CERTIFICATE IN STRUCTURAL ENGINEERING PROGRAM

January 2018 Course Outline

C54: Seismic Bridge Analysis for Force-Based & Performance-Based Design per CSA-S6-14

Offered via classroom and web cast

Purpose: This course focusses on seismic bridge analysis requirements for satisfying the various requirements set forth in the new Canadian Highway Bridge Design Code, CSA-S6-14. The course will provide the students with different seismic bridge analysis tools starting from the basic to the more advanced. The students will come away with practical insights into the level of complexity of seismic analysis required for different tasks and how simple analysis can help with initial sizing. Emphasis will be laid on the type of analysis for satisfying the force-based and performance-based requirements of CSA-S6-14 along with result interpretation and pitfall avoidance.

Selected Topics: Frame work and basic concepts for force-based and performance-based analysis and design; general code overview of analysis requirements; single mode and multi-mode methods; equivalent cracked-section properties; modal and directional combinations; incorporating soil-structure interaction for various analysis types; moment-curvature analysis; inelastic static pushover analysis (using stepwise linear approach and non-linear analysis software); interpretation and pitfalls of pushover analysis; pushover analysis application for explicit performance demonstration and capacity design; time history analysis: basics such as damping, hysteresis and backbone curves; interpretation of non-linear time history results; basics of liquefaction and lateral spread analysis (employing response spectrum and non-linear static analyses); force effects for foundation design; introduction to base-isolation analysis requirements; assessment and retrofit analysis requirements and techniques. Design comparison using seismic analysis corresponding to different performance criteria will be provided NOTE: As structural analysis software will be used for this course. SAP will be provided without cost for the duration of the class for those who do not currently have access to such software.

Course Coordinator*: *Saqib Khan, *M.A.Sc.,S.E.,P.E.,P.Eng., Senior Project Engineer and Seismic Specialist - Bridges and Structures - Hatch Infrastructure*

Instructors: ***Saqib Khan,*** email: ***saqib.khan@hatch.com***

Communications: Notices to students and questions outside of class will be handled strictly through e-mail.

Submission of Assignments: Web cast students will be expected to submit electronic course assignments in the format prescribed by the instructor. All other students are required to submit their assignments at the beginning of the next class in hardcopy.

Schedule: 12 Thursdays, 6:30 P.M. to 8:30 P.M., January 11 to April 5, 2018 (February 22, 2018 Mid-term break)

Venue: **Room C485,** UBC Robson Square, 800 Robson Street, Vancouver

Parking: The entrance to underground parking at UBC Robson Square can be accessed at Howe and Nelson Street. More information including rates can found here: http://robsonsquare.ubc.ca/find-us/

Student Code of Conduct: Registration in this course confirms that the student has read, and will abide by, the Student Code of Conduct: http://seabc.ca/documents/course_outlines/StudentCodeOfConduct.pdf

Web cast: This course is being offered **via the internet** as well as in the classroom. As it is a live transmission, the dates and times of the classes are the same as in the classroom. Should you wish to take this course via the internet, please complete the application form provided for **internet courses.**

System requirements for LIVE e-learning Training:

- ✓ Any DSL or Cable Connection at minimum of 1Mb.
- ✓ Speakers and/or headset plugged into your PC.
- ✓ PC with at least Windows 7 or XP running a processor greater than 1 Ghz. with Ram of 1 Gb or greater.