

Syllabus for AERO 3323 – Aerospace Structures I Spring 2025

1.0 Overview

This 3-credit hour junior-level class is the first course in analysis and design of aerospace structures. Topics covered will include: Stress, Strain, Elasticity, Finite Element Methods, Energy and Energy Methods, Thin plates, and Buckling as applied to aerospace structures. This material forms a basis for the detailed analysis of aerospace structures and frames covered in Aerospace Structures II.

2.0 Course Information

Instructor: Dr. Jack Chessa

Email: jfchessa@utep.edu

Office Hours: TBD

Office: A-124 or via MS Teams (jfchessa@utep.edu)

Required Textbook: “Aircraft Structures for Engineering Students”, 4th edition, T.H.G. Megson, Butterworth-Heinemann

Reference Textbooks: “Aircraft Structures”, David Perry, Dover; “Mechanics of Aircraft Structures”, C.T. Sun, Wiley; “Understanding Aircraft Structures”, John Cutler, Blackwell Publishing.

Prerequisites: MECH 2332 - Mechanics of Materials

Meeting Times: LART 304 - TTH 12:00 -1:20

2.1 Course Delivery

This course will be delivered fully face-to-face. Class will be held at the assigned meeting times and attendance is required. The course material will be mostly on the MS Team for this class with the link given below (but you should have all received an invitation).

[MS Teams home page for class](#)

Most of the course material will be posted on the MS Teams page. Lecture notes will also be posted on the Teams page as well

[Lecture Notes \(Web view\)](#)

The latest lecture plan with the required readings, and homework problems will be given on the spreadsheet below on MS Teams

[Lecture Plan.xlsx](#)

2.2 Course Topics

See the Course Lecture Plan Document for details, but the general topics in this class are

- 1) Mathematical fundamentals
 - a) Vectors, Matrices and Tensors
 - b) Change of basis
 - c) Eigenvalue problem
- 2) Overview of aircraft structures
 - a) Truss designs,
 - b) Stressed skin designs
 - c) Monocoque designs
 - d) Materials and manufacturing
 - e) Nomenclature
- 3) Loads on air and space structures
 - a) Static loading
 - b) Dynamic loading
 - c) Safety factor and margin of safety (AIAA spec)
 - d) Load factor and V-n diagrams
- 4) Matrix Methods
 - a) Solution approach
 - b) Truss element
 - c) Beam element
- 5) Box design and optimization
- 6) Stress
 - a) Stress definition and representation
 - b) Change of basis
 - c) Stress on inclined plane
 - d) Mohr's circle
 - e) Principal stress
 - f) Hydrostatic and deviatoric stress
- 7) Strain
 - a) Strain kinematics
 - b) Change of basis
 - c) Mohr's circle for strain
 - d) Principal strain
 - e) Strain gage rosette and strain measurement
- 8) Elasticity
 - a) 3D Elasticity
 - b) Plane stress
 - c) Plane strain
 - d) Orthotropic plane stress (lamina)
- 9) Material failure
 - a) Tresca

- b) Mises
 - c) Composite failure
 - d) Fatigue
- 10) Energy Methods
- a) Strain energy
 - b) Virtual work
 - c) Energy methods, Castigliano's methods
- 11) Manufacturing
- a) Aircraft construction
 - b) Rivets and fasteners
 - c) Weld design

3.0 Grading

There will be two grading equations used to calculate two raw final grade scores. You will be given the higher of these two raw grades. The raw scores will be calculated as given in the table below

	Raw 1	Raw 2
In-class exams (3)	60%	30%
Quizzes and attendance	15%	20%
Project(s)	10%	25%
Homework	15%	25%

3.1 Exams

There will be three in class exams given during the semester with the third being given during the final. The final exam is not cumulative but has the same weight as the other exams.

3.2 Quizzes and Attendance

Attendance is required in this class. There will be unannounced short quizzes (approx. 15 minutes) periodically in class. The quiz material will be based on prior reading or homework. These are to be done individually, there will be no discussion between students on this.

3.3 Homework

Homework problems are due at the start of class. I may not always collect the homework, but if I do it is expected to be ready to hand in.

HOMEWORK MUST BE IN THE FORMAT ([Engineering Homework Format.docx](#)) as given on MS Teams. If homework is not in the format it will not be graded.

3.4 Projects

There will be one to two projects assigned in this class. These projects will be assigned, and a specific report format will be required. Typically these will involve a finite element computation either in Altair

Hyperworks/Optistruct or in Matlab.

5.0 Course Policies

Most of these course policies are consistent with the Mechanical Engineering standard course policies. Please read them carefully.

5.1 Academic Honesty

During exams and quizzes, you are not allowed to use any form of wifi-enabled electronic device, including cell phones or other electronic communication devices or methods (wristwatches, earbuds, etc.).

If you are suspected of scholastic dishonesty you may or may not be directly confronted about your conduct by the instructor or proctor. You will, however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam may not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes.

Scholastic dishonesty on homework, lab assignments, and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams.

5.2 Class Attendance Policy

Attendance is mandatory. Anyone with 5 or more absences will be dropped from the class. A drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid, and other programs.

As per UTEP rules, you may be asked to show a UTEP ID at any time during class. Anyone who is present and not registered in the class will be subject to disciplinary action unless the instructor gives prior approval.

5.3 Excused Absence for Exams

The UTEP catalog allows Exam Absence to be excused ONLY for university-recognized Activities and very specific other situations. Medical absence is NOT allowed in the UTEP catalog. For consistency with the catalog, students will NOT be excused from exams due to illness.

5.4 DSS

If you feel you may have a disability which will make it difficult for you to carry out the work as I have outlined and/or if you need special accommodations/assistance due to a disability, please contact the Center for Accommodations and Support Services (CASS) at 747-5148, go to Room 106E Union, or email cass@utep.edu.