System on Chip

Component
École Nationale Supérieure d'Électrotechnique d'Électronique

In brief

- **Ametys Code:** N9EE05C
- **Open to exchange students:** Yes

Presentation

Objectives

At the end of the lectures, third-year students in the InSys program in the EEEA department will be able to:
- define precisely what a SoC is;
- explain the advantages of these circuits
- compare the relevance of choosing a SoC over an ASIC.

At the end of the project sessions, third-year students in the InSys program in the EEEA department will be able :
- generate an SoC and integrate it into a Xilinx Zynq FPGA circuit;
- test different function development techniques on this family of circuits (hardware or software)
- imagine and produce audio functions that can be implemented on the circuit, having chosen the most efficient technique.

Description

The System-On-Chip course consists of two lectures and around ten project sessions.

The lectures provide a detailed description of what a System-On-Chip is, its technological and economic advantages, its limitations and challenges, and why these circuits constitute a rapidly expanding market. In particular, the concepts of reuse, IP, and hardware/software co-development are explained in detail.

The project sessions put these concepts into practice by designing an audio effects device in the Xilinx Vivado development environment on a Zynq development board. During the first sessions, students develop the Zynq hardware configuration and

program the microcontroller in C language to briefly control an audio codec. They then develop and add audio effects of their choice to this basic configuration, in C or VHDL.

The assessment consists of two parts: a demonstration of the circuit and the effects developed during the session, and a report, in English, based on the model of a device user manual.

Pre-requisites

Basic knowledge of microelectronics and embedded systems, in particular:
- Silicon technology
- Microprocessor architecture
- Timing analysis

* Basic experience with the Xilinx Vivado development environment
* Basic experience with VHDL and C programming languages