

Structural Dynamics

[Time] Tues. and Thurs. 9:30-10:45 am

[Location] ECCE 1B52

[Instructor] Professor Abbie Liel

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[Office Hours] Mon./Wed. 2:30–3:30 PM. For other times, please make an appointment.



[Other] Homework assignments, solutions and other course documents will be available on CULearn. Check your email for updates on course schedule and assignments.

Course Description and Objectives

By the completion of this course you should be able to:

- (1) Describe underlying assumptions in dynamic analysis and idealize (model) structures and loading for the purpose of analysis.
- (2) Apply the basic theory of analysis of structures subject to time dependent (dynamic) loads to analyze dynamic response of linear and nonlinear single degree of freedom structures and multiple degree of freedom structures to predict displacement response as a function of time.
- (3) Create Matlab programs that implement numerical analysis methods for structural analysis.
- (4) Characterize types of dynamic loading that impact civil engineering structures and their influence on structural behavior and damage.

Prerequisites

Structural Analysis (CVEN 3525 or equivalent)

Mechanics of Materials I (CVEN 3161 or equivalent)

You also need a basic understanding of differential equations and matrix methods of structural analysis. If you are uncomfortable with these topics, you should review early in the semester.

Course Requirements and Assessment

The lectures, homework assignments, presentation and exams will explore the important aspects of dynamic loading, their effects on structures and appropriate mathematical solution methods. In-class time will be spent in lectures, problem solving and discussion. Attendance is critical for developing understanding and skills needed for homework assignments and exams.

Your grade in this course will be weighted as shown for a total of 100%:

- Weekly homework assignments and laboratory reports [25%]
- Exams – Midterm [25%] and Final [35%]
- In-class presentation and report [15%]

The grading scale is not curved and will be taken as follows -- A: 90 to 100%, B: 80 to 89.9%, C: 70 to 79.9%, D: 60 to 69.9%, F: 59.9% and below.

Exams

The midterm exam is scheduled to be held in class on **Tuesday March 1**. The final exam is scheduled for **Wednesday May 4** from 4:30 to 7:00 PM. Keep these times free. Alternate exam times will be available only under extraordinary circumstances. All exams will have a conceptual (closed book) section and a computational (open book, open notes) section.

Homework Assignments

You have the choice of submitting your assignment individually or in groups of 2. No late homeworks will be accepted. Homework assignments will be graded as $\checkmark+$ (work is complete and accurate), \checkmark (work is complete and mostly correct), $\checkmark-$ (work is incomplete or has significant errors).

Laboratory Assignments

We will be conducting doing some laboratory work in ITLL throughout the semester. Each time, you will be asked to submit a laboratory report. These reports are graded on a 100 pt. scale. In order to access the ITLL computer systems, you will need to take a short orientation by the ITLL tech staff. These orientation sessions meet every day at 5:05pm and last 15-20 minutes. Please plan to take the ITLL orientation within the first three weeks of the semester.

Textbook

Chopra, Dynamics of Structures, 3rd Edition, Pearson/Prentice Hall, 2007. *Required*. Other editions are ok, but page and problem numbering may differ.

Course Schedule

<i>Topic</i>	<i>Description</i>	<i>Reading</i>
1	Equation of motion for SDOF systems	Chp. 1
2	Free vibration analysis	Chp. 2
3	Harmonic loads	Chp. 3
4	Periodic and general loads	Chp.4
5	Numerical methods	Chp. 5
6	Response spectra	Chp. 6
7	SDOF response of nonlinear systems	Chp. 7
7	Equations of motion for MDOF systems	Chp. 8,9
8	Vibration of undamped MDOF systems	Chp. 10-11
9	Vibration of damped MDOF systems	Chp. 10-12
10	MDOF response time history analysis	Chp. 13
11	MDOF response spectra analysis	Chp. 13

We will also be examining earthquake loading wind loading, blast loading, traffic loading and wave/hydraulic loading at various times throughout the semester.

Comments

I am always happy to meet with you to discuss your progress in the course or suggestions for how the class can be improved. Please feel free to stop by during office hours or to schedule an alternative appointment. Also, be sure to speak up in class if you have questions or you think I've made a mistake – it is likely someone else has the same question!

Other Policies

- (1) If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322 and www.colorado.edu/disabilityservices.
- (2) Campus policy regarding religious observances requires that faculty make every effort to reasonably and fairly deal with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. If you have a concern regarding any activity in this class, please notify me early in the semester so that we can make alternative arrangements.
- (3) All students at the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at <http://www.colorado.edu/policies/honor.html>. The bottom line is that your work (your calculations, your writing, etc.) should represent **your own work** and not borrow language from anyone else without proper citation.
- (4) The University of Colorado at Boulder policy on Discrimination and Harassment (<http://www.colorado.edu/policies/discrimination.html>), Sexual Harassment and Amorous Relationships applies to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based on race, color, national origin, sex, age, disability, sexual orientation or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at <http://www.colorado.edu/odh>.