





5.00 credits

30.0 h + 30.0 h

Q1

|                             |   |
|-----------------------------|---|
| Teacher(s)                  | Legat Jean-Didier ;   |
| Language :                  | English<br>> French-friendly  |
| Place of the course         | Louvain-la-Neuve  |
| 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, multicyle processor and pipelined processor). Embedded processor architecture and I/O systems.  |
| Learning outcomes           | <p><b>At the end of this learning unit, the student is able to :</b></p> <p>In consideration of the reference table AA of the program "master in electrical engineering ", this course contributes to the development, to the acquisition and to the evaluation of the following experiences of learning:</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2</li> <li>• AA2.1, AA2.2, AA2.3, AA2.4</li> <li>• AA5.3</li> <li>• AA6.1</li> </ul> <p>1</p> <p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand how the digital circuits (combinational circuits, sequential circuits) work</li> <li>• Understand the architecture of programmable circuits (FPGA)</li> <li>• Synthesize and simulate digital circuits in a language such as Verilog or VHDL</li> <li>• Understand the architecture of a RISC processor</li> <li>• Use and program a microcontroller</li> <li>• Understand and implement a digital electronic system</li> </ul> |
| Evaluation methods          | The evaluation is based on a continuous evaluation during the academic year. The practical details are specified on the course website.   |
| Teaching methods            | <ul style="list-style-type: none"> <li>• Learning is based on readings and tasks with compulsory homework.</li> <li>• Each student (or goup of 2 students) has at his disposal during the semester an electronic system comprising an FPGA connected to a RaspberryPI</li> </ul>  |
| Content                     | <ul style="list-style-type: none"> <li>• Combinational logic</li> <li>• Sequential logic</li> <li>• Implementation technology</li> <li>• Simulation language and Verilog synthesis</li> <li>• Main logic circuits: arithmetic circuits, memories, programmable circuits</li> <li>• Architecture and microarchitecture of the ARM processor</li> <li>• Memories (caches, ...)</li> <li>• Peripherals and main communication systems</li> </ul>   |
| Inline resources            | Moodle<br><a href="http://moodleucl.uclouvain.be/enrol/index.php?id=4">http://moodleucl.uclouvain.be/enrol/index.php?id=4</a>   |
| Bibliography                | Digital Design and Computer Architecture - David Money Harris @ Sarah L. Harris - 2007, Elsevier  |
| Other infos                 | None  |
| Faculty or entity in charge | ELEC  |

| <b>Programmes containing this learning unit (UE)</b> |                        |         |              |   |
|--|------------------------|---------|--------------|---|
| Program title  | Acronym                | Credits | Prerequisite | Learning outcomes   |
| Master [120] in Biomedical Engineering               | <a href="#">GBIO2M</a> | 5       |              |  |
| Master [120] in Electrical Engineering               | <a href="#">ELEC2M</a> | 5       |              |  |
| Master [120] in Computer Science and Engineering     | <a href="#">INFO2M</a> | 5       |              |  |
| Master [120] in Electro-mechanical Engineering       | <a href="#">ELME2M</a> | 5       |              |  |