CIVE 842: Structural Dynamics
Fall Semester 2015
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.


Course Objectives: 1. Describe the fundamental dynamic parameters of civil structures and their influence on response.
2. Explain and derive the equations of motion that govern the response of single and multiple degree-of-freedom structural systems.
3. Write the equation of motion for a generalized single degree-of-freedom structure.
4. Select the most appropriate method and solve an equation (or set of equations) of motion for a structural system.
5. Describe the limitations and assumptions of various solution strategies as compared to experimental or real world applications.
6. Measure, estimate and document the dynamic response of structures using experimental, analytical, and numerical methods.


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Teaching Assistant: Mohammad Ebrahim Mohammadi (me.m@huskers.unl.edu)
362C Whittier Research Facility
Office Hours: Monday 1:30 pm – 3:00 pm (teaching assistant, Whittier 362S)
Monday 3:30 pm – 5:00 pm (instructor, Whittier 362K/PKI 206F)
Tuesday 3:30 pm – 5:00 pm (teaching assistant, Whittier 362S)
Wednesday 10:30 am – 11:30 am (instructor, Whittier 362K/PKI 206F)
other times are available by appointment

Digital office hours will be experimentally used using Adobe Connect with the course instructor. 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: Coursesites (similar to blackboard) will be used to distribute course material (notes, assignments, reference documents, etc.). It is required for students to have access to download the appropriate material and verify your e-mail address on the site. An invitation to join will be sent during the first week, if one is not received please contact the instructor. If registration is not completed, any scores will not be recorded into the online grade book.

Grading: Homework (approx. one per week, drop of the lowest assignment) 20%
Midterm Exams (announced 1 week ahead of time) 35%
Final Exam 40%
Attendance, Quizzes, and Participation 5%

Notes:
1. All homework assignments are due at the start of 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 grading breakdown, 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. The instructor may choose to use unannounced quizzes at the start or end of class. These quizzes are implemented such that students stay current with the class material. Quizzes are typically closed book and notes.
6. 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).
7. **Active learning strategies** will be used in class that allow students to
participate in class polls, quizzes, and discussions. This will be done as a
classroom experiment and will invoke the use of color coded flashcards
initially. All students will be given a single flashcard, if lost it is the student’s
responsibility to replace it.
8. **Class evaluations** will be performed online in Lincoln and on paper in
Omaha. To encourage participation of the evaluations for continuous class
improvement, an extra credit score of 1% will be applied to the final grade
for completion of the class evaluation. Details on the documentation for
online submission will be provided towards the end of the semester, while
attendance noted in the Omaha classroom.

**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 must be **stapled** or bound.

**Digital Meeting Place:**
A **virtual space** is provided to enable communication with your fellow
classmates. 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
minimally reduced for all suspected parties. Any student who commits this or
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:

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<th>Topic</th>
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<td>I. Overview, Motivation, and Introduction to Single Degree-of-Freedom (SDOF) Systems</td>
<td>Chapter 1</td>
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<td>II. SDOF Free Vibration (Undamped and Damped)</td>
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<td>III. SDOF Forced Vibration (Harmonic and Periodic Excitations)</td>
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<td>IV. SDOF Forced Vibration (Arbitrary, Step, Pulse Excitations)</td>
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<td>V. Numerical Evaluation of Dynamic Response</td>
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<td>VI. Earthquake Response of Linear Systems</td>
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<td>VII. Earthquake Response of Inelastic Systems (as time permits)</td>
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<td>VIII. Response Spectra</td>
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<td>IX. Generalized SDOF Systems</td>
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| X. Multiple Degree-of-Freedom (MDOF) Systems               | Chapter 9    
| XI. Approximate Methods for MDOF Systems (as time permits) | Chapter 10    |
| 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    |