CS-453

Concurrent algorithms

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Cursus	Sem.	Type
Computer science	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Written
Workload	120h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

With the advent of multiprocessors, it becomes crucial to master the underlying algorithmics of concurrency. The objective of this course is to study the foundations of concurrent algorithms and in particular the techniques that enable the construction of robust such algorithms.

Content

Model of a parallel system
A Multicore architect
Processes and objects
Safety and liveness

Parallel programming
Automatic parallelism
Mutual exclusion and locks
Non-blocking data structures

Register Implementations
Safe, regular and atomic registers
General and limited transactions
Atomic snapshots

Hierarchy of objects
The FLP impssibility
The consensus number
Universal constructions
Transactional memories
Transactional algorithms
Opacity and obstruction-freedom

Keywords

Concurrency, parallelism, algorithms, data structures

Learning Prerequisites

Required courses

ICC, operatings systems

Recommended courses

Algorithms, concurrency

Important concepts to start the course

Processes, threads, datas structures

Learning Outcomes

By the end of the course, the student must be able to:

- Reason in a precise manner about concurrency
- Design a concurrent algorithm

Teaching methods

Lectures and exercises

Expected student activities

Attendance at lectures completing exercise and sometimes doing a project

Assessment methods

With continuous control, mid-term final exams and sometimes project

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Websites

- http://lpd.epfl.ch/site/education