UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Design Laboratory II

2122-2-F9201P038

Aims

The aim of the course is to teach the architectural and methodological foundations of the Internet of Things (IoT) discipline through theoretical and practical lessons. The student will develop advanced skills in network communication protocols, embedded device integrations, sensors, actuators and middleware platforms for the implementation of IoT systems. During the practical lessons, different application scenarios will be tested, such as those of home automation, manufacturing, metering.

Contents

The course consists of a theoretical part and a part of exercises. The theoretical part aims at exploring the main IoT communication architectures and protocols and exploring the main technologies that define the so-called Internet of Things ecosystem (IoWT). The part of the exercises aims to deepen the IoT and IoWT ecosystem from a practical point of view: smart sensor networks, embedded systems, network protocols.

Detailed program

- Introduction to Internet of Things;
- Sensors (types of sensors, data characterization)
- IoT networks (LPWAN e LoRa, Cellular Nets e NB-IoT, Industry-specific nets)
- IoT protocols (HTTP, CoAP, MQTT, AMQP, 6LoWPAN);
- IoT platform;

- Internet of Web Things;
- Designing APIs for Things based on the REST principles;
- Implementing RESTful Things with HTTP and WebSockets (MQTT and CoAP)
- Case of study and design of IoT systems;

Prerequisites

Foundations of computer networks, internet stack, programming languages C/C++, web programming

Teaching form

Lectures and assisted exercises (at labs when students' personal PC are not available).

The practical part includes "hands on" exercizes, during which the student can realize with his own hands some application scenarios configured specifically by the teacher. This part of the activity is functional to understanding the basics of the Internet of Things and Embedded Systems. All the educational material necessary for the study of the teaching topics and the preparation of the exam will be shared through elearning tools

The course will be held in italian, except for the terms in english, which will be in english and mandatory attendance is required.

Lessons will be held in presence, unless further COVID-19 related restrictions are imposed.

Textbook and teaching resource

- *Internet of Things: A Hands-on Approach*, by Arshdeep Bahga and Vijay Madisetti, 2015, Publisher: Universities Press, ISBN: 978-8173719547 (http://www.hands-on-books-series.com/iot.html)
- *Building the Web of Things - With examples in Node.js and Raspberry Pi,* by Dominique D. Guinard and Vlad M. Trifa, 2016, Publisher: Manning, ISBN: 9781617292682 (https://www.manning.com/books/building-the-web-of-things)

- GitHub of the course (https://github.com/)
- Teachers' slides (http://elearning.unimib.it/).

Semester

Second Semester

Assessment method

The exam consists in the design and realization of project assigned by the teachers. The project will be discussed as oral presentation and teachers can ask questions about theoretical parts of the course program.

Office hours

Flavio De Paoli, Wednesday from 10 to 12

Paolo Napoletano, Monday from 14 to 16