

SAN JOSE STATE UNIVERSITY
Aerospace Engineering
AE112 Aerospace Structures I, Fall 2017

Course and Contact Information

Instructor: Dr. Lucia Capdevila
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Office Hours: MW 10:40 – 11:40 am

Teaching Assistant: Reine Ntone
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Office Hours: Fridays 3:00 – 4:00 pm (appointment needed)

Class Days/Time: MW 9:00 – 10:40 am
Classroom: Engineering 164
Prerequisites: Grade of “C” or better in Physics 50 and Math 32

Course Format

Course Description

Aircraft loads, V-n diagram; spacecraft boost loads. Free-body diagrams, 2-D and 3-D force and moment equilibrium. Centroid and area moment of inertia. Shear force and bending moment diagrams; cantilevered wings & internal support structures; stress/strain relationships; Mohr’s Circle.

Course Goals

1. To review vector algebra and develop the skills of creating a free-body diagram and performing a static equilibrium analysis.
2. To show the application of air loads, inertia loads, mass properties and materials to aircraft structural analysis and design.
3. To provide a fundamental knowledge of the principles of strength of materials.
4. To analyze aircraft and spacecraft structural members in tension, compression and torsion.
5. To calculate centroids and area (section) moments of inertia.
6. To become familiar with experimental strain measurement and its reconciliation with theoretical stress prediction.

Course Learning Outcomes

1. Estimate forces and moments applied over an aircraft’s flight envelope.
2. Create free-body diagrams of aircraft internal and external structure; solve with vector algebra.
3. Solve for forces and moments applied to typical internal aircraft members.
4. Estimate boost loads of launch vehicles; determine internal spacecraft reactions.

5. Calculate on-orbit loads of 3-D truss structure during burn maneuvers.
6. Construct shear force and bending moment diagrams for a cantilevered wing under constant and triangular distributed loads.
7. Learn the principles of strain gauge technology, application and use.
8. Compute area properties of two-dimensional wing and fuselage cross sections: centroid and moments/products of inertia.
9. Calculate shear stress and angle of twist along a shaft-type structure in torsion.
10. Draw Mohr's Circle and solve for the maximum principal stresses.

Required Texts: None

Textbooks: We'll be following these text in class

- Sheppard & Tongue: Statics, Analysis and Design of Systems in Equilibrium
- Gere & Goodno: Mechanics of Materials

Additional References:

- Bruhn: Analysis & Design of Flight Vehicle Structures
- Hibbeler: Mechanics of Materials
- Megson: Aircraft Structures for Engineering Students
- Mitiguy: Statics & Introduction to Solid Mechanics
- Niu: Airframe Structural Design: Practical Design Information and Data on Aircraft Structures
- Peery: Aircraft Structures

Course Requirements and Assignments

The assignments for this course consist of analytical and hardware lab problems.

More details can be found from [University Syllabus Policy S16-9](http://www.sjsu.edu/senate/docs/S16-9.pdf) at <http://www.sjsu.edu/senate/docs/S16-9.pdf>.

Late Assignment Policy

Late assignments are not accepted for credit. However, late assignments may receive feedback if submitted before grading has commenced.

Final Examination

A comprehensive written final exam will be given during the university's final exam week.

Grading Information

Grades are derived from homework problems and exams. Each homework problem is worth 10 points. Partial credit is assigned based on the demonstrated understanding of concepts and analytical/numerical results.

Determination of Grades

In-Class Workouts	4 %
Pop-Quizzes/Surveys	1 %
Analytical Problems (Homework)	15 %
Lab Problems	20 %
Two Hour Exams	40 %
Final Exam	20 %

Grading Specifics: 100 – 97% A+; 96 – 93% A; 92 – 90% A-; 89 – 85% B+; 84 – 80% B; 79 – 76% B-; 75 – 72% C+; 71 – 68% C; 67 – 64% C-; 63 – 61% D+; 60 – 57% D; 56 – 53% D-; < 53% F. All exams must be taken to receive a passing grade.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>

AE Department Policies <http://www.sjsu.edu/ae/programs/policies/>

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on my faculty web page at <http://www.sjsu.edu/people/firstname.lastname> and/or on [Canvas Learning Management System course login website](http://www.sjsu.edu/canvas) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](http://my.sjsu.edu) at <http://my.sjsu.edu> (or other communication system as indicated by the instructor) to learn of any updates.

**AE112 – Aerospace Structures I – Fall 2017
Approximate Weekly Schedule**

Week	Mon.	Content	Wed.	Content
1			8/23	Dimensions & Units, Vectors and Notation, Vector Basis and Reference Frames
2	8/28	Forces	8/30	Forces (continued)
3	9/4	NO CLASS - Labor Day Holiday	9/6	Moments
4	9/11	Moments (continued)	9/13	Free Body Diagrams
5	9/18	Equilibrium	9/20	Equilibrium (continued)
6	9/25	EXAM 1	9/27	Distributed Forces
7	10/2	Distributed Forces (continued)	10/4	Internal Loads in Frames, Machines and Trusses
8	10/9	Internal Loads in Frames, Machines and Trusses (continued)	10/11	Normal Stress and Strain
9	10/16	Hooke's Law and Poisson's Ratio	10/18	Shear Stress and Strain
10	10/23	Axially loaded members	10/25	Torsional deformation of a circular bar
11	10/30	Stress and Strain in Pure Shear	11/1	EXAM 2
12	11/6	Beams Loads and Reactions	11/8	Shear Force and Bending Moments
13	11/13	Shear-Force and Bending Moment Diagrams	11/15	Stresses in Beams
14	11/20	Stresses in Beams (continued)	11/22	NO CLASS - Thanks Giving Holiday
15	11/27	Principal Stresses	11/29	Mohr's Circle
16	12/4	Reconciling Strain Measurement with Stress Calculation in Lab Problems	12/6	Reconciling Strain Measurement with Stress Calculation in Lab Problems (continued)
17	12/11	Review	12/13	NO CLASS - Other Finals
18	12/18	7:15 - 9:30 FINAL EXAM		