

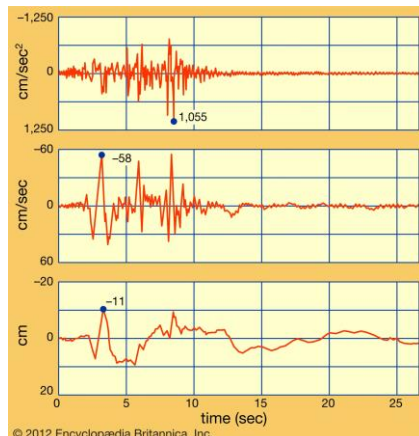


CPD Course on Earthquake Engineering

Design of Structures for Earthquake Resistance: 2.0 CPD Credits

Cape Town: 14 & 15 September 2023

Johannesburg: 18 & 19 September 2023



Why is this course needed?

Every now and then, severe earthquakes occur around the world, causing massive damage to infrastructure, and killing people. A grim reminder of this reality was the Turkey-Syria earthquake earlier this year, in which over 50,000 people lost their lives, and damage to infrastructure was estimated at over US\$100 billion. Not so long ago in 2010, there was the Haiti Earthquake, in which estimates of those killed vary from 100,000 to over 300,000. There are many other earthquakes that occur on a smaller scale, but nevertheless causing significant damage to buildings and other infrastructure. Southern Africa is fortunate to have relatively low natural seismic activity, but earthquakes are very unpredictable, and in the South African context, seismic movements can also be caused by mining-related underground explosions and extensive rock excavations. It is therefore desirable to incorporate some level of seismic resistance in the design of important or vulnerable infrastructure such as hospital buildings, multi-storey buildings and car parks, shopping malls, masonry churches/mosques, bridges, viaducts, concrete dams and power stations.

What will the course cover, and who should attend?

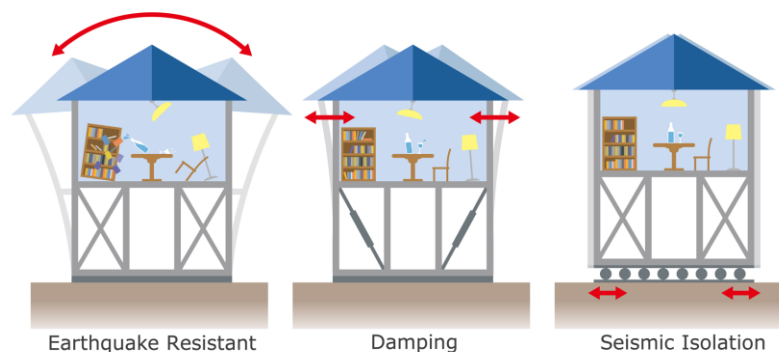
This 2-day course, presented by a leading authority on earthquake engineering from the USA, will explain how earthquakes are caused, and cover the analysis of structures for seismic loading, as well as the design of buildings to withstand earthquakes, including code provisions. All civil, structural and geotechnical engineers who may be required to design new infrastructure for earthquake resistance, or to assess the seismic capacity of existing buildings and other infrastructure, are invited to attend.

Detailed course outline

- Review of dynamic analysis: Single and multi-degree of freedom systems; Free and forced vibration response; Time-domain and frequency-domain analysis; Viscous and hysteretic damping
- Causes and mechanisms of earthquakes; Damage potential of ground motions; Case studies



- Design-based control of earthquake consequences: Stiffness, strength and ductility and their respective effect on controlling economic loss, uninterrupted operation and life protection
- Nature of earthquake loading; Difference between wind and earthquake loads; Characterization of earthquake loads; Strong-motion records selection and scaling; Derivation of design spectra
- Effect of selection of form, material and structural system on earthquake resistance; Common layout defects and their effect; Case studies from previous earthquakes
- Seismic design approaches: Direct design versus capacity design; Contrast between ductility-based design and force-based design; Impact on construction costs
- Ground motion characterization: Selection of earthquake records for derivation of design spectra; Methods and criteria for selection of records for dynamic response history analysis
- Methods for the evaluation of earthquake actions on structures: Fundamental understanding of code base shear equation; Use of elastic and inelastic spectra in design; Applications of acceleration and displacement spectra in design; Dynamic response-history analysis as a basis for design
- Assessment of earthquake effects on populations of structures: Applications of vulnerability functions
- Lessons learned from previous earthquakes: Observations and conclusions from earthquakes in Turkey, USA, Japan, Chile, Greece, Italy, Pakistan and Indonesia



Registration

The course registration fee is **R12,500-00**. This covers presentations by a leading international authority on the subject, printed course notes and a certificate of attendance. There is a 20% discount for full-time postgraduate students, and graduates under the age of 25 (proof of student status, or of age, should be provided with the submission of this form). The registration form may be requested via the contacts below.

Contact persons

Registration Queries: Heidi Tait, CPD Manager, EBE Faculty, Univ. of Cape Town. Email: heidi.tait@uct.ac.za

Technical Queries: Prof. Alphose Zingoni, PrEng, CEng, PhD, DIC, FSAAE, FIABSE, FIStructE (Course Convenor). Department of Civil Engineering, EBE Faculty, University of Cape Town. Email: alphose.zingoni@uct.ac.za

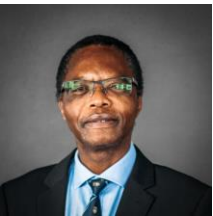


About the Presenter



A Fellow of the British Royal Academy of Engineering, Professor Amr Elnashai is Vice President for Research and Technology Transfer at the University of Houston in the USA. Previously, Prof. Elnashai served as Dean of Engineering at the Pennsylvania State University, where he held the Harold and Inge Marcus Chair and the Woodward Chair in the College of Engineering. He has been visiting professor at the University of Surrey, UK, since 1997. Other visiting professor appointments include the University of Tokyo, the University of Southern California, and the European School for Advanced Studies in Reduction of Seismic Risk, Italy. Prof. Elnashai is founder and editor-in-chief of the Journal of Earthquake Engineering, a member of the drafting panel of the European design codes, past chair of the UK earthquake engineering association, and member of Council of the UK Institution of Structural Engineers. His technical interests are multi-resolution distributed analytical simulations, network analysis, large-scale hybrid testing and field investigation of the response of complex structures to earthquakes. He has produced numerous publications, including earthquake-investigation fields reports, three books and several book chapters. He holds MSc and PhD degrees from Imperial College London, and a BSc engineering degree from Cairo University.

About the Convenor



Prof. Alhose Zingoni leads the Structural Engineering & Mechanics Group at the University of Cape Town. He holds MSc and PhD degrees in Structural Engineering from Imperial College London. He conducts research in the area of structural mechanics, with a focus on shell structures, vibration analysis, structural dynamics and novel computational methods. He has authored 4 books, edited another 7, and published over 100 scientific papers on these topics. He is the founder of the International Conference on Structural Engineering, Mechanics and Computation (SEMC), held at UCT every 3 years. In 2016, he was elected a Fellow of UCT for “original distinguished academic work.” His book *“Shell Structures in Civil and Mechanical Engineering”* (ICE Publishing, London, 2018) won the UCT Book Award for 2019. He is registered as a Chartered Engineer (CEng) with the Engineering Council of the UK, and as a Professional Engineer (PrEng) with the Engineering Council of South Africa. He is a Fellow of the Institution of Structural Engineers (London), a Fellow of the International Association of Bridge & Structural Engineering (Zurich), a Member of the Academy of Sciences of South Africa and a Fellow of the South African Academy of Engineering.

