

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	Obl.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	2 weekly
Project	1 weekly
<b>Number of positions</b>	

**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**

CS-206 Parallelism and concurrency  
CS-208 Computer architecture

**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 - 30%
- Exercises - 30%
- Final exam - 40%

### Supervision

Office hours	Yes
Assistants	Yes

### Resources

#### Websites

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