

Course guide

300100 - STCIOT - Sustainable Iot Architectures

Last modified: 07/10/2025

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: **Degree:** MASTER'S DEGREE IN ARTIFICIAL INTELLIGENCE FOR CONNECTED INDUSTRIES (AI4CI) (Syllabus 2025). (Optional subject).
Academic year: 2025 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Camen Delgado (i2Cat)

Others:

PRIOR SKILLS

- Basics of programming. Knowledge of Matlab.
- Basics of Electronics and Circuit Theory.
- Basics of Mathematical Analysis

TEACHING METHODOLOGY

Lectures during one week (5h-6h per day) + autonomous project

LEARNING OBJECTIVES OF THE SUBJECT

The main goal of this course is to understand the need of batteryless IoT devices and what are the new challenges of these intermittent systems. Other general aspects of IoT such as low power communication technologies or applications (including sustainable applications) will also be covered.

STUDY LOAD

| Type | Hours | Percentage |
|-------------------|-------|------------|
| Hours large group | 27,0 | 36.00 |
| Self study | 48,0 | 64.00 |

Total learning time: 75 h



CONTENTS

Sustainable IoT Architectures

Description:

This Short Term Course will focus on sustainable batteryless IoT devices. In general, IoT devices run on batteries, which are short-lived, harmful to the environment and difficult to replace in hard-to-reach areas. For this reason, batteryless devices get rid of batteries by using energy harvested from the environment and storing it in a small capacitor. However, capacitors have to deal with an intermittency behaviour which results in communication and computing challenges, which will be explained in this course. We will evaluate how different technologies such as Bluetooth Low Energy (BLE) or LoRaWAN deal with this new paradigm and what are the new takeaways.

Topics:

- Introduction to IoT
- Sensors, Actuators and Applications
- IoT Communication Technologies
- Batteryless IoT devices
- Circuit modeling
- Energy harvesting possibilities
- Batteryless Communication Challenges
- Batteryless Computing Challenges
- Conclusions

Full-or-part-time: 75h

Theory classes: 27h

Self study : 48h

GRADING SYSTEM

Final exam, short in-class quizzes and lab project report.

A project assignment to perform after the STC execution will also be evaluated.