# Aerospace Engineering Design and Presentation

**Local Course #:** 82664

**State Course ID:** 13036500

**Course Description:**

Students enrolled in Engineering Design and Presentation I will demonstrate knowledge and skills of the design process as it applies to engineering fields and project management using multiple software applications and tools necessary to produce and present working drawings, solid model renderings, and prototypes. Through implementation of the design process, students will transfer advanced academic skills to component designs. Additionally, students will explore career opportunities in engineering, technology, and drafting and what is required to gain and maintain employment in these areas.

**Link to TEKS:**

https://texas-sos.appianportalsgov.com/rules-and-meetings?$locale=en_US&interface=VIEW_TAC_SUMMARY&queryAsDate=08%2F07%2F2025&recordId=225703

**First 9 Weeks Major Topics:**

Identify major components of an aircraft.

Identify the three axis of an aircraft.

Label the motions about the three axis of an aircraft.

Describe the four major forces which act on an aircraft.

Describe the four ways that lift is generated by an airfoil.

Label the components of an airfoil.

Describe the Earth's atmosphere composition and layers.

Describe the relationship of altitude, temperature and pressure within the Earth's atmosphere.

Describe the factors that impact lift and drag.

Explain factors which improve aircraft stability.

Describe how the motions about the three axis of an aircraft are stabilized and controlled by aircraft components.

Calculate the center of gravity of an aircraft.

Revise the weight and location of masses onboard an aircraft for safe flight balance.

Demonstrate how lift may be created with an airfoil.

Calculate the values of Earth's atmosphere altitude, temperature and pressure relative to each other.

Calculate the values of lift, drag and Reynolds Number.

Predict how aircraft characteristics affect lift, drag, and Reynolds Number.

Design an airfoil to meet or exceed desired performance.

Design a glider to meet or exceed desired performance.

Summarize test data to evaluate glider performance against design criteria.

Revise a glider to meet or exceed desired performance.

Analyze the factors that contribute to a successful glider design.

Accurately construct a glider that represents a design.

Predict glider performance.

Compare glider performance to predicted performance.

Optimize glider performance to improve performance.

**Second 9 Weeks Major Topics:**

Describe major advances in navigation technology.

Identify components of common aviation navigation aids.

Describe how an aircraft reacts to flight control inputs.

Describe purpose of air traffic control system how it functions.

Explain how Global Positioning System, GPS, functions.

Identify the functions of a typical Global Positioning System, GPS, unit functions

Describe the relationship of Tsiolkovsky rocket equation variables.

Identify characteristics which contribute to a successful team.

Interpret an indication shown on a navigation aid.

Illustrate navigation aid indication on a map.

Operate an aircraft in a simulated environment.

Plan a flight route.

Use a navigation aid to fly an aircraft to a destination in a simulated environment.

Predict an aircraft collision based on aircraft vectors.

Calculate an alternate aircraft vector for safe separation.

Create route consisting of latitude and longitude waypoints using a Global Positioning System, GPS, unit.

Interpret a route from latitude and longitude waypoints.

Select team members for a project based on characteristics.

Select propulsion system based on characteristics of each.

Describe the four primary forces acting on an aircraft.

Explain how Newton's Third Law applies to aerodynamic forces.

Describe the characteristics of the four types of propulsion systems.

Classify rocket engine systems.

Identify the thrust and impulse equations.

Describe parts and functions of a typical model rocket engine.

Outline model rocket safety suggestions.

Label model rocket components and functions.

Recognize the equation of center of gravity and center of pressure.

Identify common space propulsion systems.

Identify basic criteria to consider when designing a spacecraft.

Construct a physical model of a system.

Measure mechanical properties of material.

Interpret measurements of a test system.

Simulate performance of propulsion systems.

Design an aircraft propulsion system to meet a given objective such as maximum efficiency, maximum thrust to weight ratio.

Infer how changes in propulsion system parameters affect performance.

Interpret measurements of a model rocket engine thrust.

**Third 9 Weeks Major Topics:**

Design a stable model rocket.

Construct a stable model rocket.

Gather performance data associated model rocket launch such as maximum height of flight.

Construct a stable model rocket.

Calculate maximum height using rocket engine test data and indirect height measurements.

Organize and express thoughts and information in a clear and concise manner.

Select spacecraft components based on characteristics of each component.

Select spacecraft landing system based on characteristics of each component.

List major contributions made by people studying orbital mechanics.

Describe common satellite orbital pattern shapes and applications.

Name and describe the six Keplerian elements.

Explain Kepler's Laws.

Recognize the equations for orbital period, orbital gravitational potential energy, orbital kinetic energy, and total orbital energy.

Describe how an orbital mechanics modeling software can be applied design a satellite system.

Explain how financial factors impact a project.

Analyze how an orbital mechanics theory can describe satellite motion.

Organize and express thoughts and information in a clear and concise manner.

Identify the most appropriate orbital pattern for an application.

Calculate an orbiting body's orbital period, orbital gravitational potential energy, orbital kinetic energy, and total orbital energy.

Model a satellite system using a modeling software.

Formulate a financial proposal for a project.

**Fourth 9 Weeks Major Topics:**

List alternative applications than aircraft for aerospace engineering concepts.

Describe the parts and functions of a wind turbine.

Identify factors that impact aircraft efficiency.

Recognize the drag equation.

Design aerospace system as an alternate to an aircraft which use aerospace engineering concepts. Examples include a wind turbine and a parachute.

Construct an alternate aerospace system.

Measure output of an alternate aerospace system.

Optimize an alternate aerospace system.

Explain aircraft efficiency affects aircraft design.

Explain how unmanned systems can be integrated into aerospace systems.

Recognize factors that affect communication with equipment in space.

Describe how input and output devices function.

Explain the purpose of a flowchart or pseudocode.

Describe functions of a computer program.

Identify how functions of a computer program can be applied to perform a task.

Outline how a satellite data is gathered and used to create a map.

Describe how human factors impact space travel.

Describe how spacecraft systems function.

Analyze how aerospace unmanned systems function.

Synthesize a discrete knowledge into a coherent sequence of events.

Deliver organized oral presentations of work tailored to the audience.

Describe the impact of a communication delay on the success of a mission.

Operate output devices to perform a function.

Relate sensor input to the environment being measured.

Create a flowchart or pseudocode to perform a task.

Construct a control program to accomplish a specified goal.

Operate a remote system through a series of performance tasks including autonomous navigation.

Gather data using robot control software.

Arrange data using spreadsheet software.

Operate a simulated spaceflight.

Describe factors that a student should consider when planning a career.

Outline questions as preparation to interview a professional.

Collect information related to a future career.

Interview a professional.

Assemble career information into a coherent plan.

Deliver organized presentations of work tailored to the audience.

Criticize the work of a peer.