



MASONRY STRUCTURES AND ASSESSMENT OF EXISTING STRUCTURES

Enrollment year	2018/2019
Academic year	2019/2020
Regulations	DM270
Academic discipline	ICAR/09 (CONSTRUCTION TECHNIQUES)
Department	DEPARTMENT OF CIVIL ENGINEERING AND ARCHITECTURE
Course	CIVIL ENGINEERING
Curriculum	Strutturistico
Year of study	2°
Period	Annual (30/09/2019 - 12/06/2020)
ECTS	12
Lesson hours	98 lesson hours
Language	Italian
Activity type	WRITTEN AND ORAL TEST
Teacher	MAGENES GUIDO (titolare) - 4 ECTS PENNA ANDREA - 5 ECTS SILVA MOURA PINHO RUI JORGE - 3 ECTS
Prerequisites	The course foresees that students will have already successfully followed the courses on Structural Mechanics and Structural Engineering.
Learning outcomes	<p>The "Masonry Structures" module aims at providing the students with the necessary knowledge to understand the fundamental principles of masonry mechanics, of the structural conception and design of masonry structures, of the structural assessment of existing masonry structures, with reference to gravity and environmental loading, including issues related to seismic action.</p> <p>The 'Assessment of Existing Structures' module aims not only at providing students with knowledge and tools for an accurate modelling of the nonlinear response of existing RC structures subjected to seismic action, but also at introducing the principles seismic assessment</p>

methods and retrofitting techniques used for this type of structures.

Course contents

The "Masonry Structures" module covers the following topics. Masonry materials and components. Modern masonry typologies. Mechanical properties of masonry, constitutive models. Behaviour of masonry under uniaxial and multi-axial states of stress. Shear strength of masonry. Masonry structural elements subjected to in-plane and out-of-plane action: limit states and capacity. Geometric second order effects in masonry walls subjected to vertical and lateral loading. Masonry buildings: structural types and overall conception. Modelling and analysis of masonry buildings, safety and performance assessment. Masonry buildings subjected to seismic loading. Existing and historical masonry structures. Typologies of historical masonry. Main structural components of existing masonry buildings. Causes and diagnosis of structural damage. Structural survey. In-situ testing techniques. Structural analysis of existing buildings (including seismic loading). Arches and vaults, static analysis. Strengthening and retrofitting techniques. Seismic strengthening.

The 'Assessment of Existing Structures' module is structured in six main parts, listed below. In addition, during the course the students will also be asked to undertake a design project in which an existing building will first need to be seismically assessed and then retrofitted through one or more proposed interventions.

- Notes on modelling challenges and issues
- Nonlinear behaviour of RC structures
- Nonlinear dynamic analysis (time-history)
- Nonlinear static analysis (pushover)
- Seismic assessment of existing RC structures
- Seismic retrofitting of existing RC structures

Teaching methods

Lectures (hours/year in lecture theatre): 74
Tutorials (hours/year in lecture theatre): 32
Workshops (hours/year in lecture theatre): 0

Recommended or required readings

The slides presented during the lectures will be made available for download by the students from an FTP server that will be indicated at the start of the course, as will be also Excel files useful for some of the practical exercises. Some textbooks and software pertinent to the course are also listed in what follows:

- Nuove Norme Tecniche per le Costruzioni. D.M. 14/01/ 2008
- G.Macchi, G.Magenes. Le costruzioni in muratura. Cap. 13 del libro "Ingegneria delle strutture" a cura di E.Giangreco, vol. 3, ed. UTET.
- I.V.Carbone, A.Fiore, G.Pistone. Le costruzioni in muratura. Hoepli.
- G.Croci. Conservazione e restauro strutturale dei beni architettonici. Hoepli.
- G. Manfredi, A. Masi, R. Pinho, G. Verderame, M. Vona. Valutazione

degli edifici esistenti in Cemento Armato. IUSS Press

- Seismosoft (2011). SeismoStruct - A computer program for static and dynamic nonlinear analysis of framed structures. Available from <http://www.seismosoft.com>

Assessment methods

For both modules, a course project is compulsory and its progress will be monitored throughout the course; at the end of the latter, the project undertaken by the students will be assessed through a discussion of both the results obtained as well as the procedure adopted. The final exam will be oral and available only to those students who will have successfully completed and delivered the course project.

Further information

Sustainable development goals - Agenda 2030

[\\$lbl legenda sviluppo sostenibile](#)