San José State University
Aerospace Engineering
AE112 Aerospace Structural Analysis I, Fa11 2016

Instructor:	Dr. Boylan-Ashraf
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Office Hours:	Wednesday, 1:30-3:30 p.m.
Class Days/Time:	Monday & Wednesday / 11:00 a.m. – 12:40 p.m.
Classroom:	Engr. 164
Prerequisites:	MATH 133A and PHYS 050 (with a grade of C- or better in each course) or graduate standing. Co-requisite: MATE 25 and ENGR 100W

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 https://ae.sjsu.edu/profile/peggy-c-boylan-ashraf and/or on the Canvas Leaning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking with the messaging system through MySJSU at http://my.sjsu.edu.

Course Description

Introduction to aerospace structures through problem solving and experiments in fundamentals of equilibrium analysis, which leads to stress analysis –a highly essential component for failure prediction. All topics are applied to aerospace vehicles and will include aircraft and spacecraft loads, introduction to axial (compression and tensile), torsional, and flexural loadings; safety factor; and shear force-bending moment diagrams.

Course Goals

Introduce students to:

- *Equilibrium analysis of aerospace rigid bodies under various combinations of applied loads.*
- *Solid body mechanics.*
- *Fundamentals of stress analysis.*

Course Learning Outcomes (CLO)

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

1) *Analyze force and moment vectors by using appropriate coordinate systems and units.*
2) *Construct complete and correct free-body diagrams and develop equilibrium equations.*
3) *Calculate reactions of supports necessary to ensure static equilibrium of rigid bodies.*
4) *Explain the concept of and perform calculations for centroids and center of mass.*

5) *Analyze complex distributed loads, perform calculations of internal forces and moments, and draw shear force-bending moment diagrams.*
6) *Describe and perform stress, strain, and deformation calculations.*
7) *Analyze structures experiencing combined loads and characterize multiaxial stress states.*
8) *Construct stress states and perform calculations of principal stresses and maximum shear stress.*
9) *Analyze stresses and deflections of beam structures experiencing a combination of internal transverse shear and bending moment.*
10) *Classify types of loadings (axial, torsional, and flexural) on a solid aerospace structures.*

Course Relationship to BSAE Program Outcomes

	A	B	C	D	E	F	G	H	I
Learning Objectives									
1 – 5	++								
6	++	√		√					√
7 - 10	++								

\+ Skill level 1 or 2 in Bloom's Taxonomy
++ Skill level 3 or 4 in Bloom's Taxonomy
+++ Skill level 5 or 6 in Bloom's Taxonomy
√ Skill addressed but not assessed

Required Texts/Readings

Textbook

Riley, Sturges, and Morris: Statics and Mechanics of Materials (2nd). ISBN 10: 0471434469

Other Materials

Instructor Notes are posted on Canvas Learning Management System

Course Requirements and Assignments

Exams
There are 4 examinations (Examinations 1, 2, 3 and Final Examination) scattered throughout the semester. Make-up examinations will be given only for very unusual circumstances and/or approved medical excuses. For anticipated conflicts with a scheduled examination, you must contact your professor before the examination to try to arrange an alternate examination. All requests for make-up examinations must be submitted in writing and must include the reason for the request and a copy of your schedule of classes this semester.

Homework
While a correct answer is the goal of any problem solution, we are most interested in the path that you take to obtain the solution. When grading your homework, it is very important that all of your work is clearly described in your solution. In the case of an incorrect final answer, this can help your professor determine where the conceptual or computational error is in the solution. The important elements of a good problem-solving technique are:

1. Correct problem set-up.
2. Correct analysis.
3. Correct numbers and units.
4. Correct interpretation of the answer (both units and direction).

These are the elements that earn major credit.

Note: Neatness and completeness count! Analysis that cannot be understood, interpreted, or checked by others is of little or no value. For **all** work that is submitted for grading, if part of the work is missing, or if the work is incomplete; or if the work cannot be read; or if the work cannot be understood, you will get little or no partial credit.

Lab Experiment

Hooke's Law (TBA)

Final Examination and Evaluation

Final Examination: Wednesday, December 14, 2016 at 9:45 a.m. - 12 noon in Engr. 164.

Exam 1	21%
Exam 2	21%
Exam 3	21%
Final Exam	21%
Homework	12%

Grading Information

A	> 91%	C+	> 75%
A-	> 88%	C	> 70%
B+	> 85%	C-	> 68%
B	> 80%	D+	> 65%
B-	> 78%	F	< 60%

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 at http://www.sjsu.edu/gup/syllabusinfo/.

AE Department and SJSU policies are also posted at http://ae.sjsu.edu/program-policies.

Course Schedule

Week	Date	Topics
1	8/29 | 8/31	Forces Resultants | Rectangular vs. Non-Rectangular Components
2	**9/5** | 9/7	**NO CLASS (LABOR DAY)** | Particles: Equilibrium (2D)
3	9/12 | 9/14	Particles: Equilibrium (3D) | Moments (Characteristics), Moments (2D)
4	9/19 | 9/21	Moments (3D) | Couples
5	**9/26** | 9/28	**EXAM 1 |** Equivalent Force-Couple (2D)
6	10/3 | 10/5	Equivalent Force-Couple (3D) | Center of Mass, Centroids and Composite Bodies
7	10/10 | 10/12	Distributed Loads | Rigid Bodies: Free Body Diagram
8	10/17 | 10/19	Equilibrium (2D) | Equilibrium (3D)
9	10/24 | 10/26	Frames and Machines (spoilers, elevator bell crank mechanism) | Frames and Machines (conventional aircraft mechanical systems, aircraft control linkages, landing gear)
10	**10/31** | 11/2	**EXAM 2 |** Stress-Strain Concepts, Deformation (Hooke's Law experiment-TBA)
11	11/7 | 11/9	Thermal Effects, Safety Factor | Axial Loading (tensile and compression)
12	11/14 | 11/16	Torsional Loading | Stresses on Oblique Planes
13	11/21 | **11/23**	Flexural Loading | **NO CLASS (THANKSGIVING BREAK)**
14	11/28 | **11/30**	Second Moments, Elastic Flexural Formula | **EXAM 3**
15	12/5 | 12/7	V&M Diagram | General Combined Loading (rudder pedals, propeller shafts, cargo compartment)
16	12/12 | 12/14	Principal Stresses and Maximum Shear Stress | Mohr's Circle
Final Exam	**Wednesday, December 14**	**9:45 a.m. – 12:00 noon in Engr. 164**