CEE 5464 Structural Dynamics and Earthquake Engineering

Fall 2010

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T.A. Office Hours -- Fridays 10:00am to 12:00am.

Lecture: Tuesdays and Thursdays 2:00pm to 3:15pm
207 Patton Hall

Final Exam: December 15, 2010 2:05pm to 4:05pm

Texts: Required

- Chopra, Anil K. 2007 *Dynamics of Structures – Theory and Applications to Earthquake Engineering*, Third Edition, Published by Prentice Hall
- Course handouts

Optional

- Clough, Ray, and Penzien, Joseph 2003 *Dynamics of Structures*, Second Edition, Published by Computers and Structures, Inc.
- Berg, Glen V. 1989 *Elements of Structural Dynamics*, Published by Prentice Hall Inc.
- ASCE/SEI 7-10 *Minimum Design Loads for Buildings and Other Structures*

Grading:

Quizzes	5%
Homework	25%
Exam 1	20%
Exam 2	20%
Final Exam	30%

Prerequisites: CEE 3424 – Reinforced Concrete Structures I
CEE 3434 – Design of Steel Structures I
CEE 4404 – Computer Analysis of Structures (Co-requisite)

Homework: Homework is due at the beginning of class. Late homework will not be accepted.

Quizzes: Unannounced quizzes will be periodically given to encourage students to keep up with course material. Quizzes will generally be conducted at the beginning of class.

Honor System: This class will comply with the graduate honor system. For more information, please see the graduate honor system at: http://ghs.grads.vt.edu/

Course Learning Objectives:

- Analyze the dynamic response of SDOF systems.
  - Formulate the equation of motion for SDOF dynamic systems.
  - Calculate the dynamic response of damped and undamped SDOF systems subjected to free vibration, harmonic loading, impulse loading, step loading, and arbitrary loading.
  - Develop time-stepping algorithms to analyze the earthquake response of dynamic systems.
  - Compute structural response due to earthquakes using response spectrum and response history techniques.
- Analyze the dynamic response of MDOF systems.
  - Formulate the equation of motion for MDOF dynamic systems.
  - Calculate mode shapes and associated natural frequencies.
  - Compare different methods for modeling damping.
  - Examine structural response of MDOF systems using modal analysis, response spectrum analysis, and response history analysis.
- Evaluate structural response to earthquake motions
  - Define the need for ductility in structures and assess amount of ductility in a system. Examine ductile detailing of typical structural systems.
  - Contrast current building code approaches and performance based earthquake engineering.

Course Outline:

I. Introduction and Basic Concepts (chapter 1)
II. Free Vibration of Linear SDOF Systems (chapter 2)
III. Response of SDOF Systems Subjected to Harmonic Loading (chapter 3)
IV. Response of SDOF Systems to Impulse, Step, and Arbitrary Loading (chapter 4)
V. Numerical Evaluation of Dynamic Response (Chapter 5)
VI. Earthquake Response of SDOF Linear Systems (chapter 6)
VII. Earthquake Response of SDOF nonlinear systems (chapter 7) (Time Permitting)
VIII. Multi-Degree of Freedom Systems (chapter 9 and 10)
IX. Damping in MDOF Structures (chapter 11)
X. Modal Analysis (chapter 12 and 13)
XI. Introduction to Structural Design for Earthquakes (from other references)