

PERFORMANCE-BASED SEISMIC DESIGN

- A SEMESTER LONG UWI COURSE FOR PROFESSIONAL ENGINEERS –

Background

This course, which has been in operation for the past 12 years, was originally conceived as a means of simultaneously training professional engineers as well as MSc students. It is an optional course in our MSc Civil Engineering programme. Regarding the former set, the content of this course is essential for engineers in order to understand modern building codes which are needed for ensuring public safety. This is because there has been a revolution in the philosophy of the new building codes making them much more sophisticated.

The following considerations provide the rationale for why training in the UWI course is now urgently needed:

- 1. The latest versions of the ASCE/SEI 7 (ASCE/SEI 7-16) and the IBC (2018) require knowledge of performance-based seismic design for a thorough understanding of its provisions because key concepts and terminology of performance-based design are now being employed in these codes.*
- 2. The new standard for performance-based seismic design (ASCE/SEI 41-17), is substantially more complicated than the previous version of 2013, and the code development process for the 2022 edition has begun.*
- 3. The performance-based design paradigm will likely be the dominant structural design approach in the U.S.A codes within the next few years. In August 2019, the ASCE launched a pre-standard for Performance-Based Wind Design. This will soon become a U.S.A standard and the model code for hurricane-resistant design.*

The mechanism for including professional engineers as students of an MSc course is that they must register as an “occasional student” if not intending to do the final exam, but “specially admitted” if they do. The registration procedure is shown on the next page. This course has always had a high percentage of its cohort coming from industry.

Course Information:-

Course Description: The “Performance-Based Seismic Design” course enables engineers to understand and appropriately apply the most recent building codes: IBC 2018, and the ASCE 7-16, ASCE 41-17. These skills are urgently needed given new developments and building safety requirements placing emphasis on the concept of risk analysis as applied to new and existing buildings. There are 2 practical coursework exercises involving (1) the quantitative assessment and possibly retrofit design of an existing building, and (2) nonlinear dynamic analysis. There at 12 consecutive sessions from 4:00-6:00pm usually on Thursdays and beginning from the third week of January. The sessions take place online.

Learning Outcomes: The student shall: know and understand the principles of performance-based seismic design of buildings per ASCE 41; be able to calculate the structural seismic retrofitting requirements of a building; be able to determine the management strategies for seismic structural retrofitting; know and understand the principles of the probabilistic risk assessment of a building; be able to calculate the approximate seismic risk of a given building; know and understand the principles of the regional seismic risk assessment per HAZUS.

Target Students: Practising structural or civil engineers.

Course Syllabus:

Introduction to the principles of Performance-Based Earthquake Engineering and ConsequenceBased Earthquake Engineering; The Seismic Rehabilitation Design Process and Objectives; Capacity Spectrum NSP Analysis; Coefficient Method NSP Analysis; Acceptance Criteria for Systems analysed by Linear Methods and Nonlinear Methods; Retrofit and Management Strategies and Systems; SACFEMA Reliability Analysis Method; Vulnerability Analysis Methods; Software for Pushover Analysis and NDP Analysis; Regional Seismic Risk Assessment; Introduction to HAZUS.

Instructor: Richard Clarke PhD (quantitative seismic assessment and retrofit design specialist).

How To Access the Course:-

The university accommodates this possibility via enrolment as a student with the special designation of “Occasional Student”. As indicated, the Occasional Student attends class along with students pursuing degrees or diplomas, but does not take the exam, but participates fully including submission of coursework exercises. If the student’s attendance is above the minimum, the student receives a certificate of attendance, at least from the department.

*Important: If the following process is not completed before the start of the lectures, **attend class** while the process continues.*

Procedure:-

1. Apply to: “ Coordinator, MSc Civil Engineering, Department of Civil and Environmental Engineering”, for departmental approval to take the course – CIEN 6030 Performance-Based Seismic Design. Email richard.clarke@sta.uwi.edu
2. Upon receipt of departmental approval, begin the Registration Process by filling-out the Application form. Apply as “occasional student” if you do not wish to sit the final exam, but “specially admitted” if you do. The form can be obtained online from http://sta.uwi.edu/resources/documents/postgrad/pgspecial_admission.doc
3. Email the School of Graduate Studies who will then guide you through the rest of the steps, or provide any clarification. Email Jeanelle.armour@sta.uwi.edu
4. At the end of the process, you will receive an ID number that will allow you to enter the online system where the classes are conducted.

CONTACTS: Ms. Jeanelle Armour, School of Graduate Studies: 18686622002 ext 82575, ext 84191, ext. 83064 ; Richard Clarke, Department of Civil and Environmental Engineering: 18687401010