ASEN 3712 – Spring 2025

Structures

Instructor: Maryam Shakiba
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Office Hours*:
* to discuss personal matters, students may request a one-to-one meeting with the instructor

Teaching Assistants:
Samantha Sheppard
Office hours:

Maxine Stoenescu
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Office hours:

Office hours compiled:

Lectures: Mondays and Wednesdays, 1:00 PM – 2:15 PM, AERO 120

Class website: CANVAS, https://canvas.colorado.edu/ , ASEN3712

Class e-mail list: Through Canvas only

Texts: Lecture notes are posted on Canvas

iClicker:

Online discussion forum: Slack

Note: All technical must be asked during office hours or posted on public channels in Slack first. The instructor and the TA/TFs will not reply to these questions over email or private messages on Slack and Canvas. Students are **strongly encouraged** to answer each other's questions. This is a great way to work together to solve problems, and not have to wait for an instructor or TA/TF response.

Prerequisites: Requires prerequisite courses of ASEN 2703 and APPM 2350 or MATH 2400 (all minimum grade C-). Restricted to Aerospace Engineering (ASEN) majors and IDEN majors with an Aerospace emphasis.

Course Objectives: The main objective of the course is to introduce modern structural analysis techniques based on understanding of the development of internal forces, stresses and deformations. These are essential to the design and verification of advanced aerospace structures and systems. The course offers an introduction to matrix and finite element methods for skeletal (truss and frame) structures, as well as to fundamental concepts in energy methods and structural stability.

Major Course Topics and Schedule:

Week	Topic	Week of
1	Stress and Strain	1/13/25
2	Stress and Strain – Material laws	1/20/25
3	Material laws – 2D Elasticity	1/27/25
4	Stress Transformation – Pressure Vessels	2/3/25
5	Torsion	2/10/25
6	Torsion	2/17/25
7	Torsion - Energy Methods	2/24/25
8	Energy Methods	3/3/25
9	Energy Methods - Finite Element Method	3/10/25
10	Finite Element Method	3/17/25
11	SPRING BREAK	3/24/25
12	Finite Element Method	3/31/25
13	Stability of Structures	4/7/25
14	Stability of Structures	4/14/25
15	Stability of Structures	4/21/25
16	Design Problems	4/28/25

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

Reading Assignments: Reading assignments are to be completed before the lecture/discussion. In-class clicker quizzes will often test material assigned as reading. The lecture/discussions should help to clarify and supplement what students have read.

Homework: Homework assignments are given most weeks on Wednesday and are due a week later, as specified in the assignment. No homework assignments are due in the week of midterm exams. 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 lectures and try to follow 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 in 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 the PILOT and co-PILOT computers to do computer work, once they have completed the PILOT orientation.

Grading Guidelines:

In-class quizzes	6%
Canvas quizzes	6%
Homework	10%
2 midterm exams	48% (24% each)
Final Exam	30%
	100%

* If the lowest midterm score (and only the lowest midterm score) are lower than the score of the final exam, that midterm grade is dropped, and the weighting of the final is increased by 24% respectively.

Notes:

- In-class quizzes gauge the student's level of preparation for lecture and the conceptual understanding of course material. They will measure a combination of participation and accuracy in the answers. No makeup quizzes are offered, but up to 10% of the missed points will be dropped.

- Canvas quizzes gauge the student's understanding of basic concepts. They can be taken as many times as wanted; only the highest score will be considered.

- Each homework assignment includes a set of several problems. The assignment is partially graded for completeness (25pts), while one randomly selected problem is graded in detail for technical content and presentation (25pts). Thus, the final score for each homework set is out of a total of 50pts and computed based upon the numeric breakdown below:

$$HW\frac{Score}{50} = 30pts\ (Rand.Problem) + 20pts \times \frac{\#\ of\ Remaining\ Problems\ Completed}{\#\ of\ Remaining\ Problems\ in\ Set}$$

  Solutions for all homework problems will be posted on CANVAS after the due date. The homework assignments with the two lowest scores will be dropped. Homework needs to be turned in by a specified due date. All homework should be submitted electronically via Gradescope; see information below. Late homework will not be accepted.

- Midterms cover material discussed in the weeks prior to the exam. They provide a gauge to determine what an individual student has learned. The midterm exams 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 of the crib sheet will be announced separately for each midterm. **No makeup exams will be offered.**
- The final exam spans the entire course but with additional emphasis on material covered since the last midterm.
- All your scores and grades will be posted on CANVAS and need to be checked within **2 weeks** after they are posted; requests to change a score on CANVAS need to be made within this period. These requests must be made directly in Gradescope.
- Graded homework is returned via Gradescope; see information below. Students should check the assignment for grading correctness and request a change of score via Gradescope if incorrect grading is found.
- Midterms will be scanned and added to Gradescope. Students can request to have the paper version of the exam returned. Once they are returned, only the scanned version will be used for grading.
- About Gradescope: Students will receive an email to sign up. Students will need to upload their assignment. In case of hand-written assignments, students can use a smartphone or use scanners at the CU library. Should a student not have access to either, please, contact the instructor within the first two weeks of the semester. Instructions on how to upload assignments can be found at help.gradescope.com.
  Instructions on uploading assignments can be found at:
  https://www.youtube.com/watch?v=KMPoby5g_nE.
  Instructions on viewing scores and feedback after an assignment is graded can be found at: https://www.youtube.com/watch?time_continue=2&v=TOHCkI12mh0.

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 – 69.00	1.33
D	63.00 – 66.99	1.00
F	Below 63.00	0.00

Exam Times and Locations:

- Midterm 1: Monday, February 17th, during lecture time at AERO 120
- Midterm 2: Monday, April 7th, during lecture time at AERO 120
- Final exam*: Monday, May 5th, 7:30 pm to 10:00 pm

  * date is not confirmed yet by CU campus and may change.

Course Policies and Procedures:

1. The instructor and TAs/TFs reserve the right to reply to email questions only in business hours, i.e. Monday through Friday, 8:00 am – 5:00 pm. Emails received 24 hours or less before the assessments or any due dates are not guaranteed to be responded to.
2. The instructor reserves the right to make changes to the weekly course schedule and the syllabus based on occurring events that require different dispositions. The instructor will give sufficient advanced notice through announcements in class and posting on CANVAS. Changes to this syllabus and assignments may be announced at any time during class periods. The instructor will post the current syllabus and assignments on CANVAS. Both are dated in the footnote.
3. This course exclusively uses CANVAS to send out announcements, to provide comments to students daily on class activities, and to provide general information about course assignments. It is **strongly recommended** that all students set up their CANVAS account such that they automatically receive a notification about new announcements and updates to the CANVAS course page.
4. Homework and lab reports need to be uploaded to Gradescope (https://www.gradescope.com/). Students should create an account on Gradescope using the CU Boulder email address.
5. No makeup exams, makeup homework, and makeup in-class activities will be offered. A zero-score is recorded for each missed exam, in-class activity, and homework. Note that the two lowest in-class activities and the two lowest homework assignments with the lowest scores are dropped.
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 the classroom behavior policy, the Student Code of Conduct, Office of Institutional Equity and Compliance.
7. **Requirements for Infectious Diseases**: As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. CU Boulder currently requires COVID-19 vaccination and boosters for all faculty, staff and students. Students, faculty and staff must upload proof of vaccination and boosters or file for an exemption based on medical, ethical or moral grounds through the MyCUHealth portal.

   The CU Boulder campus is currently mask-optional. However, if public health conditions change and masks are again required in classrooms, students who fail to adhere to masking requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with

these requirements will be referred to Student Conduct and Conflict Resolution. For more information, see the policy on classroom behavior and the Student Code of Conduct. If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the Public Health Office (contacttracing@colorado.edu). In this class, if you are sick or quarantined, please, alert the instructor about your absence due to illness or quarantine. Please, note there is no need to state the nature of their illness. In this class, if you are sick or quarantined, please, alert the instructor about your absence due to illness or quarantine. Please, note there is no need to state the nature of their illness.

8. **Accommodation for Disabilities**: If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. **Students should expect to receive accommodations for a timed assessment (e.g., exam) only if their faculty instructor(s) receive the student's accommodations letter at least 5 business days before the assessment, as a departmental policy, in order to facilitate administering the assessment.** Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the Disability Services website. Contact Disability Services at 303-492-8671 or DSinfo@colorado.edu for further assistance. If you have a temporary medical condition, see Temporary Medical Conditions on the Disability Services website. If you have a temporary medical condition or required medical isolation for which you require accommodation, please notify the instructor as soon as possible so that appropriate accommodations can be made. If you are sick or require isolation please notify the instructor of your absence from in-person activities and continue in a completely remote mode, as you are able, until you are allowed or able to return to campus. Please note that for health privacy reasons you are not required to disclose to the instructor the nature of your illness or condition, however you are welcome to share information you feel necessary to protect the health and safety of others within the course.
9. **Preferred Student Names and Pronouns**: CU Boulder 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; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.
10. **Honor Code:** All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code. Violations of the Honor Code may include but are not limited to: plagiarism (including use of paper writing services or technology [such as essay bots]), cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. Understanding the course's syllabus is a vital part in adhering to the Honor Code.

    All incidents of academic misconduct will be reported to Student Conduct & Conflict Resolution: StudentConduct@colorado.edu. Students found responsible for violating the Honor Code will be

assigned resolution outcomes from the Student Conduct & Conflict Resolution as well as be subject to academic sanctions from the faculty member. Visit Honor Code for more information on the academic integrity policy.

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 (harassment, exploitation, and assault), intimate partner abuse (dating or domestic violence), stalking, and related retaliation by or against members of our community on- and off-campus. The Office of Institutional Equity and Compliance (OIEC) addresses these concerns, and individuals who have been subjected to misconduct can contact OIEC at 303-492-2127 or email CUreport@colorado.edu. Information about university policies, reporting options, and OIEC support resources including confidential services can be found on the OIEC website.

    Please know that faculty and graduate instructors are required to inform OIEC when they are made aware of incidents related to these concerns regardless of when or where something occurred. This is to ensure that individuals impacted receive outreach from OIEC about their options and support resources. To learn more about reporting and support for a variety of concerns, visit the Don't Ignore It page.

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 in a timely manner. In this class, you must let the instructor know of any such conflicts within the first two weeks of the semester so that they can work with you to make reasonable arrangements. See the campus policy regarding religious observances for full details.

13. **Mental Health and Wellness**. The University of Colorado Boulder 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.

    Free and unlimited telehealth is also available through Academic Live Care. The Academic Live Care site also provides information about additional wellness services on campus that are available to students.

Final Comments

The grading scheme in this course is not assigned to reward or punish. It is designed to indicate the student's level of competency compared to the standards set by the AES faculty. Does the student meet the minimum level of competency? Does the student exceed the minimum? Is the student below the minimum? This should be indicated by the final grade. The instructors are professionals and it is their job to set and maintain standards. The instructors are expected to use their education, experience, and interactions with industry, government laboratories, others in academia, etc., to determine the content of these standards. Because the CU Aerospace Engineering program is accredited by ABET (Accreditation Board for Engineering and Technology), the AES curriculum meets that board's requirements. As with

any other professionals (doctors, lawyers, etc.) the students must trust that the instructors know what they are doing and that they are obliged to uphold standards.

The final grade indicates the student's readiness to continue to the next level of courses. Meeting the minimum requirements indicates that the student is prepared to continue at least at the minimum level required for the next in the sequence of courses. Exceeding the minimum means the student is ready to enter the next course and that the student has mastery of material beyond the minimum, i.e., the student shows some level of proficiency.

In addition to technical competence, professionalism, initiative, and self-sufficiency are expected from students. Deadlines (for assignments, for regrading requests, to give notice of conflicts) will be enforced, if nothing else to ensure fairness among students. Students are encouraged to attend office hours and receive all the help needed to complete assignments; however, they will be expected to come with specific questions after having already attempted to solve the assignments.

However.

We understand that life happens. If you have an emergency (loss of job, sickness in family, mental health issues, other unforeseen and significant difficulties), please let the instructors know as soon as possible.

Even if you are just overwhelmed by your life situation, please let us know as soon as possible. We expect professional, serious, focused students, not robots. But we can only help you if you give us enough warning, and we can act when it is still possible to do so (not, say, after the solution for an assignment is posted). So, if something happens, let us know, and we will figure something out.

Let's try to have the best semester possible.