

## 2012 Spring Semester CT6005: Seismic-Resistant Design

### INSTRUCTOR

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### COURSE SCHEDULE

Tuesday: 9:30-12:20

### TEXTBOOK

Lecture notes will be distributed in class.

### REFERENCES

1. FEMA. (2003). *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures, Reports No. FEMA 450*, Washington, D.C.
2. FEMA. (2000). *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, Report FEMA 356, Federal Emergency Management Agency, Washington, D.C.
3. ATC. (1996). "Seismic Evaluation and Retrofit of Concrete Buildings", Report ATC-40, Applied Technology Council, Redwood City, U.S.A.
4. Priestley, M. J. N., Calvi, G. M. and Kowalsky, M. J. (2007). *Displacement-Based Seismic Design of Structures*, IUSS Press, Pavia, Italy.

### GRADING

Homework: 20%  
Midterm exam : 40%  
Final exam: 40%

### COURSE CONTENT

1. HISTORY OF EARTHQUAKE ENGINEERING
  - 1.1 History of earthquakes and seismic regulations
  - 1.2 History of structural seismic systems
  - 1.3 Seismic design philosophies
2. ENGINEERING CHARACTERIZATION OF EARTHQUAKES
  - 2.1 Causes and effects of earthquakes
  - 2.2 Basic concepts in seismology
  - 2.3 Attenuation relationships
  - 2.4 Seismic hazard analysis
3. RESPONSES OF SYSTEMS TO EARTHQUAKE SHAKING
  - 3.1 Elastic single-degree-of-freedom (SDOF) systems

- 3.2 Multiple-degree-of-freedom (MDOF) Systems
- 3.3 Elastic response spectra
- 3.4 Inelastic response spectra
- 3.5 2003 NEHRP hazard characterization
  
- 4. 2003 NEHRP EQUIVALENT LATERAL FORCE PROCEDURE
  - 4.1 Design base shear
  - 4.2 Lateral force distribution
  - 4.3 Redundancy and earthquake effects
  - 4.4 Reserve strength and earthquake effects
  
- 5. NONLINEAR STATIC PROCEDURE
  - 5.1 Introduction to performance-based seismic design
  - 5.2 ATC-40 procedure
  - 5.3 FEMA 356 procedure
  - 5.4 Direct displacement-based design procedure
  
- 6. SEISMIC ISOLATION SYSTEMS
  - 6.1 Principles of seismic isolation
  - 6.2 Types of seismic isolation hardware
  - 6.3 Mechanical characteristics of seismic isolation bearings
  - 6.4 Analysis and design of seismic isolation systems
  
- 7. PASSIVE ENERGY DISSIPATION SYSTEMS
  - 7.1 Principles of passive energy dissipation
  - 7.2 Types of passive energy dissipation hardware
  - 7.3 Analysis and design of passive energy dissipation systems