linfo2315 2023	Design of Embedded and real-time systems

5.00 credits	30.0 h + 30.0 h	Q2

Teacher(s)	Pelsser Cristel ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Main themes	• Embedded processors • Standard peripherals • Multi-core architecture and communication between cores • Real-time operating systems: characterization and comparison • In-depth study of a real-time OS • Programming methods of applications on top of a real-time OS • Embedded Linux • Security of embedded systems • Secure programming with Rust for embedded systems
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 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: • 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.
Evaluation methods	The evaluation is based on 3 evaluations: 2 intermediary evaluations and a final evaluation in June. Each intermediary evaluation counts for 1/4 while the final evaluation counts for 2/4. In case of second session, the result obtained during the 2nd session replaces all preceding grades. The use of generative AI is not authorized for this course.
Teaching methods	The teaching methods includes lecture sessions where the main issues are explained. The implementation is done through assignments that students perform individually or in groups. Material will be lent to each student in the course so that she/he can develop a personal expertise.
Content	• Embedded processors • Standard peripherals • Multi-core architecture and communication between cores • Real-time operating systems: characterization and comparison • In-depth study of a real-time OS • Programming methods of applications on top of a real-time OS • Embedded Linux • Security of embedded systems • Secure programming with Rust for embedded systems
Inline resources	https://moodle.uclouvain.be/course/view.php?id=558

Bibliography	• Real-time Operating Systems Book 1 - The Theory Jim Cooling - Lindentree Associates 2017 - ISBN: 9781 5496 0894 0
Other infos	Background: Preliminary knowledge of computer architecture and programming.
Faculty or entity in charge	INFO

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 Computer Science	SINF2M	5		🔍
Master [120] in Electro-mechanical Engineering	ELME2M	5		🔍