2EL6130 – Embedded systems and internet of things

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Department: CAMPUS DE RENNES
Language of instruction: FRANCAIS
Campus: CAMPUS DE RENNES
Workload (HEE): 60
On-site hours (HPE): 35,00
Elective Category : Engineering Sciences
Advanced level : Yes

Description

This elective course is part of the Infosec track, but can be taken by any second year student that knows how to program in C and Java. The goal of this elective course is to discover the specificities of the development of applications that are executed on embeded systems or IoT objects.

The constraints for developing these connected objects are multiple: energy limits, computing capacities, network connectivy, data overloading, real time, etc. Indeed, this elective course will focus on general principle that are shared by these devices, ofr example, the data upload to the cloud, the optimization of the software computing, the network connectivity.

In a second part, the elective course illustrates these principles by selecting real embedded systems on which we study the software ecosystem. From the language point of view, the course shows how can be used the C language or languages using virtual machines and in both cases, how these languages are used in embedded systems. For the data, the course presents the solutions for storing locally or using programming API which enables to upload these data in cloud infrastructures.

This course may be enriched by industrial partners that can provide their expertise for specific embedded devices.

Quarter number

SG8

Prerequisites (in terms of CS courses)

- Know programming with the C and Java language
- Know the basics of Linux command lines

Syllabus

Chapter : Principles: embedded systems and IoT

- The specificity of embedded OS
- The network protocols for IoT (z-wave, zigbee)
- The languages for embedded systems
- Real time systems (WCET)

Chapter : RIOT OS

- Discovering RIOT
- Development language
- Lab: manipulating sensors

Chapter : Developing Android mobile applications

- Specificities of Android development
- Graphical User Interfaces
- Client Serveur applications
- Labs: discovering Android, requesting a server

Chapter : Contiki and Yocto

- Discovering of the operating system
- Lab: manipulating sensors

Class components (lecture, labs, etc.)

- 12h of course
- 15h of labs

Grading

- Continuous control: Evaluation of RIOT/Contiki/Yocto/Android labs (0.5)
- Continuous control: Presentation of advanced topics (0.5)

Resources

- Emulators or real devices
- Platform IoT Labs

Learning outcomes covered on the course

- Know the specificities and the constraits of embedded systems et internet of things
- Develop software with such systems

Description of the skills acquired at the end of the course

- C6.3 Specify, develop et realize and validate a software