



Code: ICAR/09

Credits: 9

Matter: Seismic Strengthening of Existing Masonry Structures

Main language of instruction: Italian

Other language of instruction: English

Teaching Staff

Head instructor

Prof. Stefania Imperatore - stefania.imperatore@unicusano.it

Introduction

1. Objective of the course:

The course aims to deepen the knowledge of structural retrofitting systems for historical masonry constructions with artistic value, providing to the students the necessary tools and methods for the design and assessment of the degree of safety of these structures on the seismic point of view.

The skills needed to identify and solve the problems related to the seismic vulnerability of existing masonry structures in compliance with existing regulations, will be provided. Upon successful completion of the course, students should be able to identify specific vulnerabilities of existing masonry buildings as so as the more suited structural solutions aimed to the seismic consolidation of existing masonry buildings with a historical-monumental character.

Objectives

2. Course Structure:

The course is divided into four macromodules, related respectively to the teaching of the static and seismic behavior of existing masonry buildings with a historical-monumental character, to the theory and structural calculation of retrofitting solution for aimed to inhibiting the main seismic vulnerabilities. The knowledge acquired in theory lessons will be applied in the "virtual classroom" forum through 2 activities, consisting in the solution of simple practical problems (E-tivity).

Competencies:

- knowledge of the basic concepts of Statics of Historical Masonry Structures
- knowledge and identification of the Seismic Behavior of Historical Masonry Structures

- knowledge and definition of the modeling methods aimed to simulate the behavior of Existing Historical Masonry Structures
- knowledge and definition of the main seismic vulnerability in Existing Historical Masonry Structures
- knowledge and design of main techniques for the seismic retrofitting of Existing Historical Masonry Structures

Syllabus

3. Programme of the course:

Subject 1. The Masonry as a material

Proposed topics: characterization of the material (compliance with the rule of art, definition of the quality index masonry, characterization of the masonry material), survey and investigation of masonry structures, definition of the structural vulnerabilities.

Subject 2. Static Behavior of Historical Masonry Structures

Proposed topics: behavior of linear elements (walls and columns) and curved elements (arches and domes)

Subject 3. Seismic Behavior of Historical Masonry Structures

Proposed topics: detailed analysis of all the kinematic mechanisms responsible for seismic vulnerability of Existing Historical Masonry Structures; seismic behavior and methods for the analysis of structures characterized by a box behavior (consolidated or properly designed buildings).

Subject 4. Seismic Retrofitting Techniques

Proposed topics: Traditional retrofitting techniques for elevations and roof structures; Traditional retrofitting techniques for arches structures; outgrowths of traditional techniques by mean the introduction of innovative materials; FRP; SRG.

Evaluation system and criteria

The exam consists of a written test, which normally includes 2 numerical exercises and 2 theoretical question on the main topics covered in the course.

E-tivities are evaluated from 0 to 4 points, while 0-26 points are assigned to the written test.

Bibliography and resources

4. Materials to consult:

The educational materials (lecture notes, slides and video lessons) are available on the Unicusano platform.

5. Recommended bibliography:

- GIUFFRÈ (1990). Letture sulla meccanica delle murature storiche. Kappa Editore, Roma.
- S. MASTRODICASA (2012). Dissesti statici nelle costruzioni edilizie. Hoepli Editore.
- M. COMO (2013). Statica delle costruzioni storiche in muratura. Aracne Editore
- M. VINCI (2012). Metodi di calcolo e tecniche di consolidamento per edifici in muratura. Hoepli Editore.