The course introduces the students to the basic notions of computer architecture and, in particular, to the choices of the Instruction Set Architecture and to the memory hierarchy of modern systems.

Content
- Complex digital systems in VHDL.
- Basic components of a computer.
- Instruction Set Architectures.
- Assembly-level programming.
- Multi-cycle implementation of processors.
- Caches.
- Virtual memory.

Keywords
Computer Architecture, Basic Processor Architecture, Instructions Sets, Cache Hierarchies, Virtual Memory.

Learning Prerequisites
**Required courses**
- Conception de systèmes numériques

**Important concepts to start the course**
- Digital design in VHDL
- FPGA design software: Intel Quartus
- Simulation and verification of digital systems behavior: ModelSim.

Learning Outcomes
By the end of the course, the student must be able to:
- Design and implement a processor at the Register Transfer Level using logic synthesizers and simulators.
- Develop assembly language programs.
- Justify the organization of a modern memory system including cache hierarchies and virtual memory.
• Design and implement a cache memory.

Teaching methods
• Ex cathedra lectures and exercises.
• Labs on a dedicated FPGA board.

Expected student activities
• Attending the course and exercise/lab sessions.
• Completing the lab assignments.
• Homework: solving the exercises in the course exercise book.
• Participating in the discussions on the forum.

Assessment methods
Continuous assessment.

Supervision
Office hours Yes
Assistants Yes
Forum Yes

Resources
Virtual desktop infrastructure (VDI)
No

Bibliography

Ressources en bibliothèque
• Computer Organization and Design: The Hardware-Software Interface / Patterson

Moodle Link
• http://moodle.epfl.ch/course/view.php?id=14225

Prerequisite for
• Architecture des systems-on-chip.