CIVE 842: Structural Dynamics

Fall Semester 2014
University of Nebraska-Lincoln
MW 9:00 AM – 10:15 AM
Scott Engineering Center 111/Peter Kiewit Institute 160

Prerequisites: CIVE 341 (Introduction to Structural Engineering) or similar.
CIVE 443 (Structural Analysis) or similar is recommended, but not required.

Description: Dynamic behavior of civil engineering structures. Free and forced vibrations of multi degree-of-freedom systems. Response of continuous beam and frames. Elastic-plastic behavior. Dynamic loads on bridges. Analysis and design considerations for buildings and bridges subjected to seismic loadings. Application of computer-aided numerical procedures.

Textbook: Chopra, Anil K. (2011). *Dynamics of Structures.* 4th Edition, Prentice Hall, Stamford, CT. 992p.
ISBN-13: 978-0132858038

Optional Reference: Clough, Ray W. and Penzien, Joseph. (2003). *Dynamics of Structures.* 3rd Edition, Computers & Structures Inc., Berkeley, CA. 730p.

Instructor: Richard L. Wood (rwood@unl.edu)
362K Whittier Research Facility, office: (402) 472-1916

Teaching Assistant: Mohammad Ebrahim Mohammadi (me.m@huskers.unl.edu)
362C Whittier Research Facility

Office Hours: Monday 10:30 am – 12:00 pm (instructor, PKI 206F/Whittier 362K)
Tuesday 11:00 am – 1:00 pm (teaching assistant, Whittier 362S)
Wednesday 3:30 pm – 5:00 pm (instructor, PKI 206F/Whittier 362K)
other times are available by appointment

Digital office hours will be experimentally used using Adobe Connect. To facilitate login, a computer with internet is required. However a university IP address is not required.
http://connect.unl.edu/rwood

Email Policy: In each email, use "CIVE 842" as part of the subject line. This will ensure that your email is filtered appropriately and responded in a timely manner. Emails may be sent to either the instructor or teaching assistant.

Course Documents: Blackboard or an alternative will be used to distribute course material (notes, assignments, reference documents, etc.). It is essential for students to have access to download the appropriate material and verify your e-mail address on the site.

Grading:	Homework (approx. one per week, drop of the lowest assignment)	25%
	Midterm Exams (announced 1 week ahead of time)	30%
	Final Exam	40%
	Attendance and Participation	5%

Notes:

1. All homework assignments are due at the **beginning of the class** on the due date assigned, unless otherwise noted. Late work will only be accepted within two days of the due date, in the absence of prior approval for extraneous circumstances. Late work will be deducted 25% per calendar day.
2. As indicated on the schedule, there will be **two midterm exams and a final exam**. The subject matter for each exam will be announced in class at least one week before.
3. If a student **misses an exam**, the instructor must be notified as soon as possible. For compelling (and documented) reasons, the instructor reserves the right to provide a make-up exam, change the weight of other exams, or assign a term project in determining the course grade.
4. Discussion regarding exam grades will be performed within **two days of returning the exams**. Any unclaimed exams will be discarded two weeks after it has been returned to the class.
5. Select assignments will require the use of **MATLAB**. MATLAB is provided to the UNL community free of charge for on-campus or VPN use. For details on procuring a license, visit: http://procurement.unl.edu/matlab-licenses. Assignments done in MATLAB must adhere to the same format as described below and all developed files should have appropriate comments (% syntax format).
6. A classroom response system that allows students to participate in class polls, quizzes and discussions, may be implemented during the semester. This will be done as a classroom experiment and will not require any additional cost. Printed color flash cards will be provided to facilitate an active classroom environment.

Homework/Assignment Format:

Homework preparation and submission guidelines are established to create professional quality detail.

1. Each assignment is to be solved neatly on **engineering graph paper**.
2. Each problem must have a problem statement, problem sketch, diagrams, solution steps, equations used (with variables and then substituted values), and a final answer. The final answer must be **boxed** and include appropriate **units** and **sign conventions**.
3. Use of a **straight edge** is compulsory for sketches, figures, and tables.
4. **All of your work must be shown**. The solution steps are just as important as the final answer and any solution which does not contain the previous steps will receive deduction in points.
5. Multiple pages should be **stapled** or bound.

Digital Meeting Place: A virtual space to enable communication with your fellow classmates is provided. You will be able to access this virtual Adobe Connect room by clicking on the link below. It will also serve as the area where any interactive online video sessions will occur. More details are available online.

http://connect.unl.edu/cive842

Academic Dishonesty: You are encouraged to work together on your assignments, but copying will not be tolerated. For all computer generated work, be sure you work on separate computer terminals and do not turn identical assignments. Scores will be reduced for all suspected parties. Any student who commits other acts of misconduct may be subject to further disciplinary action by the University. The regulations in the "Code of Conduct" concerning academic honesty will be strictly enforced in this class.

Tentative Course Outline:

	Topic	**Reference**
I.	Overview, Motivation, and Introduction to Single-Degree-of-Freedom (SDOF) Systems	Chapter 1
II.	SDOF Free Vibration (Undamped and Damped)	Chapter 2
III.	SDOF Forced Vibration (Harmonic and Periodic Excitations)	Chapter 3
IV.	SDOF Forced Vibration (Arbitrary, Step, Pulse Excitations)	Chapter 4
V.	Numerical Evaluation of Dynamic Response	Chapter 5
VI.	Earthquake Response of Linear Systems	Chapter 6
VII.	Earthquake Response of Inelastic Systems	Chapter 7
VIII.	Response Spectra	Chapter 7
IX.	Generalized SDOF Systems	Chapter 8
X.	Multiple Degree-of-Freedom (MDOF) Systems	Chapter 9 Chapter 10
XI.	Approximate Methods for MDOF Systems (as time permits)	Chapter 12
XII.	Modal Participation and Contributions (as time permits)	Chapter 12
XIII.	Seismic Response of MDOF Systems (as time permits)	Chapter 13
XIV.	Design for Seismic Loads within Building Codes (as time permits)	Chapter 22