

# Seismic Analysis and Design of Masonry Structures

## Overview

The goal of the course is to provide an introduction to materials, construction practices, structural behaviour, analytical methods, and typical code requirements for the seismic design of new masonry buildings and the seismic evaluation and retrofit/rehabilitation of existing ones. The course would address: Properties of masonry materials: brick, block, mortar, grout and reinforcement; Mechanics of masonry in compression: failure theories, compressive strength, elastic modulus; Behaviour of masonry walls subjected to lateral forces and their role in building structural systems excited by earthquake motions: Unreinforced masonry walls: vertical and transverse loadings, shear walls; Reinforced masonry walls: axial force, flexure and shear design, detailing of reinforcement; Building systems: floor diaphragms, lateral-force distribution to shear walls; Assessment and rehabilitation of existing masonry buildings: sources of vulnerability, knowledge and survey of the structure, methods of analysis, performance criteria; and Strategies for seismic rehabilitation/retrofitting.

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

The objectives of the course are:

- (1) To identify/determine the elements of seismic behaviour of masonry components and systems;
- (2) To identify methods of modelling, analysis and assessment of masonry structures (particularly non-linear equivalent frame approach);
- (3) To identify appropriate techniques for seismic strengthening and retrofit of masonry structures and procedure for retrofit design.

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>08 – 20February 2016</b>
<b>Host Institute</b>	<b>IIT Madras</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 structural engineer or researcher interested in seismic analysis of existing masonry structures and analysis/design of new masonry structures, including reinforced masonry.</li><li>▪ You are a student or faculty from an academic institution interested in pursuing research on seismic behaviour of existing masonry structures and design of new masonry structures.</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.2000 <b>Faculty Participants:</b> Rs.6000 <b>Government Organizations:</b> Rs.10000 <b>Industry Participants:</b> Rs.20000</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



**Guido Magenes** is Full Professor of Structural Engineering at the University of Pavia, Department of Civil Engineering and Architecture (DICAr). Since 2004 he is also collaborating with the EUCENTRE Foundation (European Centre for Training and Research in Earthquake Engineering) Pavia, where he is head of the Masonry structures division.

Guido Magenes has over 28 years research experience in the area of seismic analysis, design and assessment of structures, including extensive experimental activity. He has authored or co-authored over 200 scientific papers in the field of structural engineering, with emphasis on masonry and reinforced concrete structures subjected to seismic and non-seismic loading.



**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.

## Course Coordinator

**Name: Dr Arun Menon**

Phone: +91 - 44 - 2257 4299

E-mail: arunmenon@iitm.ac.in

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