GENERAL INFORMATION

Course information	
Name	Introduction to Smart Systems
Code	DEA-OPT-613
Degree	MII, MIT
Year	2
Semester	Fall
ECTS credits	3 ECTS
Type	Elective
Department	Electronics, Control Engineering and Communications
Area	
Coordinator	Álvaro Sánchez Miralles

Lecturer	
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Lecturer	
Name	
Department	
Area	
Room	
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Tutorial timetable	

DETAILED INFORMATION

Contextualization of the course

Contribution to the professional profile of the degree

The purpose of the course is to provide students with a basic overview of the smart systems and their applications. It deals with smart grids, smart cities and smart industry.

By the end of the course, students will:

- Know the basic features of a smart system.
- Have practical experience dealing and designing some applications related with smart grids, cities or industry.

Prerequisites

No prerequisites.

CONTENTS

Contents
CHAPTER 1: INTRODUCTION TO SMART SYSTEMS
• Features • Architecture • Applications
CHAPTER 2: DATA MODELLING AS A KEY PART IN SMART SYSTEMS
• Context • Main schemas: conceptual, logical and physical.
CHAPTER 3: SMART GRIDS & ENERGY
• Sensors & actuators • Intelligence • Services provided in smart grids
CHAPTER 4: SMART CITIES
• Sensors & actuators • Intelligence • Services provided in smart cities
CHAPTER 5: SMART INDUSTRY 4.0
• Sensors & actuators • Intelligence • Services provided in the smart industry

COMPETENCES AND LEARNING OUTCOMES

Competences and Learning Outcomes

Competences

General Competences

CG3. The capability of adapting to new theories, methods and changing engineering situations based on a sound technical training.

CG4. The capability of solving problems with personal initiative, efficient decision making, critical reasoning and transmitting technical information in the engineering world.

CG5. The capability of conducting measurements, calculations, assessments, studies, reports, planning, etc.

CG10. The ability to work in a multilingual and multidisciplinary environment.

Basic Competences

Specific Competences

Learning outcomes

RA1. The student understands the basic principles behind Smart systems.

RA2. The student has a basic and practical experience in researching about Smart systems.

RA3. The student has a practical experience in developing conceptual data models.

TEACHING METHODOLOGY

General methodological aspects

Each session will combine theory and practice. The teacher will explain the basics of the subject and will go in depth in the more important issues with illustrative examples. The students will be grouped in pairs in order to put in practice the proposed methods and techniques in a collaborative way.

In-class activities

1. **Lectures and problem-solving sessions (10 hours)**: The lecturer will introduce the fundamental concepts of some topics, along with some practical recommendations, and will go through worked examples to support the explanation. Active participation will be encouraged by raising open questions to foster discussion and by proposing short application exercises to be solved in class either on paper or using a software package.
2. **Smart subject exposition (8 hours):** students are grouped in teams of 2 people. After a preliminary research about one smart theme (smart grids, smart cities or smart industry), the team has to make a presentation in the class.
3. **Project development (7 hours):** students are grouped in teams of 2 people. They have to design the solution of a real problem of a smart system, proposed by the lecturer.
4. **Assessment (5 hours).**

Off-class activities

1. **Personal study** of the course material and resolution of the proposed exercises (20 hours).
2. **Research and development** of one smart theme (30 hours).
3. **Development of the final project** (10 hours).

ASSESSMENT AND GRADING CRITERIA

Assessment activities	Grading criteria	Share
Data modeling exam	• Understanding of the theoretical concepts. • Application of these concepts to problem-solving.	30%
Content & exposition of the smart subject	• Depth of analysis and understanding of the research work developed. • Quality of the exposition.	20%
Final project development	• Quality of the project design • Quality of the exposition	40%
Final exam	• Understanding of the theoretical concepts. • Application of these concepts to problem-solving.	10%

GRADING AND COURSE RULES

Grading

Regular assessment

- **A1. Data modeling exam: 30%**
- **A2. Content & exposition of the smart subject: 20%**
- **A3. Final project development: 40%**
- **A4. Final exam: 10%**

Retakes

There will be only a final exam which will be the 100% of the grade. It will include both some practical questions and theoretical concepts.

Course rules

- Class attendance is mandatory according to Article 93 of the General Regulations (Reglamento General) of Comillas Pontifical University and Article 6 of the Academic Rules (Normas Académicas) of the ICAI School of Engineering. Not complying with this requirement may have the following consequences:
    - Students who fail to attend more than 15% of the lectures may be denied the right to take the final exam during the regular assessment period.
    - Regarding laboratory, absence to more than 15% of the sessions can result in losing the right to take the final exam of the regular assessment period and the retake. Missed sessions must be made up for credit.
- Students who commit an irregularity in any graded activity will receive a mark of zero in the activity and disciplinary procedure will follow (cf. Article 168 of the General Regulations (Reglamento General) of Comillas Pontifical University).

WORK PLAN AND SCHEDULE[1]

In and out-of-class activities	Date/Periodicity	Deadline
• Mid-term exam	Week 4	-
• Final exam	Last week	-
• Lectures	Weekly	-
• Review and self-study of the concepts covered in the lectures	Weekly	-
• Project preparation	Last 3 weeks	-

STUDENT WORK TIME SUMMARY			
IN-CLASS HOURS			
Lectures	Problem solving	Assessment	Practical Session
6	4	5	15
OFF-CLASS HOURS			
Individual review of lectures	Individual practical work	Team work	Practical session elaboration
6	15	24	15
		ECTS CREDITS:	3 (90 hours)

BIBLIOGRAPHY

Basic

- Notes prepared by the lecturer (available in Moodle).

Complementary

[1] A detailed work plan of the subject can be found in the course summary sheet (see following page). Nevertheless, this schedule is tentative and may vary to accommodate the rhythm of the class.

ORIENTATIVE SCHEDULE SMART ENG

PROGRAM	6-9	13-9	20-9	27-9	4-10	11-10	18-10	25-10	3-11	8-11	15-11	22-11	29-11
Introduction to Smart System	2	1											
Data modeling as a key part in Smart systems		1	2		2								
Data modeling evaluation				2									
Smart grids & energy						2	2						
Smart cities								2	2				
Smart industry 4.0										2	2		
Project development												2	2