

# Advances in Seismic Hazard Analysis and Soil-Structure Interaction

## Overview

The course aims at introducing the students to the theories and methods of modern earthquake geotechnical engineering, particularly **advances in seismic hazard analysis and soil-structure interaction**. The course will initially review the basic notions of engineering seismology such as earthquake size, seismic hazard, intensity measures of ground motion, dynamics of porous materials and soil constitutive modelling. A subject treated during the course is geotechnical modelling of sites using field and laboratory testing. This will form the basis for the study of local site effects through 1D linear-equivalent and non-linear ground response analyses. Concepts such as mechanical impedance, transfer function and deconvolution of input motion will be discussed in greater detail. Topics of the course will also include phenomena of ground failure such as liquefaction, co-seismic and post-seismic instability of natural slopes, surface fault ruptures, and design of foundations and buried pipe networks in unstable, lateral spreading ground. The latter part of the course addresses the theoretical framework of soil-structure interaction (SSI) under earthquake loading and advanced numerical modelling of SSI problems. Peculiarities associated with the SSI are addressed followed by a few examples and case studies.

**Prerequisites:** UG course in RC structures, fundamentals of structural dynamics and earthquake engineering.

The objectives of the course are:

- (1) To identify recent advances in the engineering seismology and seismic hazard analysis;
- (2) To address seismic geotechnical risk, particularly surface fault rupture and seismic instability of natural slopes; and
- (3) To address the theoretical framework of soil-structure interaction under earthquake loading and advances in the numerical modelling of SSI problems.

This course is being conducted as part of the educational activities of **National Centre for Safety of Heritage Structures (NCSHS)**, IIT Madras ([www.ncshs.org](http://www.ncshs.org)). Register at [www.gian.iitkgp.ac.in](http://www.gian.iitkgp.ac.in).

<b>Course Dates</b>	<b>18 – 30<sup>th</sup> July 2016</b>								
<b>Host Institute</b>	<b>IIT Madras, Chennai</b>								
<b>No. of Credits</b>	<b>2</b>								
<b>No. of Participants</b>	<b>50 (Maximum)</b>								
<b>You Should Attend If...</b>	<ul style="list-style-type: none"><li>▪ You are a geotechnical/structural engineer or researcher interested in seismic hazard analysis and modelling and analysis soil-structure interaction.</li><li>▪ You are a student or faculty from an academic institution interested in pursuing research in the area of seismic hazard analysis and soil-structure interaction.</li></ul>								
<b>Course Registration Fees</b>	<p>The participation fee for taking the course is as follows:</p> <table><tr><td><b>Student Participants:</b></td><td>Rs. 2000</td></tr><tr><td><b>Faculty Participants:</b></td><td>Rs. 6000</td></tr><tr><td><b>Government Organizations:</b></td><td>Rs. 10000</td></tr><tr><td><b>Industry Participants:</b></td><td>Rs. 20000</td></tr></table> <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <p><b>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai.</b></p>	<b>Student Participants:</b>	Rs. 2000	<b>Faculty Participants:</b>	Rs. 6000	<b>Government Organizations:</b>	Rs. 10000	<b>Industry Participants:</b>	Rs. 20000
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<b>Industry Participants:</b>	Rs. 20000								
<b>Accommodation</b>	The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel">http://hosteldine.iitm.ac.in/iitmhostel</a>								

## Course Faculty



**Carlo G. Lai** obtained his Ph.D. in Civil Engineering from Georgia Institute of Technology, Atlanta, USA in 1998, with a Major in Geotechnical Earthquake Engineering and a Minor in Mathematics. He holds MS degrees in Engineering Science and Mechanics and Civil Engineering from

Georgia Institute of Technology, Atlanta.

He has been Associate Professor of Geotechnical Engineering at University of Pavia since 2010, and Head of Geotechnical Earthquake Engineering Section at EUCENTRE, Pavia since 2003. He is an Affiliate Faculty at the European School for Advanced Studies in Reduction of Seismic Risk (ROSE School – IUSS) of Pavia. Among many recognitions received by him is the prestigious Bishop Medal 2003 for the best research contribution in Geotechnical Engineering published in 2002. Prof. Lai has a Hirsch's h-index of 8 (Web of Science).

His research interests are in geotechnical earthquake engineering and engineering seismology with special regard to stochastic ground response analyses, probabilistic seismic hazard assessment, propagation of Rayleigh waves in dissipative continua, solution of dynamic soil-structure interaction problems, and definition of seismic input at construction sites.



**Dr. G. R. Dodagoudar** is presently working as professor in the Department of Civil Engineering, Indian Institute of Technology Madras, Chennai, India. He obtained his Ph. D. from the Indian Institute of Technology Bombay, Mumbai, India. His areas of research interests include: **Inelastic analysis in geomechanics, Reliability analysis of**

**geotechnical systems, Soil dynamics and earthquake engineering and, Seismic hazard and risk assessment.** Professor Dodagoudar has guided so far 8 Ph. D. and 7 M.S. (Research) theses in addition to many M. Tech. dissertations. He has great passion for teaching and taught many UG and PG courses in the IIT Madras, Chennai. He publishes extensively in national and international referred journals. He is currently serving as a member of the editorial review board of a few journals. He has actively involved in many continuing education programmes. He is an active member of board of studies in many of the universities and he is also on the governing council in many of the Engineering colleges. He is an active member of the AICTE's, New Delhi, Standing Appellate Committee. Dr. Dodagoudar completed many prestigious sponsored research and consultancy projects.

## Course Coordinator

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