OBJECTIVE
The two-day course aims to equip the participants with the necessary technical expertise and software skills for seismic analysis and design of buildings in Singapore per EC8 (Singapore National Annex). Participants are assumed to have basic knowledge of structural dynamics and are familiar with basic functions of ETABS software. The emphasis of the course will thus be on detailed implementation of EC8-code permitted methods and the use of computer software ETABS2016. Key concepts in correct and effective modelling of buildings will be demonstrated with focus on Lateral Force Method (static) and Response Spectrum Method (linear dynamics). Advanced analysis methods such as Nonlinear Pushover Analysis, Dynamic Response History Analysis (Linear & Nonlinear) and Performance Based Design will also be discussed. Participants will be guided through hands-on examples for seismic analysis and design of several realistic building examples including multi-towers building and irregular-shape RC buildings. While the emphasis is on EC8 for Singapore, the knowledge and skills learned will also be useful for design of overseas projects with seismic requirements.

COURSE OUTLINE

1. Review of Structural Dynamics and Earthquake Design Philosophy
   a. Fundamentals of structural dynamics
   b. Elastic response spectrum
   c. Effects of earthquakes on buildings
   d. Earthquake design philosophy
   e. EC8 and Singapore National Annex documents
   f. No-collapse and damage limitation requirements
   g. Design response spectrum
   h. Ductility and behaviour factor
   i. Structural irregularity in plan and elevation
   j. Demonstration examples of structural dynamics (SDOF and MDOF systems)
      i. Resonance and effects of damping
      ii. From earthquake ground motion to elastic response spectrum

2. Important concepts on creating a good building model for FE analysis
   a. FEM overview
   b. Modeling RC joints stiffness
   c. Modeling cracked section properties
   d. Staged construction for transfer system
   e. Understanding building response with modal analysis
   f. P-Delta analysis
   g. Modeling for geometric imperfections
   h. Rigid and Semi-Rigid diaphragms
      i. Principles of capacity design
      j. Preferred structural framing for seismic analysis
         i. Strong-column and weak-beam
         ii. Ductile failure vs brittle failure.

3. Modeling, analysis and design a 28-storey RC building for seismic effects
   a. Irregularity checks
   b. Second-order effects & imperfections
   c. Natural frequencies, mode shapes, effective modal mass
   d. Inherent and accidental torsions
   e. Lateral force method of analysis
   f. Modal response spectrum analysis
   g. Modal and directional combinations
   h. Combination of actions for member design
   i. Inter-storey drift check
   j. Different RC Detailing requirements and its impact on design forces.

4. Seismic analysis and design of complex buildings
   a. Multi-tower building
   b. Building with PT floors
   c. Building with flexible foundation
   d. Irregular building with semi-rigid diaphragm

5. Alternative ways to design for seismic effects
   a. Dissipative structure (medium ductility class)
   b. Base isolation with rubber bearings for critical buildings
   c. Basic concepts of performance-based seismic evaluation for existing buildings
      i. Static push-over analysis
      ii. Dynamic response history analysis

SPEAKER PROFILE

Professor C. G. Koh obtained his Ph.D in 1986 from the University of California at Berkeley. He is currently the Director of Centre for Hazards Research of the Faculty of Engineering, National University of Singapore. His research interests include computational and experimental dynamics, vibration isolation and mitigation, structural system identification, and offshore/marine engineering. He has been actively involved in research and consultancy mainly on structural dynamics problems. He has been engaged as technical advisor and consultant in more than 70 industrial projects (in Singapore and the region). The projects include major infrastructure developments such as train-track systems, high-tech plants, tall buildings (earthquake and wind), cable nets and offshore systems. He has also conducted numerous short courses (public and in-house) on structural dynamics and seismic analysis.

Er. Choo is a Singapore Registered Professional Engineer with over 20 years of consulting experience both in Singapore and USA. In USA, he was a consultant with Dietrich Industries, Inc. and designed many Light-gage steel frame structures scattered over USA. He also spearheaded Dietrich Industries’s first IT project worth USD4 millions which enable their engineers to model, analyze and design any steel structures in 3D with automatic shop drawing generation. In Singapore, he was a consultant at CPG Consultants Pte Ltd and had designed and supervised over SGD800 million worth of building related projects.

He is currently the Technical Director of Otte International Pte Ltd, which specializes in advanced and innovative IT solutions for Building, Structural and Geotechnical Engineering professionals. He has extensive experience in computer-aided analysis and design with advanced engineering software. He has conducted numerous training courses and seminars in Singapore, Malaysia and overseas.

Er. Choo graduated with Master of Public Works and Master of Science in Civil Engineering with a Full Academic Merit Scholarship from University of Pittsburgh, Pittsburgh, Pennsylvania, USA. He was awarded the Chi Epsilon (National Civil Engineering Honor Society, USA) scholarship in the Metropoli- tan District, the National Dean’s List and School of Engineering Dean’s List in his undergraduate studies in the same university.
COURSE INFORMATION

Advanced Seismic Analysis and Design with ETABS 2016 per EC8 (Singapore)

Date: 18 - 19 April 2017 (Tue & Wed)
Time: 9:00am - 5:00pm
Venue: Otte Training Room, 1 Pemimpin Drive #10-11, One Pemimpin, Singapore 576151

Fees:

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<td>Fees per participant</td>
<td>$1,500</td>
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Note:

i. Early-bird fees only valid for registrations received by 28 March 2017.
ii. 20% discount for registration of a group of 3 and above. This 20% discount is not applicable to Early-bird registration.
iii. Participants are required to bring their own laptops with support for WiFi connection.
iv. Training License will be provided.

Terms and Conditions:

1. Due to limited seats of 20, registration is on a first-come-first-served basis. Training seats will be confirmed upon receipt of payment.
2. Cancellation of registration notice must be made in writing if you are unable to attend. Course fees refund as follows:
   - Notice received 14 days prior to course date - 90% refund.
   - Notice received 7 days prior to course date - 75% refund.
   - Cancellation will not be accepted if notice is received less than 7 days before the event; but a substitute delegate is welcomed at no extra charge.

REGISTRATION FORM

Organization: ................................................................. Department: .................................................................

Address: ........................................................................................................................................................................................................

Person in charge (Dr/Mr/Ms): ................................................................. Job Title: .................................................................

Email: ................................................................. Tel (O): ................................................................. (HP): ................................................................. Fax: .................................................................

Participants’ Names: PE No.: Job Title: Email: Tea breaks

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I/We hereby agree to abide by the terms and conditions stated above.

Person in charge Signature  Date & Company Stamp

Please submit the completed registration form to the fax or email address below. An invoice & confirmation email will be sent to you upon receipt of your registration.

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