

# Course guide 220243 - 220243 - Smart Buildings

**Last modified:** 25/07/2025

**Unit in charge:** Terrassa School of Industrial, Aerospace and Audiovisual Engineering **Teaching unit:** 758 - EPC - Department of Project and Construction Engineering.

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

Academic year: 2025 ECTS Credits: 5.0 Languages: Catalan

#### **LECTURER**

**Coordinating lecturer:** Tejedor Herran, Blanca

Others:

#### **PRIOR SKILLS**

Basic knowledge of building facilities is recommended

### **DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES**

#### Specific:

- 2. Proper knowledge for the design, construction and management of buildings and their surroundings, especially in the field of industrial engineering.
- 4. Acquire the knowledge necessary for the design, implementation, verification and control of facilities, infrastructure and urban development in the field of industrial engineering.

## **TEACHING METHODOLOGY**

The course is structured in three parts: theoretical lessons, practical lessons and project. In the theoretical lessons, the lecturer introduces concepts and methods. To facilitate their understanding, the subject contains several exercises and examples. In the practical lessons, the lecturer guides students in the application of theoretical concepts to solve problems, always using critical reasoning. Students' project is divided into three deliverables according to theoretical lessons.

It should be noted that all teaching material is in English, since it is an area where the specific terminology of most concepts does not have a literal translation into Catalan or Spanish.

## **LEARNING OBJECTIVES OF THE SUBJECT**

Introduce the student to the concepts of design, construction and management of smart buildings and related systems.

## **STUDY LOAD**

Туре	Hours	Percentage
Hours small group	15,0	12.00
Self study	80,0	64.00
Hours large group	30,0	24.00

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Total learning time: 125 h

## **CONTENTS**

### **Introduction to smart buildings**

### **Description:**

Introduction to the theoretical framework of intelligent buildings.

- Comparative analysis between smart building and green building
- Case studies and real examples
- How to evaluate needs of building systems (i.e. types of facilities, legislation, tools etc.).

#### **Specific objectives:**

Provide the basis for assimilating the fundamental concepts of the course

#### Related activities:

Short-exercises

1st delivery of the project

**Full-or-part-time:** 35h Theory classes: 10h Laboratory classes: 5h Self study: 20h

#### Smart systems in buildings

### **Description:**

The second module includes:

- Conceptualization of the "Volere Method"
- Creation of possible scenarios
- Identification and definition of user's requirements
- Resolution of case studies

#### Specific objectives:

The student should determine the requirements of design, construction and management of the building. The goal is to achieve the interaction between facilities and users in order to reduce the impact in terms of economy - energy - environment

## **Related activities:**

Short-exercises

2nd delivery of the project

**Full-or-part-time:** 45h Theory classes: 10h Laboratory classes: 5h Self study: 30h

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#### The framework for integrated building systems

### **Description:**

Proposal of strategies for integrated building systems

- Physical and functional dimensions
- Integrated systems and interfaced systems
- Network architecture
- Communication protocols (KNX, BACNET, MODBUS etc.)
- Type of cabling between devices
- Data management at urban scale
- Monitoring and control of building systems
- Economy

## Specific objectives:

The student should design and integrate smart systems to reduce: operational costs, environmental impacts, energy demands. This module pretends to propose a buuilding management system with its respective sensors and actuators to satisfy user's requeriments that were defined in Module II

#### Related activities:

Short-exercices
3rd delivery of the project

**Full-or-part-time:** 45h Theory classes: 10h Laboratory classes: 5h Self study: 30h

## **GRADING SYSTEM**

The qualification system is focused on short activities and a final project. The activities are performed during the session or developed at home (25%). The project is often based on a real case study (75%) and it can be performed individually or in group (depending on the scope of the project or number of students). To ensure a good execution, the project is divided in three deliverables over the course (NP1 = 25%; NP2 = 25%; NP3 = 25%).

#### **EXAMINATION RULES.**

Attendance is mandatory (>80% of classes)

## **BIBLIOGRAPHY**

#### Basic:

- Sinopoli, Jim. Smart buildings systems for architects, owners and builders [on line]. Oxford: Butterworth-Heinemann, 2010 [Consultation: 03/10/2022]. Available on: <a href="https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781856176538/smart-building-systems-for-architects-owners-and-builders">https://www-sciencedirect-com.recursos.biblioteca.upc.edu/book/9781856176538/smart-building-systems-for-architects-owners-and-builders</a>. ISBN 9781856176538.

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