IX.2431 - Integration of connected systems

GENERAL INFORMATION

Module: Integration of Connected Systems
Module leader: Saad EL JAOUHARI
Module ID: IX.2431
ECTS: 4
Average amount of work per student: 100 hours, including 42 hours supervised
Teamwork: yes
Keywords: IoT, design, connected systems, smart city, connectivity,

PRESENTATION

With more than 27 billion connected objects estimated to be in 2024, the Internet of Things (IoT) is now at the heart of digital evolution. Indeed, the IoT now makes it possible, daily, to provide secure and optimized services and applications, distributed on intelligent and interconnected IoT networks, with detection, action and communication capabilities.

System integration is a set of activities that create new solutions from existing elements, including:

- The integration of different components to build a new system
- The design and implementation of a new IoT-based solution
- The security of such system

This module offers a systemic and transversal vision of connected object systems. After an introduction to the fundamental concepts, a transversal project will be carried out in groups to integrate sensors and actuators, gateways, long-distance networks, the cloud and security mechanisms.

EDUCATIONAL OBJECTIVES

Prerequisites

Students must have basic knowledge on telecommunication and computer networks and the signal processing. It is useful to have computer skills, if possible, programming, and networking, to benefit from this module.

Content/Program

Concepts

- Architecture and eco-design of connected systems
- Introduction and overview of system integration
- IoT-based applications
- Standards, Architectures and Protocols
- Multi-level security

Know-how

- Design a system of connected objects that meets a specific need.
- Secure a network of connected objects.
- Data processing, analysis, and visualization.
- Implement a system of connected objects from scratch (with basic components)
- Design an electronic circuit.

Tools used

- Raspberry, Beaglebone, Arduino
- Linux, Rasbian

- GIT, Arduino IDE
- BLE, WIFI, MQTT, CoAP

PEDAGOGICAL METHODS

Learning methods

- 7 class sessions.
- 1 practical session
- 6 project coaching sessions.

Evaluation methods

- Individual written exam (50%) and project in teams of 4-5 (50%)

Language of work

Lectures, practical work and communication between teachers and students are conducted in English.

BIBLIOGRAPHY, WEBOGRAPHY, OTHER SOURCES

- https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/
- https://aws.amazon.com/what-is/iot/?nc1=h_ls

Tutorial for beginners:

- https://www.youtube.com/watch?v=09zfRaLEasY&ab_channel=ProgrammingElectronicsAcademy
- https://www.arduino.cc/en/Guide
- https://projects.raspberrypi.org/en/projects/raspberry-pi-getting-started
- https://tutorials-raspberrypi.com/