarding careers available to them. The ninth-grade course will inspire students to consider aviation and aerospace careers while laying the foundation for continued study in grades 10 through 12 and beyond.

Exploring Aviation & Aerospace, Semester 2

Unit 6 Aviation Safety and Oversight
Description: Exploring the regulatory and safety organizations and infrastructure that are essential to today's aviation environment, students will define safety and examine concepts such as perceived and accepted risk before developing their own safety management systems. They'll go on to investigate the role of regulation and oversight in creating and maintaining safety and efficiency within the aviation system and gain an understanding of the mission and responsibilities of the FAA. Later, students will consider the role of the National Transportation Safety Board and take an in-depth look at the accident investigation process as they take on the roles of various NTSB "Go Team" members in a simulated accident investigation. Finally, students will examine the government's role in delivering weather information and the importance of weather reporting to aviation safety.
Next Generation Science Standards
Three-dimensional Learning

HS-ETS1-1 - Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

- Science and Engineering Practices
  - Asking Questions and Defining Problems
  - Constructing Explanations and Designing Solutions
- Disciplinary Core Ideas
  - ETS1.A: Defining and Delimiting Engineering Problems
- Crosscutting Concepts
  - Systems and System Models
  - Influence of Science, Engineering, and Technology on Society and the Natural World

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.

- Science and Engineering Practices
  - Constructing Explanations and Designing Solutions
- Disciplinary Core Ideas
  - ETS1.C: Optimizing the Design Solution

HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

- Science and Engineering Practices
  - Constructing Explanations and Designing Solutions
- Disciplinary Core Ideas
  - ETS1.B: Developing Possible Solutions
- Crosscutting Concepts
  - Influence of Science, Engineering, and Technology on Society and the Natural World

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.

- Science and Engineering Practices
  - Using Mathematics and Computational Thinking
- Disciplinary Core Ideas
  - ETS1.B: Developing Possible Solutions
- Crosscutting Concepts
  - Systems and System Models

Common Core State Standards Mathematics

HSS-ID.B.5 - Summarize, represent, and interpret data on two categorical and quantitative variables.

HSN-Q.A.2-3 - Reason quantitatively and use units to solve problems.

Unit 7 Exploring Careers in Aviation and Aerospace

Description:

Students will learn about a variety of aviation and aerospace careers, as well as the education, training, and certification requirements needed for each. Students will begin by exploring flying careers, including airline, cargo and drone operations, military aviation, and flight instructing. Students will go on to explore aerospace engineering careers, including specialties such as propulsion and navigation. Finally, students will look at the unique skills needed to be a successful air traffic controller and participate in a simulation that demonstrates just how challenging the job can be. They'll complete the unit by exploring different types of aviation mechanic jobs.

Next Generation Science Standards

Three-dimensional Learning

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.

- Science and Engineering Practices
  - Constructing Explanations and Designing Solutions
- Disciplinary Core Ideas
  - ETS1.C: Optimizing the Design Solution

HS-ETS1-3 - Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

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Unit 8 Aviation Innovation and Problem-Solving

Description:

This unit offers students a look into the future of aviation and aerospace as they discover the challenges the industries face and the innovative technologies that will address those challenges. Students will begin this unit by looking at key environmental impacts of aviation—emissions and noise—and the emerging technologies designed to help reduce both. Next, they'll explore both the necessity and the complexities of modernizing our aviation system, increasing capacity, and bringing new types of flying machines into the mix of air traffic now traversing our skies. They'll go on to explore supersonic flight, discovering its history in commercial air travel and new efforts to make it viable as a means of transportation. They'll also look at how technology has increasingly automated flight and how fully autonomous aircraft may change the future of aviation. They'll go on to explore the unique advantages and challenges associated with developing electric aircraft before considering the possibilities associated with colonizing space, including the types of jobs that might be essential to a successful colony.

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  - Constructing Explanations and Designing Solutions

- Disciplinary Core Ideas
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- Crosscutting Concepts
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Common Core State Standards Mathematics

HSG.MG.A.1 - Use geometric shapes, their measures and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Unit 9 Innovation Challenge

Description:

In this unit, students will put their understanding of the engineering design process to the test as they design a "space condo." Students will work in teams to design a dwelling to protect residents from the harsh conditions on Mars, particularly the extremely low atmospheric pressure. Students will rigorously apply the engineering design process as they identify problems, brainstorm solutions, create a design, build and test a prototype, evaluate the results, refine their design, and share what they've learned. With limits on the types of materials and designs that may be used, students will have to exercise their creativity and work collaboratively at each stage of the project.

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Common Core State Standards Mathematics

HSG.MG.A.1 - Use geometric shapes, their measures and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Unit 10 Thinking About a Career in Aviation

Description:

Students will begin planning for a career in aviation and aerospace by writing a personal mission statement to help guide their future decisions. They'll go on to consider a range of training and educational options for different careers before selecting one potential career to explore further. Next, students will work on practical skills for presenting themselves to potential employers. Students will go on to evaluate the professional, technical, and communications skills they may already have and plan a path for developing additional skills in each of these areas. The unit will culminate with students building a career portfolio that they can use to support job and scholarship applications and grow throughout the remainder of their high school careers.

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