WARREN COUNTY SCHOOL DISTRICT

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: Intro to Aviation
Course Number: 00768
Course Prerequisites: None

Course Description: This course provides the foundation for advanced exploration in 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 look at the problem-solving practices and innovative leaps that transformed space exploration from the unimaginable to the common in a single generation. Students will also gain a historical perspective, from the earliest flying machines to various modern aircraft.

Suggested Grade Level: Grades 9-12
Length of Course: One Semester
Units of Credit: .5
PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:
65 – Technology Education
To find the CSPG information, go to CSPG
Certification verified by the WCSD Human Resources Department: ☒Yes ☐No

WCSD STUDENT DATA SYSTEM INFORMATION

Course Level: Academic
Mark Types: Check all that apply.
☒F – Final Average ☒MP – Marking Period ☒EXM – Final Exam

GPA Type: ☐ GPAEL-GPA Elementary ☐ GPAML-GPA for Middle Level ☒ NHS-National Honor Society
☒ UGPA-Non-Weighted Grade Point Average ☒ GPA-Weighted Grade Point Average

State Course Code: 03209
To find the State Course Code, go to State Course Code, download the Excel file for *SCED*, click on SCED 6.0 tab, and choose the correct code that corresponds with the course.

TEXTBOOKS AND SUPPLEMENTAL MATERIALS

Board Approved Textbooks, Software, and Materials:

Title:	N/A
Publisher:	N/A
ISBN #:	N/A
Copyright Date:	N/A
WCSD Board Approval Date:	August 28, 2023

Supplemental Materials: AOPA Curriculum provided by the Aircraft Owners and Pilot's Association

Curriculum Document

WCSD Board Approval:

Date Finalized:	7/26/2023
Date Approved:	10/9/2023
Implementation Year:	2023-2024

SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

SCOPE AND SEQUENCE OF CONTENT AND CONCEPTS

Unit 1: Aviation 101
Pre-Course Exam
Section A – Introduction to Aviation and Aerospace
- Lesson 1 Introduction to Aerospace Studies
- Lesson 2 Engineering Practices in Action
- Lesson 3 Aviation Careers Are For You!

Section B – Overview of Commercial, Military, and General Aviation
- Lesson 1 Introduction to Commercial Aviation
- Lesson 2 Introduction to Military Aviation
- Lesson 3 Introduction to General Aviation

Section C – Introduction to Unmanned Aircraft Systems
- Lesson 1 UAS Fundamentals
- Lesson 2 UAS Operation and Safety

Section D – Introduction to Space Exploration
- Lesson 1 Current and Future Space Exploration

Unit 1 Exam

Unit 2: Taking Flight—Early Aviation Innovations
Section A – Aviation's Primitive Beginnings
- Lesson 1 Flight in Greek Mythology
- Lesson 2 Da Vinci and His Flying Machines
- Section B – Lighter Than Air

Lesson 1 Hot Air and Gas Ballooning
Section C – Gliders
- Lesson 1 From Birds to Gliders
- Lesson 2 Glider Flight and Early Innovators

Section D – Powered, Controlled Flight
- Lesson 1 The "Wright" Approach
- Lesson 2 Build and Test a Wind Tunnel
- Lesson 3 The "Wright" Attitude

Unit 2 Exam

Unit 3: From Theory to Practical Reality—Rapid Developments in Powered Flight
Section A – First Practical Applications of Airplanes, Commercial and Military
- Lesson 1 Beginnings of U.S. Commercial Airline Service
- Lesson 2 Aviation and World War I
- Lesson 3 Airmail and the Transcontinental Airway System

Section B – Women in Early Aviation
- Lesson 1 Women in Early Aviation

Section C – World War II
- Lesson 1 Aviation Innovation and World War II

Lesson 2 One For All, All For One
Unit 3 Exam

Unit 4: To the Stars—Making Jet and Space Travel Possible
Section A – The Jet Age
Lesson 1 Development of the Jet Engine
Lesson 2 Commercial Air Travel
Section B – The Space Race
Lesson 1 The Space Race Begins
Lesson 2 To the Moon
Lesson 3 The Space Race Winds Down
Lesson 4 The Shuttle Program
Unit 4 Exam

Unit 5: Creating the Future—What's New and Next in Aviation and Aerospace
Section A – Modern Aircraft Design
Lesson 1 Fly-by-Wire and "Glass" Cockpits*
Lesson 2 Aircraft Navigation
Lesson 3 Composites and Structures
Section B – Government and Commercial Space
Lesson 1 Government and Commercial Space
Section C – End of Semester Project
Lesson 1 End of Semester Project
Unit 5 Exam

Post-Course Exam

Standards/Eligible Content and Skills

Unit 1 Aviation 101

Description:

Students will explore the different types of aviation at work in the modern world. They'll learn the uses and benefits of various forms of aviation, including commercial, military, private, and drone flying, as well as space exploration. Students will also learn about different types of aircraft, from drones and rockets to airliners and general aviation airplanes. This unit will give students a taste of the exciting and varied career possibilities in these fields.

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

Unit 2 Taking Flight—Early Aviation Innovations

Description:

Students will follow the path of aviation from its primitive beginnings to the dawn of powered flight. They will consider how observing birds influenced the earliest human attempts at flight before moving on to explore the first successful flight technologies, including lighter-than-air aircraft and gliders. The unit will culminate with an understanding of the technologies, innovative engineering, and design processes developed by the Wright Brothers. They'll also examine how the Wright Brothers' approach to problem solving is helping today's engineers address new challenges as they strive to break boundaries in aviation and aerospace.

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

HS-LS 1-2 - Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

- Science and Engineering Practices
  - Developing and Using Models
- Disciplinary Core Ideas
  - LS1.A: Structure and Function
- Crosscutting Concepts
  - Systems and System Models

HS-PS2-2 - Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. (NOTE: This standard is not explicitly used as math is not required to complete the exercise).

- Science and Engineering Practices
  - Using Mathematics and Computational Thinking
- Disciplinary Core Ideas
  - PS2.A: Forces and Motion
  - PS2.B: Types of Interactions
- Crosscutting Concepts
  - Systems and System Models

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).

HSN-Q.A.2 - Define appropriate quantities for the purpose of descriptive modeling.

HSN-Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Unit 3 From Theory to Practical Reality - Rapid Developments in Powered Flight

Description:

Tracing the dramatic growth in aviation from its first practical applications through its use as an essential military tool, students will learn about the innovations that changed the way aircraft were made and flown. Topics will include the technological developments that led to the first commercial airline service, a transcontinental airmail system, and ultimately the fighters, long-range bombers, and transport aircraft of World War II. Students will learn how engineers, designers, and pilots solved the problems presented by aircraft that could fly further, faster, and higher than ever before.

Next Generation Science Standards

Three-dimensional Learning

HS-ESS3-2 - Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

- Science and Engineering Practices
  - Engaging in Argument from Evidence
- Disciplinary Core Ideas
  - ESS3.A: Natural Resources
  - ETS1.B: Developing Possible Solutions
- Crosscutting Concepts
  - Influence of Science, Engineering, and Technology on Society and the Natural World

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

Unit 4 To the Stars - Making Jet and Space Travel Possible

Description:

Students will learn about the innovations that led to the jet age and consider how the expansion of military technology into the commercial sector led to widespread social changes. They will learn about the space race and the intense political competition that led scientists and engineers to overcome seemingly insurmountable obstacles to take machines and people into space, to the moon, and beyond. They'll look at the problem-solving processes and innovative leaps took space exploration from the unimaginable to the common in a single generation.

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

HSA-REI.B.3 - Solve equations and inequalities in one variable.

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).

HSN-Q.A.1 - Reason quantitatively and use units to solve problems.

Unit 5 Creating the Future - What's New and Next in Aviation and Aerospace

Description:

Modern aircraft navigation, fly-by-wire, "glass" cockpits, and composite structural materials are among the key innovations that students will explore as they consider how aviation continues to advance. Students will also look at how space exploration has changed as commercial enterprises have moved into that arena. The unit and the semester will culminate in a project in which students use their new understanding of aviation technology to design, build, and defend a museum exhibit based on the topics discussed during the semester.

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
HSA-REI.B.3 - Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
HSN.Q.A.2 - Define appropriate quantities for the purpose of descriptive modeling.
Standards for Mathematical Practice
CCSS.MATH.CONTENT.HSN.Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.
CCSS.MATH.CONTENT.HSN.Q.A.3 - Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
CCSS.MATH.PRACTICE.MP4 - Model with mathematics

ASSESSMENTS

PDE Academic Standards, Assessment Anchors, and Eligible Content: The teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

Formative Assessments: The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

Effective formative assessments for this course include: Assignments, Projects, Portfolio Building

Summative Assessments: The teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

Effective summative assessments for this course include: Unit Exams, Final Exam, Completed Portfolio