

ASEN 3401 — Fall 2026

Aerospace Structures

Instructor: Prof. Mahmoud I. Hussein
Office:
Email: mih@colorado.edu
Instructor Office Hours: Wednesdays: 10:00–11:30

Teaching Fellows:

Teaching Fellows Office Hours: Wednesdays: 11:30–12:30 (AERO 302)
Wednesdays: 17:30–19:00 (Study Hall)
Thursdays: 15:00–16:00 (AERO 302)
Thursdays: 17:30–19:00 (Study Hall)

Lectures: Tuesdays and Thursdays, 16:00–17:15, AERO 120
Class website: Canvas, <https://canvas.colorado.edu/>
Texts: Hibbeler, R.C., *Mechanics of Materials*, 11th edition.
Lecture notes posted on Canvas.
Online discussion forum: Slack (to be set up)

Prerequisites

Requires prerequisite course ASEN 2401 (Introduction to Statics).

Course Objectives

The main objective of this course is to introduce students to the fundamentals of solid mechanics, building on the equilibrium and force-analysis foundation established in the prerequisite Statics course. Students will develop the ability to analyze stress, strain, and deformation in axially loaded, torsional, and bending members, including statically indeterminate configurations; to compute beam deflections using integration, superposition, and energy methods; to analyze combined-loading and multiaxial stress states using stress transformation techniques; to evaluate structural failure using appropriate failure criteria; and to design and evaluate aerospace structural members against strength, stiffness, and buckling requirements. These concepts are essential to the design and verification of advanced aerospace structures and systems.

Major Course Topics and Tentative Schedule

Week	Week Of	Topic
1	08/17/26	Course Introduction; Stress & Strain Fundamentals
2	08/24/26	Mechanical Properties of Materials; Shear Stress/Strain & General State of Stress

Week	Week Of	Topic
3	08/31/26	Axial Deformation Fundamentals & Design of Deformable Bodies; Axial Loading (Indeterminate, Trusses, Thermal Effects)
4	09/07/26	Torsion (Determinate): Torsion Formula & Polar Moment of Inertia; Angle of Twist & Power Transmission
5	09/14/26	Torsion (Indeterminate)
6	09/21/26	Bending: Flexural Stress; Transverse Shear Stress
7	09/28/26	Thin-Walled Pressure Vessels; Combined Loading; Exam 1
8	10/05/26	Stress Transformation: Principal Stresses
9	10/12/26	Mohr's Circle; Stress Concentrations in Design
10	10/19/26	Beam Deflections (Integration Method)
11	10/26/26	Beam Deflections (Superposition); Energy Methods (Strain Energy & Conservation of Energy)
12	11/02/26	Energy Methods (Virtual Work: Beams & Trusses); Exam 2
13	11/09/26	Failure Theories; Buckling (Euler's Critical Load)
14	11/16/26	Buckling (End Conditions, Design Curves, Column Design)
15	11/30/26	Design Examples; Comprehensive Review

Note: Weeks of 09/14 and 10/19 each include one of the two midterm exams; see Exam Times and Locations below. No class Thursday, 10/08/26 (Midsemester Reading Day). No class the week of 11/23 (Thanksgiving).

Coursework consists of reading assignments, homework, two midterm exams, and one final exam. Attendance at lectures is expected but not required. Exams cover all material including lectures and homework.

Reading Assignments

Reading assignments are to be completed before the corresponding lecture. The lecture should help clarify and supplement what students have read.

Homework

Homework assignments are given most weeks and are due approximately one week later, as specified in each assignment. No homework assignments are due in the week of a midterm exam. Assignments generally cover 3 to 5 problems and are designed to help students become proficient in a subject. Before doing any homework, students should read the posted lecture notes and try to follow the worked-out examples. This should give the student an idea of the principles involved and the solution method.

Written work should be neat and readable with adequate space and margins. Messy work will be left ungraded and a zero score recorded. The main and essential steps of the solution approach need to be shown; failing to do so will result in a lower score. The final result needs to be indicated by an arrow, underline, or box. Multiple answers when one is required will be counted as incorrect. Copying material from any resource (including solutions manuals, websites, and AI systems) and submitting it as one's own are considered plagiarism and are an Honor Code violation. Searching for help on a solution-repository website is also considered plagiarism.

Computer Use

Several assignments may require or benefit from computer access and basic programming skills in languages such as MATLAB and Excel. Students will have access to PILOT and co-PILOT computer resources to do computer work, once any required orientation has been completed.

Grading Guidelines

Component	Weight
In-class Quizzes	8%
Canvas Quizzes	8%
Homework	10%
Midterm Exam 1	22%
Midterm Exam 2	22%
Final Exam	30%
Total	100%

If the lowest midterm score (and only the lowest midterm score) is lower than the score of the final exam, that midterm grade is dropped, and the weighting of the final exam is increased by that percentage accordingly.

Notes

- Each homework assignment includes a set of several problems. The assignment is partially graded for completeness, while one randomly selected problem is graded in detail for technical content and presentation. Solutions for all homework problems will be posted after the due date. The homework assignments with the two lowest scores will be dropped. Homework needs to be turned in by the specified due date; late homework will not be accepted.
- Midterms cover material discussed in the weeks prior to the exam and are given at regular lecture hours in AERO 120. All midterm exams are closed-book, but a crib sheet is permitted; the maximum number of pages will be announced separately for each midterm. No makeup exams will be offered.
- The final exam spans the entire course, with additional emphasis on material covered since the last midterm, and is given in AERO 120 at specified time.
- All exam and homework scores and grades will be posted on Gradescope and need to be checked within two weeks after they are posted; requests to change a score need to be made within this period.
- Graded homework and midterms are returned via Gradescope (homework platform). Students should check each assignment for grading correctness and request a change of score if incorrect grading is found.

Letter Grading Scheme

Letter grades will be assigned as follows:

Letter Grade	Percent Grade	4.00 Scale
A	93.00–100.00	4.00
A-	90.00–92.99	3.67
B+	87.00–89.99	3.33
B	83.00–86.99	3.00
B-	80.00–82.99	2.67
C+	77.00–79.99	2.33
C	73.00–76.99	2.00
C-	70.00–72.99	1.67
D+	67.00–69.99	1.33
D	63.00–66.99	1.00
F	Below 63.00	0.00

Exam Times and Locations

- Midterm 1: Thursday, October 1, 2026, during lecture time, 16:00–17:15, AERO 120
- Midterm 2: Thursday, November 5, 2026, during lecture time, 16:00–17:15, AERO 120
- Final Exam: Thursday, December 10, 16:30–19:00, AERO 120

Course Policies and Procedures

1. The instructor and TAs will only reply to email questions during business hours (Monday through Friday, 8:00 am–5:00 pm). Emails received 24 hours or less before an assessment or any due date are not guaranteed a response.
2. The instructor may make changes to the weekly course schedule and this syllabus based on occurring events that require different dispositions. The instructor will give sufficient advance notice through in-class announcements and postings on Canvas. Both the syllabus and assignments will be dated.
3. This course uses Canvas to send out announcements, provide comments on class activities, and provide general information about course assignments. Students are strongly encouraged to set up notifications for new announcements and updates.
4. Homework needs to be uploaded to Gradescope (<https://www.gradescope.com/>). Students should create an account using their institutional email address.
5. No makeup exams, makeup homework, or makeup in-class activities will be offered. A zero score is recorded for each missed exam or homework assignment. Note that the two lowest homework assignment scores are dropped, as described above.
6. **Classroom Behavior:** Students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote, or online. Failure to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation,

gender identity, gender expression, veteran status, marital status, political affiliation, or political philosophy. For more information, see XXX (institution's classroom behavior policy and Student Code of Conduct).

7. **Public Health and Safety:** As a matter of public health and safety, all members of the university community and all visitors to campus must follow university, department, and building requirements and any public health guidance in place to reduce the risk of spreading infectious disease. If you are sick or required to isolate, please notify the instructor of your absence; you are not required to disclose the nature of your illness or condition.
8. **Accommodation for Disabilities:** If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to the instructor in a timely manner so that your needs can be addressed. Students should expect to receive accommodations for a timed assessment (e.g., an exam) only if the instructor receives the accommodation letter at least 5 business days before the assessment. If you have a temporary medical condition requiring accommodation, please notify the instructor as soon as possible.
9. **Preferred Student Names and Pronouns:** The university recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; in the absence of such updates, the name on the class roster is the student's legal name.
10. **Honor Code:** All students enrolled in a course at CU Boulder are responsible for knowing and adhering to the Honor Code. Violations may include but are not limited to plagiarism (including use of paper-writing services or AI systems), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, submitting the same or similar work in more than one course without permission, and aiding academic dishonesty. All incidents of academic misconduct will be reported to Student Conduct and Conflict Resolution: honor@colorado.edu, 303-492-5550. Students found responsible for violating the Honor Code will be assigned resolution outcomes as well as academic sanctions from the instructor.
11. **Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:** CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. University policy prohibits protected-class discrimination and harassment, sexual misconduct, intimate partner abuse, stalking, and related retaliation. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns; individuals who have been subjected to misconduct can contact that office for support and reporting options. Faculty and graduate instructors are required to inform that office when made aware of incidents related to these concerns, regardless of when or where they occurred, so that impacted individuals receive outreach about support resources.
12. **Religious Holidays:** Campus policy requires faculty to provide reasonable accommodations for students who, because of religious obligations, have conflicts with scheduled exams, assignments, or required attendance. Please communicate the need for a religious accommodation within the first two weeks of the semester so arrangements can be made.
13. **Mental Health and Wellness:** The university is committed to the well-being of all students. If you are struggling with personal stressors, mental health, or substance use concerns that are impacting academic or daily life, please contact Counseling and Psychiatric Services (CAPS)

located in C4C or call (303) 492-2277, 24/7.

Final Comments

The grading scheme in this course is not designed to reward or punish. It is designed to indicate a student's level of competency compared to the standards set by the department faculty: does the student meet the minimum level of competency, exceed it, or fall below it? The instructors use their education, experience, and interactions with industry, government laboratories, and academia to determine the content of these standards. Because this Aerospace Engineering program is accredited by ABET (Accreditation Board for Engineering and Technology), the curriculum meets that board's requirements.

The final grade indicates a student's readiness to continue to the next level of courses. In addition to technical competence, professionalism, initiative, and self-sufficiency are expected from students. Deadlines will be enforced to ensure fairness among students. Students are encouraged to attend office hours and receive all the help needed to complete assignments; however, they are expected to come with specific questions after having already attempted the assignment.

We understand that life happens. If you have an emergency (loss of job, sickness in family, mental health issues, or other unforeseen and significant difficulties), please let the instructor know as soon as possible, and we will figure something out together. Let's try to have the best semester possible.