

ASEN 3112 – Fall 2021

Structures

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Office Hours*: Tuesday 8:30 AM – 9:30 AM, AERO 303

* to discuss personal matters, students may request a one-to-one meeting with the instructor

Laboratory Coordinator: Katie Rae Williamson
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Teaching Assistants:

Ishaan Kochhar	isko2695@colorado.edu
Office hours:	Thursday 5:00 PM – 6:00 PM, AERO 302 Friday 10:00 AM – 11:00 AM, Zoom
Clara Bader	clara.bader@colorado.edu
Office hours:	Tuesday 4:00 PM – 6:00 PM, AERO 302 and Zoom
Chandra Prakash	chandra.prakash@colorado.edu
Office hours:	Wednesday 10:00 AM – 11:00, Zoom Friday 5:00 PM – 6:00 PM, Zoom
Peter DiCerbo	peter.dicerbo@colorado.edu
Office hours:	Monday 10:00 AM – 11:00 AM, AERO 302 Monday 5:45 PM – 6:45 PM, AERO 302

Laboratory Assistants: Gerald Yoho Gerald.Yoho@colorado.edu

Office hours compiled: Monday 10:00 AM – 11:00 AM, AERO 302
Monday 5:45 PM – 6:45 PM, AERO 302
Tuesdays 8:30 AM – 9:30 AM, AERO 303
Tuesday 5:00 PM – 6:00 PM, AERO 302
Wednesday 10:00 AM – 11:00, Zoom
Wednesday 6:00 PM – 7:00 PM, AERO Zoom
Thursday 5:00 PM – 6:00 PM, AERO 302
Friday 10:00 AM – 11:00 AM, Zoom
Friday 5:00 PM – 6:00 PM, Zoom

Lectures: M/W/F: 02:20 PM – 3:10 PM, AERO 120

Recitations & Labs: Section 011 TH: 12:50 PM - 02:40 PM, AERO N100
Section 012 TH: 3:00 PM - 04:50 PM, AERO N100

Zoom link:

Class website: CANVAS, <https://canvas.colorado.edu/>, ASEN3112

Class e-mail list: Through Canvas only

Online discussion forum:

Note: All technical questions about homework assignments, lab assignments, etc., must be 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.

Texts: Lecture notes are posted on Canvas

Prerequisites: ASEN 2001-2003-2004 and APPM 2360, with grades of C or better in each; if course was taken Spring 2020: with grades of C- (P+) or better in each

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 mechanical vibrations, structural dynamics, and structural stability.

Major Course Topics and Schedule:

Week	Topic
1	Stress and Strain
2	Stress and Strain – Material laws
3	Material laws – 2D Elasticity
4	Stress Transformation – Pressure Vessels
5	Torsion

6	Energy Methods
7	Energy Methods
8	Finite Element Method
9	Finite Element Method
10	Finite Element Method – Structural Dynamics and Vibration
11	Structural Dynamics and Vibration
12	Structural Dynamics and Vibration
13	Structural Dynamics and Vibration – Stability of Structures
14	Fall Break
15	Stability of Structures – Design Problems
16	Design Problems

Coursework consists of reading assignments, in-class clicker quizzes, homework, recitations, experimental/ computer labs, three midterm exams, and one final exam. Attendance to recitation is expected; **attendance to labs is mandatory**. Exams cover all material including lectures, recitations, laboratory work and homework.

Recitations: Recitations are offered on Thursdays in AERO N100, in two sections of 1 hr. 50 min each. The main objective is to review material covered during the week, especially that helpful for the currently assigned homework. Recitations may also include additional exercise material, not covered in class, useful for midterm exam preparation. Recitations are replaced by lab demos (conducted at the same time, also in AERO N100, unless another location is announced) prior to laboratory and/or computer group work.

Reading Assignments: Reading assignments are to be completed before the lecture/discussion. 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 returned 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) and submitting it as one's own are considered plagiarism and are an Honor Code violation.

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Labs: Safety is the first priority for lab work involving experiments or use of computers. If students have not done so, they are required to complete the Pilot Tour Canvas Guide. Contact the Laboratory

Coordinator if you have trouble completing the guide. Anyone violating rules of safe conduct may be restricted from accessing the co-PILOT facilities. The four experimental labs are carried out in groups of varying size. The groups are created randomly among student of the same lab section. Attendance is mandatory; missing part of a lab (demo, experiment) without cause or notification results in 50% of the student's report score being deducted. A student should contact the instructor in advance if the student cannot make attend part of a lab to make appropriate arrangements (see also section on Course Policies and Procedures).

Computer Use: Several assignments and labs may require computer access and basic programming skills in languages such as MATLAB and Excel. As part of the introduction to finite element methods the use of the commercial FEM package ANSYS is taught for the computer component of Lab 2. Students will have access to the PILOT and co-PILOT computers to do computer work, once they have completed the PILOT orientation.

Grading Guidelines:

Group work: *	4 Lab reports	25% (= 5% + 10% + 5% + 5%)
Individual:	Clicker Quizzes	10%
	Homework	15%
	3 Midterm Exams	30% (= 3 times 10%)
	Final Exam	20%
		100%

*Group work only counts toward final grade if the total individual grade is C or better. If the individual grade is below C, the final grade equals the total individual grade.

If the score of any of the 3 midterm exams is lower than the score of the final exam, the midterm grade is dropped, and the weighting of the final is increased by 10% for each dropped midterm.

Notes:

- Clicker quizzes gauge the student's level of preparation of a lecture and the conceptual understanding of course material. Up to 10% of missed clicker questions will be dropped. The quiz questions are discussed after the quiz during the lecture. No makeup quizzes are offered.
- Each homework assignment includes a set of several problems. The assignment is partially graded for completeness (20pts), while one randomly selected problem is graded in detail for technical content and presentation (30pts). 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 are posted on CANVAS after the due date. The homework assignments with the two lowest scores are 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 third 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 in email to the instructor. The subject line of the email should read:

ASEN 3112 - Request for score change for <exam/lab/homework> <Id>

- Graded homework and lab reports are 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 are returned during recitations and office hours. Students can check the assignment for grading correctness during these times and request a change of score if incorrect grading is found. Once a graded assignment is taken outside the recitation class room (co-PILOT) or the room used for office hours, no change of score can be requested.
- 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: Friday, September 24nd, during lecture time
- Midterm 2: Monday, October 18th, during lecture time
- Midterm 3: Wednesday, November 17th, during lecture time
- Final exam*: Tuesday, December 14, 4:30 PM – 7 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 exams 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 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. Lecture and lab quizzes are administered directly via CANVAS.
5. No makeup lecture quizzes, makeup homework, and makeup exams will be offered. A zero-score is recorded for each missed lecture quiz, homework, and exam. Note that the two lecture quizzes and homework assignments with the lowest scores are dropped. If the score of a midterm exam is lower than the one of the final, the midterm is automatically dropped and the weighting on the final is increased by 10%.
6. **Classroom Behavior:** Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail

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, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](#) and the [Student Conduct & Conflict Resolution policies](#).

- 7. Requirements for COVID-19:** As a matter of public health and safety due to the pandemic, 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. Students who fail to adhere to these 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.

As of Aug. 13, 2021, CU Boulder has returned to requiring masks in classrooms and laboratories regardless of vaccination status. This requirement is a temporary precaution during the delta surge to supplement CU Boulder’s COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If you qualify for a mask-related accommodation, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose.

Students who have tested positive for COVID-19, have symptoms of COVID-19, or have had close contact with someone who has tested positive for or had symptoms of COVID-19 must stay home. 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. 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
- 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 instructor' 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 academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, 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. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu); 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the [Honor Code website](#).

- 11. Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:** The University of Colorado Boulder (CU Boulder) is committed to fostering an inclusive and welcoming learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about OIEC, university policies, [reporting options](#), and the campus resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options.

- 12. Religious Holidays:** Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, students must let the instructor know of any such conflicts within the first two weeks of the semester so that reasonable arrangements can be worked out. See the [campus policy regarding religious observances](#) for full details.

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 academe, 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.

I understand that life happens, particularly during a pandemic, which will certainly still apply to the Fall of 2021. If you have an emergency (loss of job, sickness in family, mental health issues, unforeseen COVID related difficulties), please let the instructor know as soon as possible. Even if you are just overwhelmed by your life situation, please let me know as soon as possible. I expect professional, serious, focused students, not robots. But I can only help you if you give me enough warning, and we can take action when it is still possible to do so (not, say, after the solution for an assignment is posted). So, if something happens, let me know, and we will figure something out.

Let's try to have the best semester possible.