

Course guide

820768 - RIEEE - Efficiency and Rehabilitation in Building Energy

Last modified: 04/06/2024

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 758 - EPC - Department of Project and Construction Engineering.

Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Optional subject).
MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Optional subject).
MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2022). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Eva Cuerva Contreras (eva.cuerva@upc.edu)

Others: Eva Cuerva Contreras

PRIOR SKILLS

Basic knowledge of heat transfer. Basic knowledge of elements and systems that form the building: types of construction and facilities. Basic knowledge of language construction. Identification of construction plans at a basic level.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEMT-5. Employ technical and economic criteria to select the most appropriate thermal equipment for a given application, dimension thermal equipment and facilities, and recognise and evaluate the newest technological applications in the production, transportation, distribution, storage and use of thermal energy.

Transversal:

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.

CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.

TEACHING METHODOLOGY

Teaching methodology:

Lectures, exhibitions and participatory classes. The exhibition will combine knowledge from professors of Master's classes or by external people invited to lecture with the collective resolution of exercises, conduction of debates and group dynamics with the professor and other students in the classroom.

Completion of reduced scope work (TR). Learning by conducting individual or group work of reduced complexity or length, applying knowledge and presenting the results in a report.

Completion of broad scope work (TA). Learning based on the design, planning and realisation of a group project or work of full complexity or length, applying and expanding knowledge and writing a report on the approach, results and conclusions.

LEARNING OBJECTIVES OF THE SUBJECT

Objectives

The Directive 2002/91/CE requires member states to establish a procedure for energy certification, aimed at both new and existing buildings, to make objective information on the energy consumption of the building available to the buyer or tenant so as to assess and compare their performance. The building sector is a sector clearly moving in the direction of saving energy and energy efficiency. Energy efficiency is a sign of only developed economies and those countries that have achieved a certain level of development can take care of improvement.

The main objective of the course is to introduce students to the procedures of energy certification that open up a range of business opportunities related to the concept of Rehabilitation and Energy Certification.

Learning outcomes

Upon completing the course, the student should:

- Understand and be able to apply the concepts and technologies that affect energy efficiency in buildings.
- Know how to apply the DBHE of the Technical Building Code and the Royal Decree of Certification of Energy Efficiency of Buildings in the construction sector.
- Know how to get the set of tools available to obtain the Certification of Energy Efficiency of Buildings according to RD 235/2013 for New and Existing Buildings.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	23.08
Self study	85,0	65.38
Hours small group	15,0	11.54

Total learning time: 130 h

CONTENTS

Introduction

Description:

Introduction to the problems associated with energy efficiency in buildings. Energy rehabilitation of buildings. European, Spanish, Catalan regulatory framework.

Specific objectives:

Understand the role of buildings in energy consumption and overall impact on them through energy efficiency.
Understand the current legislation in the field of energy efficiency of buildings and how to apply the Energy Certification of Buildings in the field.

Related activities:

Bioclimatic Buildings Exercise

Full-or-part-time: 14h

Theory classes: 4h

Laboratory classes: 2h

Self study : 8h



Thermal envelope and building systems

Description:

Definition of the thermal envelope of the building. Presentation and technical description of the various building systems that can be found in a building and compositions for their common thermal envelope. Presentation of the Limitation of Energy Demand in Buildings document (DB HE1 of CTE).

Specific objectives:

Know the building systems and compositions for the most common thermal envelope of the building. Be able to calculate and/or estimate by visual inspection of the compositions of the different elements of the exterior of a building.

Be able to calculate the basic parameters (U, FS...) affecting the thermal transmission of the building. Be able to apply the DB HE1 of CTE.

Related activities:

Practice of building systems

Application of DB HE1

Full-or-part-time: 22h

Theory classes: 8h

Laboratory classes: 2h

Self study : 12h

Energy efficiency in facilities

Description:

Presentation of tools and procedures to improve the energy efficiency of the building and optimise the energy consumption through energy efficiency of their facilities (air conditioning, sanitary hot water, lighting and equipment).

Specific objectives:

Know the fundamental parameters of the facilities that affect energy efficiency. Be able to propose improvements in facilities that improve their energy consumption.

Know the regulations related to energy efficiency of the facilities and be able to apply it.

Full-or-part-time: 7h

Theory classes: 2h

Self study : 5h

Energy certification of existing buildings

Description:

Presentation of the process of energy certification of existing buildings, as well as the tools available to carry it out (both through the Simplified Option, CE3 and CE3X, the General Option, Calener VYP and Calener GT).

Specific objectives:

Know the different tools available to the simplified energy certification of existing buildings.

Be able to apply in a practical case the tool of certification of existing buildings through the Simplified Option, CE3X.

Related activities:

CE3X Practical Exercise

Course project (TR and TA)

Full-or-part-time: 82h

Theory classes: 16h

Laboratory classes: 6h

Self study : 60h



GRADING SYSTEM

$$NF = 0,35*NTR+0,35*NTA+0,3NPRC$$

NF: Final grade

NTR: Reduced scope work grade

NTA: Broad scope work grade

NPRC: Participation and Performance Evaluation during the Course

EXAMINATION RULES.

There will be two blocks of practical assignments to be completed during the course (TR and TA). The first block will be carried out individually, while the second will be done in groups of two or three students. The completed assignments will be presented orally in front of the entire class. In the case of group work, during the presentation, both members of the group must participate equally and respond to any questions posed by the instructors.

Throughout the course, practical exercises will be proposed to solve (either individually or in groups of 2), which will be submitted via Atenea and will contribute to the NPRC grade.