

# Course guide

## 310402 - 310402 - Advanced Facilities

**Last modified:** 24/11/2023

**Unit in charge:** Barcelona School of Building Construction  
**Teaching unit:** 758 - EPC - Department of Project and Construction Engineering.  
753 - TA - Department of Architectural Technology.

**Degree:** MASTER'S DEGREE IN ADVANCED BUILDING CONSTRUCTION (Syllabus 2014). (Compulsory subject).

**Academic year:** 2023    **ECTS Credits:** 5.0    **Languages:** Spanish

### LECTURER

---

**Coordinating lecturer:** Tarragona Roig, Joan

**Others:**

### REQUIREMENTS

---

No additional prerequisites are required beyond the access degree's.

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

---

**Specific:**

6. Carry out the modelization of physic processes and the resolution according to numeric methods.
7. Define the characteristics of the sismic action and apply the present regulations to the sismic calculation of structures in building construction.

**Generical:**

8. Developpe and/or apply ideas with originality in a context of investigation, identifying and formulating hypothesis or innovative ideas and submit them to a objectivity, coherence, and viability test.
9. Provide to the student the capacity to apply the knowledge acquired in the resolution of complex problems in any sector of the building construction.

**Transversal:**

10. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
11. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

**Basic:**

2. Possess and understand knowledge which provide a basis or opportunity to be original in the development and/or application of ideas, usually in a context of research.
3. The students must be able to apply the acquired knowledges and their ability of resolution of problems in new or little known environments inside more wide environments (or multidisciplinary) related with their study field.
4. The students must be able to integrate knowledges and front to the complexity to formulate opinions from an information which, being incomplete or limited, includes reflections about the social and ethical responsibilities linked to the application of their knowledges and opinions.
5. The students must be able to communicate their conclusions and the knowledges and ultimate reasons which support to specialised and non-specialised audiences in a clear mode and without ambiguities.
1. The students must possess the learning abilities which allow them to continue studying in a way which should be to a large extent self-directed and autonomous.

## TEACHING METHODOLOGY

The teaching methodology includes:

- Participatory exhibition classes
- Face-to-face sessions of practical work
- Independent study work

In the theory classes, the teachers will introduce the theoretical basis of the concepts, methods and results and illustrate them with suitable examples to facilitate understanding.

In practical classes (in the classroom), teachers guide students in the application of theoretical concepts to solve problems, always using critical reasoning. The teaching staff suggests that students solve exercises inside and outside the classroom, to promote contact and use the basic tools needed to solve problems.

The students, autonomously, must work on the materials provided by the teachers and the results of the exercise/problem sessions, in order to fix and assimilate the concepts. The teachers make the study plan and monitor the activities.

## LEARNING OBJECTIVES OF THE SUBJECT

Introduce the necessary theoretical and practical knowledge so that the student can:

- Know the totality of the facilities in buildings, whether residential, commercial, sports, hotel, etc.
- Being able to define the energy needs of a building based on its characteristics.
- Be able to design the most appropriate type of advanced installation based on its use and its energy saving capacity.
- Know how renewable energy generation facilities work.
- Be able to design a building management system.

## STUDY LOAD

| Type               | Hours | Percentage |
|--------------------|-------|------------|
| Hours large group  | 17,5  | 14.00      |
| Hours medium group | 5,0   | 4.00       |
| Self study         | 90,0  | 72.00      |
| Guided activities  | 7,5   | 6.00       |
| Hours small group  | 5,0   | 4.00       |

**Total learning time:** 125 h

## CONTENTS

### Module 1: Introduction to Advanced Building Facilities

#### Description:

- Introduction
- Advanced systems for thermal comfort and air quality
- Advanced energy demand modeling techniques
- Advanced description of the water cycle
- Advanced telecommunications systems

**Full-or-part-time:** 41h 30m

Theory classes: 6h

Practical classes: 1h 30m

Laboratory classes: 1h 30m

Guided activities: 2h 30m

Self study : 30h



## Module 2: Advanced air conditioning systems and decarbonized energy generation

### Description:

- Introduction
- Air-to-water heat pumps
- Water-to-water heat pumps
- District heating and cooling networks
- 5th generation cooling and heating networks
- Decarbonisation through renewable energies
- Energy communities
- Technical and economic feasibility study

**Full-or-part-time:** 62h 15m

Theory classes: 8h 30m

Practical classes: 2h 30m

Laboratory classes: 2h 30m

Guided activities: 3h 45m

Self study : 45h

## Module 3: Advanced building management

### Description:

- Introduction
- Energy management, efficiency and savings
- Sustainable management and reuse of water
- Management of thermal comfort, acoustics, light and air quality
- Automation and smart control
- Building Management Systems (BMS)
- Facility maintenance management

**Full-or-part-time:** 21h 15m

Theory classes: 3h

Practical classes: 1h

Laboratory classes: 1h

Guided activities: 1h 15m

Self study : 15h

## GRADING SYSTEM

The grading system consists of:

- Final exam (20%)
- Works and activities 1 (40%)
- Works and activities 2 (40%)

## BIBLIOGRAPHY

### Basic:

- CTE-DB-HE (Codi Tècnic de l'Edificació - Document Bàsic - Estalvi d'Energia).
- RITE (Reglament d'instal·lacions tèrmiques en edifici) i les seves instruccions tècniques).

## RESOURCES

### Other resources:

Notes given in class and material provided through ATENEA.