UCLouvain

lingi2315

2020

Design of Embedded and real-time systems

Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

5 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Legat Jean-Didier ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	• 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
Aims	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: • INFO1.1-3 • INFO2.2-4 • INFO5.2, INFO5.4-5 • INFO6.3 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: 1 • SINF1.M1 • SINF2.2-4 • SINF5.2, SINF5.4-5 • SINF6.3 Students completing this course successfully will be able to • 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. - - - - *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	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The evaluation is based on a continuous evaluation during the academic year. The practical details are specified on the course website.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** The teaching methodes includes lecture sessions where the main issues are explained. The implementation is done through assignments that students perform individually or in groups. 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.
Inline resources	http://moodleucl.uclouvain.be/course/index.php?categoryid=10
Bibliography	• 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	Background: • 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

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Computer Science	SINF2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		