

## Hardware Architecture

### Digital Circuits

#### AIMS

The goal of this course is to gain theoretical and practical understanding of the principles and mechanisms that govern digital circuits, from basic logic gates up to a simple microprocessor.

#### Expected skills:

- coding and decoding information in binary
- building combinatorial circuits from boolean functions
- modeling sequential behavior as finite-state automata
- building a sequential circuit from a finite-state automaton
- evaluating the cost and performance of digital circuits

#### IDENTIFICATION

CODE : IF-3-AC  
ECTS : 2.0

#### HOURS

Lectures : 9.0 h  
Seminars : 4.0 h  
Laboratory : 12.0 h  
Project : 0.0 h  
Teacher-student  
contact : 25.0 h  
Personal work : 25.0 h  
Total : 50.0 h

#### ASSESSMENT METHOD

Written exam (1h30). Progress  
evaluation by Moodle QCMs.

#### TEACHING AIDS

Lecture notes for the course, work  
sheets for classwork and labs [in  
French]

#### TEACHING LANGUAGE

French

#### CONTACT

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#### CONTENT

- coding: from information to bits
- computing: from boolean functions to combinatorial circuits
- storing: from latches to addressable memory
- controlling: from behavioral specification to sequential circuits [finite state automata]
- building complex circuits: separation of control and data
- Von Neuman model
- initiation to CAD and simulation tools for circuits

#### BIBLIOGRAPHY

- D. Patterson, J. Hennessy. Computer Organization and Design, The Hardware/Software Interface. Morgan Kaufmann.
- P. Amblard, J.C. Fernandez, F. Lagnier, F. Maraninchi, P. Sicard, P. Waille. Architectures Logicielles et Matérielles. Dunod. [in french]

#### PRE-REQUISITE

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