Microprocessors

Component
École Nationale Supérieure d'Électrotechnique d'Électronique d'Informatique d'Hydraulique et des Télécommunications

In brief

- **Ametys Code:** N7AE07A
- **Open to exchange students:** No

Presentation

Objectives

Understand the inner workings of a microprocessor and a microcontroller.

Be able to distinguish between fundamental concepts: sampling, quantization, resolution, memory, bus, instruction cycles, etc.

Be able to describe the architecture of a microcontroller, particularly that of PICs (8-, 16-, and 32-bit families).

Learn to program a microcontroller at a low level:

* Understanding assembly language,
* Introduction to C programming for embedded systems.

Be able to configure and use internal peripherals: timers, ADCs, GPIO ports, UARTs, SPIs, interrupts, etc.

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Description

The course is a comprehensive introduction to embedded microelectronics.
It covers:

1 / The basic principles of digital technology (sampling, quantization, buses, memories).

2/ The detailed operation of a microprocessor: arithmetic logic units, control units, execution cycles, and instruction sets.

3/ Memories: RAM, ROM, EEPROM, Flash, and their hierarchy.

4/ PIC microcontrollers:

* Harvard and Von Neumann architectures
* Differences between RISC and CISC
* Memory organization and interrupt management
* Peripherals: I/O ports, timers, CAN (ADC), UART, SPI, etc.
* Examples of assembly and C code for PIC18 and PIC24.

This is therefore a theoretical and practical course, focused on understanding hardware and low-level programming.

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Pre-requisites

To effectively follow this course, it is recommended that you have:

* A solid foundation in digital electronics (bits, buses, binary logic).
* A basic understanding of logic systems and electronic circuits.
* An introduction to C programming (basic syntax, loops, variables).
* An interest in embedded systems and the internal workings of processors.