

San José State University
Aerospace Engineering Department
AE 100 – Fundamentals of Aerospace Engineering – Fall 2020



Course and Contact Information

Instructor:	Professor Sean Montgomery
Email:	sean.montgomery@sjsu.edu or sean5montgomery@gmail.com
Office Hours:	After class, Tuesdays 11 am to noon, or by appointment
Class Days/Time:	MW 3:00 to 4:15 pm
Classroom:	Online (Zoom)
Prerequisites:	“C” or better in Math 30, Phys 50, Engr 10
Final Exam Time:	Thursday, December 10 th , 12:15 to 2:30 pm

Course Description

Introduction to the fundamental disciplines and concepts of aerospace engineering and in particular of aerodynamics, aerospace structures, stability and control, propulsion, and flight mechanics.

Course Goals

Introduce students to the fundamental disciplines of aerospace engineering. More specifically, introduce the basic principles of aerodynamics, aerospace structures and material selection, stability and control of aerospace vehicles, propulsion systems, airplane performance, flight and orbital mechanics.

Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Explain the nature of aerodynamic forces and estimate lift and drag on aerodynamic bodies.
2. Analyze simple airplane and spacecraft structures.
3. Explain the concept of static and dynamic stability of aerospace vehicles.
4. Describe the effect of different vehicle parts on longitudinal, lateral and directional stability.
5. Calculate the thrust and propulsive efficiency of different types of air-breathing and rocket engines.
6. Analyze aircraft takeoff, climb, maneuvering, cruise, glide, loiter, and landing performance.
7. Design simple orbital maneuvers.
8. Calculate aerodynamic and heat loads on hypersonic vehicles.

Required Texts/Readings

Textbook

J.D. Anderson Jr., Introduction to Flight, 8th ed., McGraw Hill, 2015.

<https://www.amazon.com/Introduction-Flight-John-Anderson-Jr/dp/0078027675/>

Course Requirements and Assignments

In-Class Problems and Homework: Problems will be given during class (workouts) and homework will be assigned regularly. Students will also be asked to complete regular reflections on lecture topics. Late assignments will receive ½ credit.

Quizzes and Exams: Quizzes will often be given throughout the semester to check students' comprehension of the course material. Longer comprehensive quizzes or exams may be given later in the semester.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practice. Other course structures will have equivalent workload expectations as described in the syllabus.

Final Project

Students will complete a final project instead of a final exam. All projects must be individual projects unless students receive approval from the instructor to do a group project. Projects should be unique and avoid overlapping with other projects in AE100 or other classes. The final project can be a:

1. Research project (e.g. Electric propulsion for spacecraft)
2. Design project (e.g. Mars rocket designed in Kerbal Space Program)
3. Analysis/Investigation/Experiment project (e.g. Testing 3-D printed wing designs in a wind tunnel)

Every project must integrate at least 3 different areas from the class (aerodynamics, propulsion, stability and control, structures, materials, performance and dynamics). Students have a lot of flexibility in choosing a project as long as the project relates to aerospace. Students will present their project to the class during the scheduled final exam time at the end of the semester.

Grading Information

In-Class Problems and Homework:	30%	(1/2 credit for late assignments)
Quizzes and Exams:	30%	
Final Exam or Final Project:	40%	

Grading Scale: A+ 100 to 97%

A 96.9 to 93%

A- 92.9 to 90%

B+ 89.9 to 87%

B 86.9 to 83%;

B- 82.9 to 80%

C+ 79.9 to 77%

C 76.9 to 73%;

C- 72.9 to 70%

D 60 to 70%

F < 60%.

Classroom Protocol

Students will turn their cell phones off or put them on vibrate mode while in class. They will not answer their phones in class. In the classroom, students may use computers only for class-related activities, such as taking notes on the lecture underway, following the lecture on Web-based PowerPoint slides that the instructor has posted, and finding Web sites to which the instructor directs students at the time of the lecture. Attendance will not be taken during class, but if students miss a class they are still responsible for any material discussed or assignments given.

University Policies

Per [University Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) (<http://www.sjsu.edu/senate/docs/S16-9.pdf>), relevant information to all courses, such as academic integrity, accommodations, dropping and adding, consent for recording of class, etc. is available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](#) at <http://www.sjsu.edu/gup/syllabusinfo/>

AE Department Policies

AE Department policies can be found at <http://www.sjsu.edu/ae/programs/policies/>

Fall 2020 Online

Zoom

Class will meet online via Zoom. You can find the links to join these meetings under the “Zoom” section on Canvas. They are also posted on the Calendar.

Technology Requirements

Students are required to have an electronic device (laptop, desktop or tablet) with a camera and built-in microphone. SJSU has a free [equipment loan program](#) available for students. Students are responsible for ensuring that they have access to reliable Wi-Fi during tests and quizzes. See the [Learn Anywhere](#) website for current Wi-Fi options on campus.

Connection Issues

If you experience connection issues with the Zoom class session, attempt to rejoin. If you are unable to resolve the issues, you may watch the recording of the class to see what you missed.

Zoom Classroom Etiquette

- **Mute Your Microphone:** To help keep background noise to a minimum, make sure you mute your microphone when you are not speaking.
- **Be Mindful of Background Noise and Distractions:** Find a quiet place to “attend” class, to the greatest extent possible.
 - Avoid video setups where people may be walking behind you, people talking/making noise, etc.
 - Avoid activities that could create additional noise, such as shuffling papers, listening to music in the background, etc.
- **Position Your Camera Properly:** Be sure your webcam is in a stable position and focused at eye level.
- **Limit Your Distractions/Avoid Multitasking:** You can make it easier to focus on the meeting by turning off notifications, closing or minimizing running apps, and putting your smartphone away (unless you are using it to access Zoom).
- **Use Appropriate Virtual Backgrounds:** If using a virtual background, it should be appropriate and professional and should NOT suggest or include content that is objectively offensive or demeaning.

Recording Zoom Classes

This course or portions of this course (i.e., lectures, discussions, student presentations) will be recorded for instructional or educational purposes. The recordings will only be shared with students enrolled in the class through Canvas. The recordings will be deleted at the end of the semester. If, however, you would prefer to remain anonymous during these recordings, then please speak with the instructor about possible accommodations (e.g., temporarily turning off identifying information from the Zoom session, including student name and picture, prior to recording).

Students are not allowed to record without instructor permission. Students are prohibited from recording class activities (including class lectures, office hours, advising sessions, etc.), distributing class recordings, or posting class recordings. Materials created by the instructor for the course (syllabi, lectures and lecture notes, presentations, etc.) are copyrighted by the instructor. This university policy (S12-7) is in place to protect the privacy of students in the course, as well as to maintain academic integrity through reducing the instances of cheating. Students who record, distribute, or post these materials will be referred to the Student Conduct and Ethical Development office. Unauthorized recording may violate university and state law. It is the responsibility of students that require special accommodations or assistive technology due to a disability to notify the instructor.

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Approximate Course Schedule

Course Schedule (*Tentative and subject to change. See CANVAS for updated schedule*)

Week	Topics
1	Introduction to aerospace engineering. Anatomy of airplanes and spacecraft.
2	Aerodynamics; lift and drag. Form, skin friction, vortex, and wave drag. Drag polars.
3	Airfoils and wings. High-lift systems.
4	Aerodynamic design of low and high-speed vehicles.
5	Airbreathing engines: internal combustion engines, propellers and rotors, turboprops, turbojets, turbofans, ramjets, scramjets.
6	Rocket engines: solid and liquid propellant; advanced propulsion concepts.
7	Airplane performance: takeoff, climb, maneuvering, absolute and service ceilings, cruise, range and endurance, gliding, loiter, landing.
8	Static and dynamic stability. Control of airplanes and spacecraft.
9	Airplane longitudinal, lateral, and directional stability.
10	Fatigue. Aerospace materials. Loads. Weight estimation.
11	Strength of materials; free body diagrams and equilibrium equations.
12	Importance of structural weight and integrity. Design of aircraft and spacecraft structures.
13	Earth and planetary entry.
14	Orbital maneuvers.
15	Hypersonic vehicles.
16	Review
17	Final Exam / Final Project Presentations