Universidad Zaragoza

Academic Year/course: 2022/23

66367 - Energy efficiency in buildings

Syllabus Information

Academic Year: 2022/23
Subject: 66367 - Energy efficiency in buildings
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 636 - Master's in Renewable Energies and Energy Efficiency
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, problem-solving sessions, visits to buildings, computer practice sessions and guided assignments.

In the **lectures**, the fundamentals and basic concepts and the bases of its application to practical cases are exposed.

In the **practice sessions**, problems and typical case studies are solved in order to illustrate the application of theoretical concepts.

In the **computer practice sessions** more complex practical cases than those presented on class are solved, through the use of various computer tools, with the assistance and help of the teacher during the session. Students will have instructions explaining the activities to do for each practice.

The **guided assignments** will be carried out individually or in small groups, as an extension and extension of the practice sessions, solving larger problems than those solved in class. Thus, the autonomous learning of the students is encouraged. Students will be provided with the necessary tools for the development of these tasks. Although the work to be performed is intended as an autonomous activity, it will be presented during the classroom sessions. These assignments will be supervised by the teacher, who will solve any doubts that may arise during its development.

In **tutorials**, the students can voluntarily ask the teacher any doubts by attending to the teacher's office, on-line or by email. Students have a schedule for tutorials.

Finally, considering the students' time availability, **visits** to various buildings and facilities of interest may be scheduled throughout the semester.

4.2. Learning tasks

The course includes the following learning tasks.

Face-to-face activities:

- A01 Lectures (40 hours).
- A02 Problem and case solving (4 hours).
- A03 Laboratory sessions (14 hours).
- A04. Special practices: visits to buildings and/or manufacturers of air conditioning equipment (2 hours).
- A08 Assessment (6 hours).

Non-face-to-face activities:

- A05 Guided assignments (10 hours).
- A07 Autonomous work (74 hours).

The indicated hours are for guidance and will be adjusted depending on the academic calendar. At the beginning of the course, lecturers will communicate the schedule of practice sessions, which will be set according to the syllabus.

4.3. Syllabus

The course will address the following topics:

- Thermal envelope of a building. Constructive solutions and thermal bridges. Calculation of energy losses and air infiltration.
- Regulations on energy efficiency of buildings: Technical Building Code - Basic Document on Energy Saving.
- Energy balance in a building: gains and losses. Calculation of the thermal demand of a building.
- Efficient heating, ventilation and air conditioning (HVAC) systems. Introduction to HVAC systems. HVAC in buildings: air conditioners, terminal elements. Domestic hot water (DHW), auxiliary elements. Air diffusion systems.
- Energy certification of buildings. Use of the Lider-Calener Unified Tool (HULC).
- Energy audits in buildings.
- Energy simulation of buildings: basic concepts and simulators. Use of the computer tool DesignBuilder.
- Bioclimatic architecture and passive strategies for energy saving in buildings. Passive House Standard. Nearly Zero Energy Buildings (NZEB).
- Fundamentals of bioconstruction.
- Green building certification systems: LEED and VERDE.
- Measuring equipment for buildings. Introduction to home automation and intelligent control systems.
- Urban district networks.
- Sustainable urban planning: basic concepts.

Practice sessions

- Practice 1. Resolution of practical cases with the Lider-Calener unified tool, HULC (4 sessions of 2 hours each: 8 hours, in total).
- Practice 2. Solving practical cases with a building energy simulation tool, DesignBuilder (3 sessions of 2 hours each: 6 hours in total).

4.4. Course planning and calendar

The subject is taught in the second semester, whose academic calendar can be consulted on the EINA website (https://eina.unizar.es/calendarios).

The lecture and practice sessions follow the schedule established by the EINA, available at the following link: https://eina.unizar.es/horarios, at a rate of 3 hours per week.

On the first day of class, the professor will inform about his tutoring hours and will present the objectives, contents and the assessment method of this subject.

The communication between students and the teacher will be managed through the Moodle platform of the University of Zaragoza (http://moodle.unizar.es). In it, the teacher will publish the main materials of the subject (notes, questions, practices, works, etc.), make announcements and notifications to the students in relation to the scheduled activities (practices, works, visits, etc.), the due-date to deliver the works, etc. Likewise, the sending of the reports corresponding to the various learning activities will be done through Moodle.

The dates of the official exams are set by the EINA and can be consulted through the following link: https://eina.unizar.es/examenes.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=66344