EPFL

CS-453	**Concurrent algorithms**		
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Cursus	Sem.	Type
Computer science	MA1, MA3	Opt.
Cybersecurity	MA1, MA3	Opt.
Data Science	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	**5 weekly**
Courses	3 weekly
Exercises	1 weekly
TP	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 architecture
Processes and objects
Safety and liveliness

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

Register Implementations
Safe, regular and atomic registers
Counters General and limited operations
Atomic counters and snapshots

Hierarchy of objects
The FLP impossibility
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

This course is complementary to the Distributed Algorithms course.

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
- Prove a concurrent algorithm
- Implement a concurrent system

Teaching methods

Lectures, exercises and practical work

Expected student activities

Final exam
Project

Assessment methods

With final exam and project

Resources

Notes/Handbook

Algorithms for Concurrent Systems, R. Guerraoui and P. Kouznetsov

Moodle Link

- https://go.epfl.ch/CS-453