

# Seismic Risk Assessment at Urban Scale

## Overview

Seismic risk assessment of the built environment is an essential element in both disaster risk mitigation and management: Risk assessment facilitates prioritising risk mitigation strategies in the built environment through retrofit programmes and developing/implementing new techno-legal regimes, on the one hand. On the other, it aids policy makers in developing disaster management strategies with scenario earthquakes to identify geographical areas under their jurisdiction expected to require maximum assistance in the event of an earthquake. Risk assessment is a convolution of the ingredients: seismic hazard, seismic vulnerability of structures and exposure, leading to loss estimation due to the natural disaster, and it can address direct and indirect losses. Several methods have been developed in the past decades based on statistical and empirical approaches, analytical approaches and expert-systems approaches. Estimation of the seismic vulnerability of the built environment simultaneously for a large population of buildings cannot be carried out with the rigour adopted for individual buildings, but requires robust models that capture the strengths and weaknesses of the structural typology.

The objectives of the course are:

- (1) To develop an understanding of the elements of seismic risk assessment and loss estimation, and their evolution to be able to identify appropriate approaches for different contexts.
- (2) To identify critical indicators of potential seismic damage and/or collapse in historical masonry constructions and modern RC constructions for vulnerability modelling.
- (3) To familiarise methods to develop damage functions, fragility and vulnerability curves.
- (4) To identify source of uncertainty and mathematical models to handle them in risk assessment.

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)).

<b>Course Dates</b>	<b>18 – 22 April 2016</b>
<b>Host Institute</b>	<b>IIT Madras</b>
<b>No. of Credits</b>	<b>1</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 structural engineer or research scientist working on seismic risk assessment of built environment at urban or territorial level.</li><li>▪ You are policy maker or official working in the area of disaster mitigation and management (DMM).</li><li>▪ You are a student or faculty from academic institution interested in seismic risk assessment of built environment at urban or territorial level.</li></ul>
<b>Course Registration Fees</b>	<p>The participation fees for taking the course is as follows:</p> <p><b>Student Participants:</b> Rs. 1000 <b>Faculty Participants:</b> Rs. 3000 <b>Government Organizations:</b> Rs. 5000 <b>Industry Participants:</b> Rs. 10000</p> <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>Accommodation</b>	<p>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></p>

## Course Faculty



Professor Dina D'Ayala is Head of Structures and Co-director of the EPICentre research centre. She is a structural engineer with research focus on protection of architectural heritage and urban settlements from natural hazard. Previously at University of Bath, she headed the Earthquake and Conservation Engineering Research group for 15 years. Research milestones include the development of a numerical procedure to determine seismic vulnerability of masonry dwelling (FaMIVE) with applications in Turkey, Nepal, Iran and Italy, the design and development of two patented dissipative strengthening prototypes to retrofit architectural heritage.

Current research includes numerical analysis and retrofit design for adobe heritage in South America, development of seismic analytical vulnerability functions for low and non-engineered buildings worldwide within the GEM framework, development of resilient measure to reduce vulnerability to flood and wind-driven rain of historic buildings in the UK. Dina is member of EERI, SECED and EEFIT, and joint editor of the Bulletin of Earthquake Engineering, and editorial board member of the International Journal for Architectural Heritage. She has been a consultant to the WB, IDA, UNDP and UNESCO on projects of heritage conservation and hazard protection in the Middle East, Ethiopia, Turkey, Iraq, Nepal etc.

She teaches structures, earthquake engineering, conservation engineering and design to UG/PG civil engineering/architecture students.



**Arun Menon** is Assistant Professor of Structural Engineering at the Civil Engineering Department of IIT Madras. He received his PhD in Earthquake Engineering from University of Pavia, Italy.

He has 15 years of exposure to the field of seismic engineering and his research interests include seismic behaviour of masonry structures, restoration of heritage structures and seismic risk assessment. He is currently coordinating the efforts of National Centre for Safety of Heritage Structures (NCSHS), IIT Madras. He is member of Bureau of Indian Standards Panel for Masonry, CED 46:P7 and Convener, Working Group for Draft Code: "Seismic Retrofit of Structures: Masonry Buildings" in CED 39:Earthquake Engineering Sectional Committee.