Instructor: Arash E. Zaghi, PhD, PE, SE (California, Connecticut, Nevada)

Storrs Campus: CAST, Room 117

Class Hours: WeFr 11:15AM - 12:30PM

Office Hours: With prior arrangement.

Email: arash.esmaili_zaghi@uconn.edu (Please include CE 5090 in the subject line)

Texts: Required:
- Class notes and handouts

Recommended (not required):
  (Available Online through Library)

References:
- Caltrans (2015), Bridge Design Practices, Chapter 4, Structural Modeling and Analysis, California Department of Transportation, Sacramento.
- Caltrans (2015), Bridge Design Practices, Chapter 21, Seismic Design of Concrete Bridges, California Department of Transportation, Sacramento.
- Caltrans (2013) SDC: Caltrans seismic design criteria version 1.7, California Department of Transportation, Sacramento.

Prerequisites: Design of Steel Structures, Design of Reinforced Concrete Structures, Structural Analysis, Earthquake Engineering or Structural Vibration

Attendance: Students are expected to attend all classes. There will be no makeup for the worked missed during the class.

Goals: In this course, we will discuss key concepts of seismic design of bridge structures. The course is expected to provide you with an in-depth understanding of capacity design. This knowledge is critical for you when performing advanced analyses, such as nonlinear analysis. This course relies heavily on project-based learning.
Tentative Grading Distribution

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
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<tr>
<td>Term Project</td>
<td>60%</td>
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<tr>
<td>Final Defense (in person, individual)</td>
<td>20%</td>
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Final Defense
After the submission of your final project, I will meet with you individually and ask questions about the projects, assumptions you made, your approach, etc. By that, I verify that you were fully involved and you have a good understanding of the concepts.

Homework
The due dates will be defined on the homework statements. Late submissions will not be accepted. Your presentation, format and neatness count toward your grade.

Term Project
You will be designing the substructure and abutments of a real bridge in California. The project will be done by pre-assigned teams of two students. More details about the term project are presented in a separate handout.

Cell Phones
Cell phones are not permitted to be used during the lecture. Laptops or tablets may ONLY be used to take notes or for class activities. Please be advised that texting and using laptops for other reasons distracts me and others; therefore, I may ask you to leave the classroom.

Software
We will be using CSiBridge v. 19. One group will also use OpenSees for some of the analyses.

Course Content

1- Introduction
2- Lessons Learned from Past Earthquakes
3- Seismic Design Concepts
   a. Chain Analogy for Capacity-Protected Design
   b. Force-Based Method (FBM)
   c. Displacement-Based Method (DBM)
4- Sections Analysis
   a. Material Properties
   b. Moment-Curvature Analysis
   c. Interaction of Axial Forces and Bending Moments
5- Plastic Displacements
   a. Plastic Hinge Length
   b. Yield and Ultimate Displacements
   c. Pushover Analysis
6- Design Displacement, Elastic Analysis Method
a. Uniform Load Method
b. Single Mode Spectral Method
c. Multi-Mode Spectral Method

- Caltrans SDC1.7
- Nonlinear Time History Analysis
- Design of Abutments
- Pipe-Pin Design
- In-Span Hinge Design