

Degree course	One cycle degree course Architecture-Restoration
Course code	1000374 Energy Requalification of Buildings
Lecturer	Rosario Francesco Nicoletti
Course name	Architectural Restoration Laboratory
Disciplinary area	08 Engineering - Architecture
Disciplinary field of science	Ing Ind 11
University credits - ECTS	2
Teaching hours	20
Course year	2nd
Semester	2nd

#### Synthetic description

Architectural Restoration is a complex subject, which gathers together founding theoretical issues and high-tech aspects. Therefore, the Architectural Restoration Laboratory includes subjects dealing with theories, and topics dealing with techniques of restoration. The Course has the purpose of providing the basic elements to understand the main theories of restoration over the centuries and, at the same time, the critical and technical tools for the elaboration of a project of conservation. On the one hand, the theoretical basics of restoration are taught, on the other hand, students learn a method for historic building conservation.

In an advanced step of the course it's expected that the conservation design will consider the subject of retrofit technical installation related to the roof aimed to its renovation.

During the design exercise an analysis will be focused to the existing and retrofit water disposal system, as well as the roof thermal insulation system.

The roof thermal insulation will be analyzed in the global energy balance of the building, so the student will get a specific awareness related to the relevance of this subject.

#### Course entry requirements

Students need to have knowledge of History of architecture and traditional building materials. Basic knowledge on Architectural Drawing and Descriptive Geometry are essential prerequisites for the course as well as basic principle of applied physic.

#### Course programme

The course is organized in lectures and a practical integrated work, conservation and energy requalification, 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 conservation, consolidation and re-use of a historic building.

### **Course of Energy requalification of buildings**

The lectures start from the theoretical aspect of applied physic of the building and European rules related to energy efficiency of the buildings.

Then in a further step through the elaboration of an energy requalification project related to an existing building. At the same time, the theoretical part related to the national rules for energy efficiency of the building is necessary to understand the main objectives of the course and how to increase the energy efficiency of historical building.

The study of project will be done by a specific software application and the renewable energy contribution will be considered.

The final exams will be focused about the strategy adopted to improve comfort, reliability and energy efficiency of the building.

Themes for practical work:

Practice deals with the study of a historical building, through historic and archival documentation and measurement. A first phase is followed by the recording of building material degradation and structural damage, and the study of the measures for conservation.

the project of re-use, with the definition of the technological adaptations, and the study of historic buildings accessibility concludes the practice that will consider also the retrofit works to improve energy efficiency and comfort similar of the standard building.

### **Expected results**

The main theme of the subject is a proper improvement of energy efficiency and comfort of the historic building respecting at the same time their proper conservation. The aim of the course is to give the student a scientific method for conservation of historic buildings.

We start with an 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. This intimate knowledge of the building governs and justifies interventions for conservation, improveand a compatible re-use of the building.

Particular attention is given to historic building accessibility, also in relation to the national law for architectural features barring advance to the handicapped. This aspect, in fact, is considered an important part of the project of re-use.

The project exercise is aimed to provide students the basic technical knowledge related to the retrofit technical installations of the roof, and in general to the following arguments:

designing of the roof rain water disposal system, optimization of thermal resistance for the roof system, thermo-hygrometric environmental phenomena applied to building envelope.

### **Course structure and teaching**

Dipartimento Patrimonio, Architettura, Urbanistica

### Course of Energy Requalification

lectures (*hours per year*): 12

Practice (*hours per year*): 8

#### Student's independent work

During the course, students elaborate a project which deals with the conservation of a historic building selected in agreement with the professor. The different phases of the project, from survey to requalification project, are verified by the professors 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 lessons 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

### Course of Energy Requalification

"Termodinamica e Trasmissione del Calore" Yunus Cengel - McGraw-Hill. Quarta edizione Paola Ricciardi

"Riqualificazione Energetica degli Edifici" – Attilio Carotti - Utet

