# IE.2310 / IE.2410 – Computer Microsystems

## General information

Module Title: Microcomputer Systems
Module ID: IE.2310 / IE.2410
Module leader: Gilles CARPENTIER
ECTS: 4 credits
Average amount of work per student: 150 hours including 56 hours supervised (14 sessions of 4 hours)
Teamwork: no
Keywords: operating system, C language

## Presentation

Operating systems are the foundation on which application systems (electronic, IT and telecom) are based and deployed. They bridge the application and hardware layers and provide a set of essential services to program high-performance applications and get the most out of the hardware. It is important for an operations engineer, who is in charge of the systems mentioned above, to have a solid fundamental knowledge of operating systems.

Many operating systems are written in the C language, especially embedded systems. We will start by learning this language and then interact with the system.

## Educational objectives

- Design programs that interact with a computer system that hosts them.
- Mastering the design phases
- Communicate, read, and write materials in English in a culturally diverse environment.

### *Prerequisite*

It is necessary to have solid skills in algorithms and programming:

- Microcontroller programming
- General algorithmics and programming

### *Content/Program*

#### Concepts

- When should you use C today?
- General structure of a program, syntax, data types, compilation and linking.
- Operators and expressions
- Instructions, blocks and conditions
- Functions
- Tables, structures and unions
- Pointers
- The preprocessor, libraries, modular programming, make
- Multitasking, Process and Scheduler System
- Communication and synchronization techniques: signals, semaphores, message queues, sockets.
- Memory Management
- File System
- Compiler and debugger implementation.
- System, kernel, critical section, semaphore, parallelism, concurrent access, mutual exclusion

### Tools used

- Linux, bash, gcc,
- A source editor (gedit, eclipse, ...)
- BeagleBone Card

## Pedagogical methods

### *Learning methods*

14 sessions of 4 hours all supervised. Each session mixes lessons and practical work (direct application of the concept).

### *Evaluation methods*

2 Individual written exams.

### *Language of work*

English.

## Bibliography, Webography, Other sources


- The C language (Kernighan and Ritchie)
- Efficient practice of the C language (Emmanuel Lazard)
- man Linux pages
- Online courses on Moodle