UCLouvain

linfo2355

2021

Multicore programming

5 credits	30.0 h + 15.0 h	Q2

Teacher(s)	Riviere Etienne ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	This course treats a specific advanced topic or selection of topics of current research interest in the area of software engineering. The actual topic(s) may vary from year to year, and will be chosen from a variety of software engineering domains such as data-intensive computing, software analytics, development and analysis of large evolving software systems, big data techniques, software repository mining, software recommendation systems, software visualization, novel programming technologies, software requirements and analysis,model-driven software engineering, software configuration management, software engineering processes, software engineering tools and methods, software testing and quality aspects, etc.
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 • INFO3.1 • INFO6.3 1 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.M3 • SINF3.1 • SINF6.3 The students shall acquire advanced theoretical knowledge and technical competences about the topics covered in the course. - - - - *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.** Evaluation methods: • Projects and continuous evaluation (40% of the final mark) • Exam (60% of the final mark) The project work is mandatory and cannot be repeated for the second examination session. Project reports will be evaluated only once before the first session and cannot be presented for the second session. Activities that are evaluated with a formative goal could be evaluated with grades and could replace part or the entirety of the exam in the evaluation mix is the circumstances impose it.
Teaching methods	**Due to the COVID-19 crisis, the information in this section is particularly likely to change.** • Lectures • Readings and/or short video producing at home • Practical sessions • Mini project
Content	This course targets programming models and methods for scalable applications on modern multi-processor and multi-core architectures. In a first short part, it provides the necessary elements of theory and defines consistency protocols, in order to be able to understand the challenges and tradeoffs associated with shared-memory concurrent programming. The emphasis is on performance and scalability aspects (efficient simultaneous use of multiple cores). The rest of the course surveys a number of fundamental algorithmic techniques for building shared memory concurrent data structures. It studies the performance implications of these data structures and algorithmic constructs in the context of modern architectures, taking into account various aspects such as the memory and cache hierarchy, hardware consistency protocols, and non-uniform memory accesses (NUMA).

	The course is accompanied by a number of practical projects. A multi-core machine is available for the experiments. Students will be able to evaluate the performance and scalability of various algorithms and data structures seen in class.
Bibliography	The Art of Multiprocessor Programming, Maurice Herlihy and Nir Shavit, Morgan Kaufmann. ISBN 978-0-12-370591-4. UCL library reference 10.620.426
Other infos	All relevant course material and slides as well as practical information related to the course will be accessible on Moodle, which will also be the primary means of communication between the teacher(s) and the students.
Faculty or entity in charge	INFO

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Computer Science and Engineering	INFO2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		
Master [120] in Computer Science	SINF2M	5		