San José State University
Aerospace Engineering
AE112, Aerospace Structures I, Fall 2019

Course and Contact Information

Instructor:	Maria Chierichetti
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Office Hours:	Monday 3:00-4:00PM, Tuesday 9:30-11:30AM or by appointment
Class Days/Time:	10:30AM-12:10PM
Classroom:	Boccardo Business center 004
Prerequisites:	Grade of "C" or better in Physics 50 and Math 32

Course Format

Service Learning (SL) Courses or Credit Bearing Internships

This class include a service learning component in the form of an outreach/community activity. More details about the service learning component will be described in the first few weeks of class. More details are available at the links below.

- Definition of Service Learning: Visit University Policy S02-3 on service learning: http://www.sjsu.edu/senate/docs/S02-3.pdf for definition and more information
- University Policy S16-14 on Internships, Service Learning, and Off-Campus Learning Experiences: http://www.sjsu.edu/senate/docs/S16-14.pdf

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Learning Management System. You are responsible for regularly checking with the messaging system through MySJSU on Spartan App Portal http://one.sjsu.edu (or other communication system as indicated by the instructor) to learn of any updates. Announcements are regularly posted on Canvas.

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. Experimental strain measurement.

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

Upon successful completion of this course, students will be able to:
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. Construct shear force and bending moment diagrams for a cantilevered wing under constant and triangular distributed loads.
5. Learn the principles of strain gage technology, application and use.
6. Compute area properties of two-dimensional wing and fuselage cross sections: centroid and moments/products of inertia.
7. Calculate shear stress and angle of twist along a shaft-type structure in torsion.
8. Draw Mohr's Circle and solve for the maximum principal stresses.
9. Work effectively in teams to design, carry out and analyze results from the Lab Problems.

Required Texts/Readings

Textbook

Beer and Johnston, Statics and mechanics of materials, ISBN 9781264026562

Other Readings

1. Bruhn: Analysis & Design of Flight Vehicle Structures
2. Hibbeler: Mechanics of Materials
3. Megson: Aircraft Structures for Engineering Students
4. Mitiguy: Statics & Introduction to Solid Mechanics
5. Niu: Airframe Structural Design: Practical Design Information and Data on Aircraft Structures
6. Peery: Aircraft Structures

Other technology requirements / equipment / material

Course Requirements and Assignments

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

Be mindful of the following University Policy S16-9
"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 practica. Other course structures will have equivalent workload expectations as described in the syllabus."

Final Examination or Evaluation

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

Grading Information

Grades are derived from homework problems, quizzes, lab reports, a service learning project, two midterms and a final exam. 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

Service learning project	10 %
Weekly Quizzes	15 %
Homework	10 %
Lab Problems	15 %
Midterm I	15 %
Midterm II	15 %
Final Exam	20 %

All exams must be taken to receive a passing grade

Grade	*Points*	*Percentage*
A plus	*960 to 1000*	*96 to 100%*
A	*930 to 959*	*93 to 95%*
A minus	*900 to 929*	*90 to 92%*
B plus	*860 to 899*	*86 to 89 %*
B	*830 to 829*	*83 to 85%*
B minus	*800 to 829*	*80 to 82%*
C plus	*760 to 799*	*76 to 79%*
C	*730 to 759*	*73 to 75%*
C minus	*700 to 729*	*70 to 72%*
D plus	*660 to 699*	*66 to 69%*
D	*630 to 659*	*63 to 65%*
D minus	*600 to 629*	*60 to 62%*

University Policies (Required)

University Policy S16-9 *(http://www.sjsu.edu/senate/docs/S16-9.pdf)*, relevant information about 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 http://www.sjsu.edu/ae/programs/policies/

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Tentative Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	08/21	Introduction, units, vector algebra (ch. 1, 2.1:2.3)
2	08/26	Equilibrium of forces in space (2.4-2.5)
2	08/28	Forces & moments / couples, equivalent loads (3.1:3.4)
3	09/02	NO CLASS – LABOR DAY
3	09/04	Free body diagrams
4	09/09	Equilibrium of rigid bodies (4.1:4.3)
4	09/11	Equilibrium of rigid bodies
5	09/16	Centroids (5.1-5.2-5.4-7.1-7.2)
5	09/18	Distributes forces (5.3) – V-n diagram
6	09/23	Loads on wings - 1 hour review
6	09/25	MIDTERM I
7	09/30	Analysis of trusses (6.1-6.2) ***Lab Problem 1: Strain Gage Seminar*** Mount strain gage, measure strain & calculate stress
7	10/02	Analysis of frames & machines (6.3-6.4)
8	10/07	Aircraft landing gear
8	10/09	Normal stress & strain (8.1:8.4)
9	10/14	Indeterminate structures (9.2) Poisson's ratio & Hooke's law (9.4-9.5)
9	10/16	Shear stress & strain (9.6)
10	10/21	Axial loading (9.7-9.8) ***Lab Problem 2:*** Measure Poisson's Ratio on Cantilever Beam
10	10/23	Torsion (10.1-10.2)
11	10/28	Beam: shear force and bending moment diagrams (12.1)
11	10/30	Beam: relation between bending and shear (12.2-12.3)
12	11/04	Review
12	11/06	MIDTERM II
13	11/11	NO CLASS – VETERANS DAY
13	11/13	Stresses in beams (13.1) ***Lab Problem 3:*** Determine thickness of torsional beam

Week	Date	Topics, Readings, Assignments, Deadlines
14	11/18	Stresses in beams (13.2-13.3)
14	11/20	Design approaches for aerospace structures
15	11/25	Principal stresses (14.1)
15	11/27	NO CLASS – THANKSGIVING HOLIDAYS
16	12/02	Mohr's circle (14.2)
16	12/04	Plane strains
17	12/09	review
Final Exam	12/12	9:45AM-12PM