

CIVENV 320 Structural Analysis - Dynamics (Fall 2022)
COURSE SYLLABUS

Instructor : Prof. Sinan Keten
Email : s-keten@northwestern.edu (typical response within hours)
Office : TECH A133
Office Hours : Walk-in, after class, or by appointment. (Zoom or In Person)
Phone : (847)-491-5282
Class Times and Location : MW 2pm-3:20pm Tech L158

Course Outcomes At the conclusion of the course, students will be able to:

- Describe the behavior of single and multiple degree of freedom dynamic systems
- Construct and interpret response spectra for dynamic structural behavior
- Complete a limited structural design to resist earthquake loads using the equivalent force method

Prerequisites CIV_ENV 216 & 221 or equivalent. CIV_ENV 325 or 323 recommended.

Grading **Homework 10%**
There will be approximately eight homework assignments over the course of the quarter, due a week after assignment. No due date extensions will be offered, however, the lowest homework assignment score will be dropped from the homework grade.

Midterm Exam 25%

Midterm will be administered during class time tentatively on 10/19/21.

Project Reports 30%

Approximately 3 individual or team projects focusing on programming with Python (Matlab or other languages also accepted) and dynamical analysis will be given.

Final Exam 30%

Final Exam date and time TBD (will appear on CAESAR).

Teamwork and Participation 5%

Instructor's assessment of your participation in class and contribution to team products

Homework

- Solutions to the HW will be posted on Canvas after the due date.
- Homework will not be accepted after the due date.
- Lowest HW score will be dropped.
- HWs will be submitted and graded online via Canvas.
- Please show your work and present it neatly.

Website I will be using Canvas for announcements, updates, and to post grades and HW solutions. Please check Canvas daily to stay up to date, and to confirm accuracy of grade records. We will utilize **Modules** on Canvas for categorizing materials.

Textbook Required: Anil K. Chopra (2017); Dynamics of Structures: Theory and Applications to Earthquake Engineering; 5th Edition; Pearson Prentice Hall, Inc.
Optional: ASCE 7-10 Minimum Design Loads for Buildings and Other Structures.

Tentative Course Schedule

COURSE OUTLINE	Date		Topics	Readings (Chopra)
WEEK 1	NO CLASS	9/21/22	Fundamentals of Dynamics	Ch. 1.1 to 1.6
WEEK 2	9/26/22	9/28/22	Free Vibration, Damping	Ch. 2.1 to 2.2
WEEK 3	10/3/22	10/5/22	Generalized SDOF Systems	Ch. 8.1 to 8.6
WEEK 4	10/10/22	10/12/22	Forced Harmonic Vibrations, Ground Motion	Ch. 3.1 to 3.6
WEEK 5	10/17/22	10/19/22	Arbitrary and Pulse Excitations, MIDTERM	Ch. 4.1 to 4.12
WEEK 6	10/24/22	10/26/22	Numerical Analysis	Ch. 5.1 to 5.7
WEEK 7	10/31/22	11/2/22	Earthquake Analysis and Seismic Design	Ch. 6, Ch. 7.1 to 7.8, ASCE 7 (provided)
WEEK 8	11/7/22	11/9/22	Multiple DOF Systems and Modal Analysis	Ch. 9.1 to 9.3, Ch. 10.1 to 10.7
WEEK 9	11/14/22	11/16/22	Damping and Response Multiple DOF Systems	Ch. 11.1 - 11.4, Ch 12.1-12.11
WEEK 10	11/21/22	11/23/22	EQ Response of MDOF Systems	Ch. 13.1, 13.2
WEEK 11	11/28/22	11/30/22	Seismic Design, EQ Response, Final Review	Ch. 13.6 to 13.8

Accessibility Statement

Northwestern University is committed to providing the most accessible learning environment as possible for students with disabilities. Should you anticipate or experience disability-related barriers in the academic setting, please contact AccessibleNU to move forward with the university's established accommodation process (e: accessiblenu@northwestern.edu; p: 847-467-5530). If you already have established accommodations with AccessibleNU, please let me know as soon as possible, preferably within the first two weeks of the term, so we can work together to implement your disability accommodations. Disability information, including academic accommodations, is confidential under the Family Educational Rights and Privacy Act.

Academic Integrity Statement

Students in this course are required to comply with the policies found in the booklet, "Academic Integrity at Northwestern University: A Basic Guide". All papers submitted for credit in this course must be submitted electronically unless otherwise instructed by the professor. Your written work may be tested for plagiarized content. For details regarding academic integrity at Northwestern or to download the guide, visit: <https://www.northwestern.edu/provost/policies-procedures/academic-integrity/index.html>

COVID-19 Classroom Expectations Statement

Students, faculty and staff must comply with University expectations regarding appropriate classroom behavior, including those outlined below and in the [COVID-19 Expectations for Students](#). With respect to classroom procedures, this includes:

- Policies regarding masking, social distancing and other public health measures evolve as the situation changes. Students are responsible for understanding and complying with current University, state and city requirements.
- In some classes, masking and/or social distancing may be required as a result of an Americans with Disabilities Act (ADA) accommodation for the instructor or a student in the class even when not generally required on campus. In such cases, the instructor will notify the class.

If a student fails to comply with the [COVID-19 Expectations for Students](#) or other University expectations related to COVID-19, the instructor may ask the student to leave the class. The instructor is asked to report the incident to the Office of Community Standards for additional follow-up.

Guidance on Class Recordings

This class will be taught in-person in the designated classroom. However, the instructor may occasionally utilize Zoom for delivering and/or recording lectures (<https://northwestern.zoom.us>). Date and time of any Zoom meetings as well as instructions on how to connect will be posted on Canvas. This class or portions of this class will be recorded by the instructor for educational purpose and available to the class during the quarter. Class recordings will generally be available on Canvas under Modules. Portions of the course that contain images, questions or commentary/discussion by students will be edited out of any recordings that are saved beyond the current term.

Prohibition of Recording Classes by Students

Unauthorized student recording of classroom or other academic activities (including advising sessions or office hours) is prohibited. Unauthorized recording is unethical and may also be a violation of University policy and state law. Students requesting the use of assistive technology as an accommodation should contact [AccessibleNU](#). Unauthorized use of classroom recordings – including distributing or posting them – is also prohibited. Under the University's [Copyright Policy](#), faculty own the copyright to instructional materials – including those resources created specifically for the purposes of instruction, such as syllabi, lectures and lecture notes, and presentations. Students cannot copy, reproduce, display, or distribute these materials. Students who engage in unauthorized recording, unauthorized use of a recording, or unauthorized distribution of instructional materials will be referred to the appropriate University office for follow-up.

Support for Wellness and Mental Health

Northwestern University is committed to supporting the wellness of our students. Student Affairs has multiple resources to support student wellness and mental health. If you are feeling distressed or overwhelmed, please reach out for help. Prof. Keten is a McCormick [Mental Health Ally](#) and is committed to offering support and guidance toward appropriate support services when needed. Students can access confidential resources through the Counseling and Psychological Services (CAPS), Religious and Spiritual Life (RSL) and the Center for Awareness, Response and Education (CARE). Additional information on all of the resources mentioned above can be found here:

<https://www.northwestern.edu/counseling/>

<https://www.northwestern.edu/religious-life/>

<https://www.northwestern.edu/care/>

Exceptions to Class Modality

Class sessions for this course will occur in person. Individual students will not be granted permission to attend remotely except as the result of an Americans with Disabilities Act (ADA) accommodation as determined by AccessibleNU.

Maintaining the health of the community remains our priority. If you are experiencing any symptoms of COVID, do not attend class and update your Symptom Tracker application right away to connect with Northwestern's Case Management Team for guidance on next steps. Also contact the instructor as soon as possible to arrange to complete coursework.

Students who experience a personal emergency should contact the instructor as soon as possible to arrange to complete coursework.

Should public health recommendations prevent in person class from being held on a given day, the instructor or the university will notify students.