CS-307

Introduction to multiprocessor architecture

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Cursus	Sem.	Type
Communication systems	BA5	Opt.
Computational science and Engineering	MA1, MA3	Opt.
Computer science	BA5	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
Hours	**3 weekly**
Lecture	2 weekly
Project	1 weekly
Number of positions	

Remark

This course will be last given in autumn 2023

Summary

Multiprocessors are a core component in all types of computing infrastructure, from phones to datacenters. This course will build on the prerequisites of processor design and concurrency to introduce the essential technologies required to combine multiple processing elements into a single computer.

Content

- Forms of parallelism
- Parallel programming models
- Cache coherence
- Memory consistency
- Synchronization
- Interconnection networks
- Software efficiency & optimization
- GPU architecture & programming

Keywords

Multiprocessors, multicores, manycores, cache coherence, memory consistency models, memory ordering, manycore cache hierarchies, interconnection networks, synchronization, parallelism, GPU

Learning Prerequisites

Required courses

Parallelism and concurrency (CS-206)
Computer architecture (CS-208)

Important concepts to start the course

Introductory understanding of computer architecture & organization
Basic C/C++ systems programming

Learning Outcomes

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

- Detect and address inefficiencies in parallel software
- Design and evaluate software for multiple parallel platforms
- Design and evaluate hardware for shared memory
- Compare and contrast hardware design choices in parallel platforms
- Demonstrate and describe the operation of snooping and directory coherence protocols

Teaching methods

Lectures, homework and project

Assessment methods

Programming assignments and exercises during the semester.
25% Programming Assignments, 20% Exercises, 25% Midterm, 30% Final exam

Supervision

Office hours	Yes
Assistants	Yes

Resources

Websites

- https://parsa.epfl.ch/course-info/cs307/

Moodle Link

- https://go.epfl.ch/CS-307