UVic CIVE 480C Course Outline

Apr 30 2020

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Title: 'Earthquake Engineering Structures'

Course objective: This course will introduce concepts of earthquake engineering related to structural design and performance. It will provide fundamental concepts across a wide range of topics, with a focus on practice and research applications. Students should come out with understanding of fundamental dynamics and analysis, structural performance including lateral resisting systems, basic design for major materials (wood, concrete, steel and masonry); design practice issues, including code requirements; field monitoring and real world structural performance; laboratory testing as used in research and development of codes; considerations for non-structural components (OFC's).

Recommended Course References: NBCC2015, CSA S16 (steel), CSA O86 (wood), CSA A23.3 (concrete); 'Earthquake Dynamics of Structures' by Chopra, 'Elements of Earthquake Engineering' by Filiatrault

Course Content:

Module	Topics
1	Course Introduction and Structural Performance. Discussion about the course content and introduction to Earthquake Engineering and performance of structures in earthquakes.
2	SDoF Structural Dynamics. Introduction to fundamental concepts including equation of motion, free vibration, harmonic excitation, ground motion and numerical analysis, response spectrum.
3	Seismic Hazard. Introduction to fundamental concepts of seismicity; seismic hazard in Canada, BC and in the National Building Code.
4	National Building Code (NBCC). Overview of Section 4.1.8 (seismic design) of the National Building Code of Canada 2015.
5	Wood Frame Design. Introduction to woodframe design including building materials, shearwalls and diaphragms.
6	MDoF Structural Dynamics and Analysis. Continuation of concepts of structural dynamics including MDoF systems, stiffness and mass matrices, response spectrum and time history analysis.
7	Non-linear behaviour. Ductile materials; Capacity protected design; non-linear analysis.
8	Steel Design. In-elastic material behaviour; code requirements, concentric and eccentrically braced frames; moment frames.
9	Reinforced Concrete Design. Material behaviour and ductility; code requirements; shearwalls and coupled shear-walls; moment connections.
10	Reading break.
11	Retrofit. Assessment of existing structures; retrofit concepts; load path; practical issues.
12	Monitoring and Laboratory Testing. Structural monitoring for earthquakes; laboratory testing of structures and components for research and their use in codes; static and dynamics testing including shake-table.
13	Special Topics. Foundations; OFC's; Isolation and Supplemental Dissipation

Course Outline

Week	Date	Lecture 1	Lecture 2	Activity (Posted on Friday each week)
1	04-May	Welcome	Performance	
2	11-May	Structural dynamics I		Quiz - SDI
3	18-May	Seismic Hazard	NBCC	Quiz - Hazard
4	25-May	NBCC		A#1 NBCC
5	01-Jun	Wood Design		A#2 Wood Design
6	08-Jun	SDII-Non-Linear Topics		Quiz - SDII
7	15-Jun	SDII-NL Topics	Steel design	Quiz - NL
8	22-Jun	Steel design		A#3 – Steel Design
9	29-Jun	Reinforced Concrete		Quiz - Concrete
10	06-Jul	Reading Break		
11	13-Jul	Seismic Retrofit		A#4 - Retrofit
12	20-Jul	Lab Testing	Monitoring	Quiz – Testing/Monitoring
13	27-Jul	Special topics		Quiz

**Live Tutorial each Friday between 12:30pm and 1:50pm*

Evaluation

Component	Weight	Posted	Due
Sum of Quizzes	10%	Each quiz will be made available on CourseSpaces after the tutorial, between 2 and 5pm on Friday	
Assignment #1	15%	May 29th	June 5th (by start of Tutorial)
Assignment #2	25%	June 5th	June 19th (by start of Tutorial)
Assignment #3	35%	June 26th	July 17th (by start of Tutorial)
Assignment #4	15%	July 17th	July 31st (by 5pm)