**San José State University**
**Aerospace Engineering Department**
**AE 100 - Fundamentals of Aerospace Engineering - Fall 2021**

**Course Info and Contact Information**

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| Instructor: | Emily Pippin |
| Email: | emily.pippin@sjsu.edu |
| Office Hours: | After class or by appointment |
| Class Days/Time: | MW 6:00 pm to 7:15 pm |
| Zoom Link: | https://sjsu.zoom.us/j/83623165876<br>Or Telephone:<br>Dial:<br>US: +1 669 900 6833 or +1 253 215 8782 or +1 346 248 7799 or +1 646 876 9923 or +1 301 715 8592 or +1 312 626 6799<br>Meeting ID: 836 2316 5876 |
| Prerequisites: | "C" or better in Math 30, Phys 50, Engr 10 |

**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.

**Texts/Readings**:
J.D. Anderson Jr., Introduction to Flight, 8th ed., McGraw Hill, 2015.
https://www.amazon.com/Introduction-Flight-John-Anderson-Jr/dp/0078027675/

Class notes

**Course Requirements and Assignments:**
In Class Problems and Homework: Problems will be given during class (workouts) and homework will be assigned with at least one weeks advance notice. Late assignments will receive ½ credit.

Midterm: One open note midterm exam will be given online during class time.

Final Examination or Final Project: Students must either take a final comprehensive exam OR submit a final project in place of the final exam. The 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 is related to aerospace. Students doing projects will give a presentation to the class and submit a written report.

**Grading Information**

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| In-Class Problems and Homework: | 40% (1/2 credit for late assignments) |
| Midterm: | 25% |
| Final Exam or Final Project: | 35% |

Grading Scale:

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| A+ | 100 to 97% | C+ | 79.9 to 77% |
| A | 96.9 to 93% | C | 76.9 to 73%; |
| A- | 92.9 to 90% | C- | 72.9 to 70% |
| B+ | 89.9 to 87% | D | 60 to 70% |
| B | 86.9 to 83%; | F | < 60% |
| B- | 82.9 to 80% | | |

**University Policies:**
Per University Policy S16-9 (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/

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**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. |
| 3 | Airfoils and wings. High-lift systems. |
| 4 | Aerodynamic design of low and high-speed vehicles. |
| 5 | Importance of structural weight and integrity. Design of aircraft and spacecraft structures. |
| 6 | Fatigue. Aerospace materials. Loads. Weight estimation. |
| 7 | Strength of materials; free body diagrams and equilibrium equations. |
| 8 | Static and dynamic stability. Control of airplanes and spacecraft. |
| 9 | Airplane longitudinal, lateral, and directional stability. |
| 10 | Airbreathing engines: internal combustion engines, propellers and rotors, turboprops, turbojets, turbofans, ramjets, scramjets. |
| 11 | Airbreathing engines: internal combustion engines, propellers and rotors, turboprops, turbojets, turbofans, ramjets, scramjets. |
| 12 | Airplane performance: takeoff, climb, maneuvering, absolute and service ceilings, cruise, range and endurance, gliding, loiter, landing. |
| 13 | Earth and planetary entry. |
| 14 | Orbital maneuvers. |
| 15 | Hypersonic Vehicles |

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| 16 | Review |
| 17 | Final Exam / Final Project Presentations |