



COURSE DESCRIPTION

Structural design and rehabilitation of built heritage

SSD: TECNICA DELLE COSTRUZIONI (ICAR/09)

DEGREE PROGRAMME: ARCHITECTURE AND HERITAGE (P53)
ACADEMIC YEAR 2023/2024

COURSE DESCRIPTION

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GENERAL INFORMATION ABOUT THE COURSE

INTEGRATED COURSE: U4000 - DESIGN STUDIO FOR ARCHAEOLOGICAL HERITAGE
MODULE: U4096 - Structural design and rehabilitation of built heritage
TEACHING LANGUAGE:
CHANNEL:
YEAR OF THE DEGREE PROGRAMME: I
PERIOD IN WHICH THE COURSE IS DELIVERED: SEMESTER II
CFU: 4

REQUIRED PRELIMINARY COURSES

- Design Studio for Architectural Heritage
- Integrated Course of Critical Knowledge of Architectural Heritage

PREREQUISITES

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LEARNING GOALS

The main goal of the “*Structural design and rehabilitation of built heritage*” course is to provide a proper knowledge on the structural engineering issues that arise in the structural safety assessment and retrofit of a cultural heritage construction.

Another goal is to provide students with an appropriate background to design a structural system able to achieve the standard safety and serviceability requirements, according to the different constraints given by the historical and cultural value of the construction site.

A special attention will be devoted to the problem of structural design in seismic areas and to the problem of compatibility among structural, restoration and architectural criteria.

EXPECTED LEARNING OUTCOMES (DUBLIN DESCRIPTORS)

Knowledge and understanding

Analysis methods for masonry structures

Standard and codes for the structural safety assessment and evaluation

Knowledge levels, inspection methods and confidence factors in the structural safety assessment.

The model of actions on the structures

Discrete numerical models for masonry structures

Structural retrofit techniques

Capacity models for masonry reinforced walls according to the standards and codes

Foundations of ancient buildings and retrofit techniques

Structural design of roofing systems for cultural heritage constructions exposed to climate actions

Applying knowledge and understanding

To apply different analysis methods for the safety assessment of masonry structures

To evaluate the capacity and the demand for the safety verifications

To design structural retrofit interventions according to the current technical standards and codes

To design roofing systems for cultural heritage constructions exposed to climate actions

COURSE CONTENT/SYLLABUS

Introduction to structural design: conceptual design, pre-dimensioning and safety verifications

Technical standards and codes

The Italian guidelines for evaluation and mitigation of seismic risk to Cultural Heritage

The knowledge acquisition path, inspection, and analysis methods

Visual inspection methods for the quality assessment of masonry walls: the IQM method

Verification of masonry walls

Structural retrofit methods

Design roofing systems in archaeological sites: structural issues

Design roofing systems in archaeological sites: case studies analysis

Classwork of the year: conceptual design and pre-dimensioning of a roofing system

READINGS/BIBLIOGRAPHY

1) Schodek, Daniel L. Structures. Editor: Pearson/Prentice Hall, 2004. Print.

2) Ministry for Cultural Heritage and Activities. Guidelines for evaluation and mitigation of seismic risk to Cultural Heritage. 2007. Editor: Gangemi.

TEACHING METHODS OF THE COURSE (OR MODULE)

The course is held in one semester and involves frontal lectures, according to the content of the Syllabus, together with classwork activities, aimed to develop the classwork of the year. At least two field survey will be organized. The classwork of the year will be defined in agreement with the other courses of the whole Lab. Within the *“Structural design and rehabilitation of built heritage”*

the main task is to develop the structural design part of the overall architectural project.

To this end, students will, firstly, carry out a bibliography research aimed to select a set of case studies similar, from the structural engineering point of view, to the one under development and will provide a description of their structural asset in terms of dimensions, typology, construction details, construction site description and so on. This task will end with a group student presentation, during the course lesson.

In the second part of the course, students will develop the conceptual and pre-dimensioning structural design within the whole architectural project under development. They will produce technical drawings, typological schemes, etc. as well as a structural report.

EXAMINATION/EVALUATION CRITERIA

a) Exam type

- Written
- Oral
- Project discussion
- Other

In case of a written exam, questions refer to

- Multiple choice answers
- Open answers
- Numerical exercises

b) Evaluation pattern

The final mark will be weighted among the CFU of each Lab module, that is: Architectural design for archaeology 33%; Archaeological conservation 22%; Structural design and rehabilitation of built heritage 22%; Exhibition design and museography 22%