### LELEC2531

**Design and Architecture of digital electronic systems**

| 5.0 credits | 30.0 h + 30.0 h | 1q |

- **Teacher(s):** Legat Jean-Didier;
- **Language:** Anglais
- **Place of the course:** Louvain-la-Neuve
- **Inline resources:** Moodle
- **Prerequisites:** No prerequisites
- **Main themes:**
  - Combinational logic circuits and sequential logic design.
  - Digital building blocks (ALU, registers, ...).
  - Hardware description language (SystemVerilog).
  - Microarchitecture of a 32-bit RISC processor (single-cycle processor, multi-cycle processor and pipelined processor).
  - Embedded processor architecture and I/O systems.
- **Aims:**
  - Regarding the learning outcomes of the master in Electrical Engineering, this course contributes to the development and the acquisition of the following learning outcomes:
    - AA1 (1.1, 1.2), AA2 (2.1, 2.2, 2.3, 2.4), AA 5 (5.3), AA 6 (6.1)
  - At the end of this course, the students will be able to:
    - Understand how the digital circuits (combinational circuits, sequential circuits) work
    - Understand the architecture of programmable circuits (FPGA)
    - Synthesize and simulate digital circuits in a language such as Verilog or VHDL
    - Understand the architecture of a RISC processor
    - Use and program a microcontroller
    - Understand and implement a digital electronic system
  - The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".
- **Evaluation methods:** The methods of assessment are defined on the course website on Moodle
- **Teaching methods:**
  - Learning is based on courses with compulsory homework.
  - Each student has at his disposal during the semester an electronic system comprising an FPGA (Altera Cyclone IV) and and PIC32 microcontroller from Microchip.
  - This course is closely linked to the project LELEC2103: Electronic System
- **Content:**
  - Combinational logic
  - Sequential logic
  - Implementation technology
  - Simulation language and Verilog synthesis
  - Main logic circuits: arithmetic circuits, memories, programmable circuits
  - Architecture and microarchitecture of a RISC processor
  - Memories (caches, ...)
  - Architecture of microcontrollers
Peripherals and main communication systems

<table>
<thead>
<tr>
<th>Bibliography</th>
<th>Digital Design and Computer Architecture - David Money Harris @ Sarah L. Harris - 2007, Elsevier</th>
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</thead>
<tbody>
<tr>
<td>Other infos</td>
<td>None</td>
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</table>
| Cycle and year of study | > Master [120] in Electro-mechanical Engineering  
> Master [120] in Biomedical Engineering  
> Master [120] in Electrical Engineering                                      |
| Faculty or entity in charge: | ELEC                                                                                             |