



Code: ICAR/10

Credits: 9

Matter: Sustainable Construction Techniques

Main language of instruction: Italian

Other language of instruction: English

Teaching Staff

Head instructor

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Introduction

1. Objective of the course:

The course aims to provide the theoretical and operational tools to learn, understand and control the techniques and construction solutions for sustainable construction with particular attention to the energy performance of the building envelope, to the levels of indoor and outdoor comfort, to bioclimatic design, innovative materials and energy-environmental certification tools for buildings. The activities associated with the course develop the skills necessary to formulate the notions of technical feasibility and environmental compatibility that guide the design applications.

Objectives

2. Course Structure:

The course is organized in nine modules. The course is developed through the prerecorded audio-video lessons which together with slides and lecture notes make up the study materials available on the platform. Self-assessment tests, of an asynchronous type, are then proposed, which accompany the pre-recorded lessons and allow students to ascertain both the understanding and the degree of knowledge acquired of the contents of each of the lessons. The course of construction techniques for sustainable construction includes 9 training credits. The total study load for this teaching module corresponds to approximately 225 hours divided as follows: approximately 175 hours for viewing and studying the videotaped material (20 hours videotaped of theory and 5 hours of exercises). About 50 hours of Interactive Teaching for the development and delivery of 4 E-tivity. About 5 hours of Interactive Teaching for the self-assessment tests. It is advisable to

distribute the study of the subject uniformly over an 11-week period by dedicating between 25 to 35 hours of study per week.

Competencies:

- knowledge and understanding of sustainable building techniques, also deriving from the process of technological innovation
- applying knowledge and understanding of the skills acquired for the design of sustainable construction elements through the development of a project.
- knowledge and understanding to identify the construction and procedural aspects of the sustainable architecture project by choosing the methods of analysis suitable for a detailed study of performing technological systems referring to the executive project of an eco-compatible building.
- knowledge and understanding a correct and understandable scientific language that allows the scientific and technical knowledge acquired in the field of construction techniques for sustainable construction to be expressed clearly and unambiguously. These communication skills are verified through e-tivity and the written verification test.

Syllabus

3. Programme of the course:

Module 1 - Sustainability in the design and construction processes of architecture

in which the following topics are addressed: Presentation of the course: structure, content and methodological notes. Definition of sustainability and sustainable construction. The principles of sustainable architecture. The assessment of environmental impacts caused by buildings. Scoring methods. Eco-budgets. Life Cycle Assessment. Life Cycle Sustainability Assessment. Environmental Product Declaration. LCA applications in construction. Certify sustainability in construction. Urban sustainability on an urban scale.

Module 2 - Climate and Energy where the following topics are addressed: Air and climate. The role of the construction sector on climate change. Mitigation and adaptation policies and measures. Italian and EU legislation on energy efficiency. High energy performance buildings.

Module 3 - Building-environment-man interaction in which the following topics are addressed: The building thermal system. Thermal reference parameters. Insulator position. Thermo-hygrometric comfort. Air quality (IAQ). Acoustic comfort.

Module 4 - Sustainable construction techniques (urban outdoor spaces) in which the following topics are addressed: Urban outdoor spaces. Guidelines for environmental control interventions. Site analysis. Definition of environmental quality requirements. Environmental quality assessment. Evaluation of thermal well-being in outdoor spaces. Technologies for the control of thermohygrometric

comfort. Windbreak barriers. The micro-urban green design. Techniques of recovery and use of rainwater

Module 5 - Sustainable construction techniques in which the following topics are addressed: Building envelope. The components of the casing. The building envelope as a modulator of energy flows. S / V form factor, distribution and ratio of opaque and transparent surfaces. Heating with active and passive systems. Systems for modulating light radiation by reflection. The selective and low-emissivity glasses. Installations for the production of energy using renewable sources. Innovative dry stratified technologies.

Module 6 - Materials and resources in which the following topics are addressed: The role of materials in the life cycle. Recyclability, biodegradability and disposal methods at the end of the cycle. Insulating materials. Phase change materials. Heating glasses. Static sun protection glasses. Dynamic shielding systems. Dynamic glasses. Photocromici glasses. Thermochromic glasses. Photovoltaic glasses. Bioadaptive glasses.

Module 7 - The energy requalification of buildings where the following topics are addressed: Strategies for the energy efficiency of buildings. Interventions on balconies and loggias. Interventions on vertical surfaces. Interventions on horizontal surfaces. Window interventions. Roofing interventions. Examples of redevelopment and energy efficiency of existing buildings.

Module 8 - Green Building in detail: illustration of case studies in which the following topics are addressed: Efficiency and efficacy of envelope solutions. Technical solutions for vertical opaque closures. Technical solutions for horizontal opaque closures. Technical solutions on existing buildings. Technical solutions for horizontal transparent closures. Technical characteristics and environmental profile of materials.

Module 9 - Development of the design theme in which the following topics are addressed: Description of the design theme. Description of performing technological systems. Preparation of cards with executive details. Description of the project documents.

Evaluation system and criteria

The exam usually consists of conducting a writing test to ascertain the student's level of preparation, as well as his / her skills in analyzing and reworking the concepts acquired. The written test involves the conduct of 7 theoretical open-answer and 3 written-graphic questions aimed at ascertaining the student's ability to carry out the analysis of the functional stratifications of sustainable technical solutions. It is advisable for the student to finish and deliver the project paper (e-tivity 4) at least 15 days before the date on which he intends to take the exam, as the exam will also focus on the discussion of the main issues addressed during the

drafting of the project . The examination is therefore subject to the delivery of the design document. The theoretical open-ended questions represent 70% of the overall mark of the test, the written questions 10%, the progress of the project (activity 4) the remaining 20%.

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:

- M. Casini, "SMART BUILDING. Involucro 2.0", Roma, DEI Tipografia del Genio Civile, 2014
- I. Oberti, "Prodotti edilizi per edifici ecocompatibili", Maggioli Editore, 2014
- G. Cammarata, "Progettare e riqualificare per l'efficienza energetica", Maggioli Editore, 2013