



3-day course

# Internet of Things (IoT)

Smart connected technologies : latest trends, challenges and opportunities

September 2 to 4, 2019

## Target audience

Engineers seeking a comprehensive introduction or update in IoT technologies and applications.

## Requirements

- A basic knowledge in embedded systems design, in microcontrollers programming, in signal processing and in communication concepts. Light programming skills.
- Participants can bring their own laptop to use during the laboratory sessions.

The course will be given in English.

## Dates and schedule

- Monday, September 2, 2019
- Tuesday, September 3, 2019
- Wednesday, September 4, 2019

from 9 am to 6 pm

## Certification

A certificate of attendance will be delivered at the end of the course.

## Course venue

EPFL, Lausanne, Switzerland

## Organization

- Embedded Systems Laboratory (ESL), Institute of Electrical Engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL)

## Overview

Technological advances in miniaturized, ultra-low power embedded systems, in communication protocols and in data mining techniques are leading to disruptive innovations. Smart cities, eHealth or Industry 4.0 – Internet of Things (IoT) environments have already started to deeply modify established industries. Nowadays, every organization should seriously think about how to embrace the opportunities and challenges offered by smart connected technologies.

This 3-day course will cover three main themes : Smart platforms for edge computing in cloud-based IoT (hardware and software designs, power/energy requirements), Communication for IoT (protocols, networks, latest standards) and secure IoT applications (examples of Industry 4.0, smart homes and wearable IoT devices), including practical case studies of data collection and data analysis exercises.

## Objectives

- Get a comprehensive overview of IoT terminology, related machine learning aspects and latest trends
- Learn about the most up-to-date developments in ultra-low power IoT systems including platform designs, embedded artificial intelligence (AI) and management of energy needs
- Understand main challenges related to communication in different IoT setups
- Discover examples and case studies of application-oriented IoT designs (in medical, wellness, smart homes or Industry 4.0 applications)
- Experiments on data collection, analysis and AI techniques using different IoT systems

# Internet of Things (IoT)

Register on [www.formation-continue-unil-epfl.ch](http://www.formation-continue-unil-epfl.ch)

## Course fee

1900.- Swiss Francs  
(includes course material, lunches  
and refreshments)

10% special discount for  
contributing members of  
EPFL Alumni

## Registration deadline

June 7, 2019

## Program Director

- **Prof. David Atienza Alonso**,  
*Associate Professor of Electrical  
& Computer Engineering and  
Head of Embedded Systems  
Laboratory (ESL), EPFL*

## Instructors

- **Prof. David Atienza Alonso**,  
*Associate Professor of Electrical  
& Computer Engineering and  
Head of Embedded Systems  
Laboratory (ESL), EPFL*
- **Prof. Andreas Burg**,  
*Assistant Professor and Head of  
Telecommunications Circuits  
Laboratory (TCL), EPFL*
- **Mr. Marco Magatti**,  
*Head of New Product Innovation  
and Design, Nespresso SA*
- **Dr. Martino Ruggiero**,  
*Head of Techno Blocks Firmware,  
PMI Science & Innovation*



## Program

### DAY 1 : SMART PLATFORMS FOR IoT

- **IoT terminology and concepts** : Multi-level IoT computing, IoT platforms and nodes, embedded AI, etc. / *Case studies* : *Wearables (Shimmer, Apple Watch) and Industry 4.0 (AWS Zero Touch Kit, TI Sensor Tag, etc.)*
- **IoT nodes designs** : Microprocessor-based designs, smart vs dummy nodes, and energy management / *Case studies* : *TI Sensor Tag; Shimmer WBSN; Apple Watch, ST Jennic*
- **IoT platforms** : Cloud computing paradigm, SaaS vs PaaS vs IaaS, deep learning concept / *Case studies* : *AWS IoT, Microsoft Azure, and Google Cloud IoT*

### DAY 2 : COMMUNICATION FOR IoT

- **Basics** : Latest trends and concepts in transmission schemes and protocols standards / *Case studies* : *IEEE 802.15.4 (ULP IoT), 802.15.6 (Body Area Netw.), LoRA, SigFox, etc.*
- **Wireless communication stack** : Basic physical layer, medium-access and network layer aspects / *Case studies* : *IEEE Zigbee and BT Low-Energy; ST NFC for IoT; Emerging M2M : NB-LTE, EC-GSM, NB-CIoT, LoRa, Sigfox*
- **Communication modeling for IoT topology exploration** : *Case studies* : *Energy, performance and power comparisons between WiFi, WiFi LP, Bluetooth/LE, Zigbee, Z-Wave & En-Ocean*

### DAY 3 : APPLICATION-ORIENTED IoT DESIGNS

- **User interfaces vs. user experience in IoT products** : Exploration of IoT characteristics to match market needs, lessons learnt from IoT product success stories / *Case studies* : *Smart Home Appliances, Smart Car Context and Reebok Wearable devices*
- **Secure IoT sensors** : Security goals and design of networks for IoT devices, building safe IoT platforms with cloud services / *Case studies* : *SSL/TLS general architecture for IoT devices in smart home and Industry 4.0*
- **Interaction of IoT devices and cloud services** : Google Cloud Platform and Amazon Web Services (AWS) / *Case studies* : *AWS cloud secure data transmission and analysis*

**Formation Continue UNIL-EPFL**

EPFL Innovation Park, Bâtiment E

CH -1015 Lausanne, Switzerland

Tel.: +41 21 693 71 20 - Fax : +41 21 693 71 30

[formcont@unil.ch](mailto:formcont@unil.ch) - [www.formation-continue-unil-epfl.ch](http://www.formation-continue-unil-epfl.ch)