




Teacher(s)	Legat Jean-Didier ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	<ul style="list-style-type: none"> • Introduction to Verilog (for who did not follow LELEC 2531 students) • Embedded processors and "soft-core" like Nios or MicroBlaze on FPGA • Standard devices of a processor and development of a dedicated device • Adding specialized instructions ("custom instructions") to the processor architecture • Architecture of a dual-core system. Communication between cores • Real-time operating systems: characterization and comparison • In-depth analysis of a real-time OS open-source (eg MicroC-OS/II) • Programming methodology of an application on a real-time OS • Embedded Linux. Development of driver • Implementation of a wireless module connected to the FPGA board
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <p>Given the learning outcomes of the "Master in Computer Science and Engineering" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes:</p> <ul style="list-style-type: none"> • INFO1.1-3 • INFO2.2-4 • INFO5.2, INFO5.4-5 • INFO6.3 <p>Given the learning outcomes of the "Master [120] in Computer Science" program, this course contributes to the development, acquisition and evaluation of the following learning outcomes:</p> <p>1</p> <ul style="list-style-type: none"> • SINF1.M1 • SINF2.2-4 • SINF5.2, SINF5.4-5 • SINF6.3 <p>Students completing this course successfully will be able to</p> <ul style="list-style-type: none"> • implement a multi-core system on FPGA using a Nios or MicroBlaze soft-core including peripherals, memories, caches, ... • make an argued choice between RTOS running on a multi-core system • use an RTOS running on a multi-core systems by taking advantage of his strengths • program effectively an application with real-time constraints by implementing a rigorous methodology.
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	<p>The teaching method includes lecture sessions where the main issues are explained. The implementation is done through assignments that students perform individually or in groups.</p> <p>A FPGA card containing an Altera Cyclone is given to each student in the course so that it can develop a personal expertise. The entire software suite (Quartus, ModelSim, Eclipse, MicroC--OS/II ...) is free.</p>
Inline resources	http://moodleucl.uclouvain.be/course/index.php?categoryid=10
Bibliography	<ul style="list-style-type: none"> • Digital Design and Computer Architecture 2nd Ed. - David Money Harris & Sarah L. Harris Morgan Kaufmann Publishers - 2012 - ISBN: 978-0-12-394424-5 • MicroC OS II: The Real Time Kernel - Jean J. Labrosse
Other infos	<p>Background:</p> <ul style="list-style-type: none"> • LFSAB1202 or LSINF1140: basic electronics • LFSAB1402: basic programming • It is useful but not mandatory to have followed the course LELEC 2531 - Design and architecture of digital electronic systems

Faculty or entity in charge	INFO
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Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Computer Science	SINF2M	5		