

## Synthetic description

Considering the principles of historical buildings conservation, the Course will provide critical and technical tools for the elaboration of a project of reinforcement of historical buildings, with particular attention to traditional building materials and constructive techniques and to methods of reinforcement in seismic areas. In particular, students will learn the criteria for the correct interpretation of the static behaviour of historical buildings, of the main causes of structural damage, and also the main techniques for strengthening these buildings. The methods for historical building reinforcement are conceived within a critic and technical process which, starting from a rigorous study of the building itself, involves the identification of damage and the related reasons which caused them, and the evaluation of technical interventions, also in relation to compatibility with the existing structures.

## Course entry requirements

Students must have a Bachelor Degree which includes the following subjects: Statics, History of Architecture and History of Traditional Building Materials. Basic knowledge on Architectural Drawing and Descriptive Geometry are also essential prerequisites for the course.

## Course programme

The course is organized in lectures, seminars and practical work to verify the evolution of the project which the professor assigns to each group of students; the course, in fact, includes a practical part which consists of the elaboration of a project of reinforcement of the assigned case study.

### **Course of Strengthening of Historic Buildings (8 ECTS)**

- *Basic knowledge on Traditional Techniques for Construction and Repair;*
- *Legislation (with particular reference to rules on historic buildings in seismic areas);*
- Analyses and interpretation of structural damage: cracks, deformations, collapse;
  - a) foundations
  - b) masonry
  - c) horizontal structures (vaults, slabs, roofs)
- *Techniques of interventions*
  - a) foundations
  - b) masonry
  - c) horizontal structures (vaults, slabs, roofs)
- provisional reinforcements

### Expected results

The main theme of the subject is the project of reinforcement and repair of historic buildings. The aim of the course is to give the student a scientific method for conservation of historic buildings. The first phase is attentive research on the history of the building and scrupulous surveys and measurements, studying structural techniques and building materials, but also degradation and stress in relation to the historic transformation of the building itself. Preliminary analyses and interpretations of structural damage are the base for a project which, fully respecting the cultural aspects of conservation and the applicable legislation, justifies the technical choices.

### Student's independent work

During the course, students will elaborate a project which deals with the reinforcement and/or repair of a historic building, selected in agreement with the professor. The different phases of the project, from survey to technical decisions, are verified by the professor during the hours dedicated to practical work.

### Testing and exams

Students' learning is tested through a completed project, and is a basic requisite for admission to the final exam. During the course, students are also tested through continual assessment (multiple-choice, short essays). The final exam is based both on topics studied during the lectures and the bibliography specified in the program. For project work, the students can present in groups, but the final exam is individual. Starting from theoretical aspects, through to technological questions, the exam covers all phases of the project.

### Suggested reading materials

- A. BELLINI (edit by), *Tecniche della conservazione*, Franco Angeli editore, Milano 1986
- G. CARONARA (edit by), *Trattato di restauro architettonico*, Utet, Torino 1996, Voll. I-IV; Voll. V-VII (Impianti); Voll. IX-XI (ed aggiornamenti)
- S. DI PASQUALE, *L'arte del costruire. Tra conoscenza e scienza*, Marsilio, Venezia 1996
- A. GIUFFRÈ, *Lecture sulla meccanica delle murature storiche*, Ed. Kappa, Roma 1991
- E. GIURIANI, *Consolidamento degli edifici storici*, Utet, Torino 2012
- S.F. MUSSO (edit by), *Tecniche di restauro. Aggiornamento*, Utet, Torino 2013.
- B.P. TORSELLO, S.F. MUSSO (edit by), *Tecniche di restauro*, Vol. I-II, Utet, Torino 2003

Other references and resources are given during the lectures.



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