

**CSCI-GA.3033-034**  
**Multicore Processors: Architecture and Programming**  
**Spring 2022**

**Instructor:** Mohamed Zahran  
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**Meeting time:** Wednesdays 4:55-6:55pm

**Meeting place:** Silv 401

**Office hours:**

- Wed 2-3:30pm (online: zoom link on course website and on Brightspace)
- otherwise by appointment

**Text**

There is no required textbook. Reading material, from research papers, articles, and tutorials will be posted on the course web site, in addition to the lecture slides.

**Course Description**

The tremendous advances in process technology have created a revolution both in hardware and in software. On the hardware side, we moved from single core processors to multicore/manycore processors. Multicore chips are now everywhere. You can find them in smartwatches, smartphones, notebooks, all the way up to supercomputers. To benefit from these chips, software must be parallelized, which starts another revolution in software.

The purpose of this course is to introduce you to both the hardware advances and parallel programming targeting multicore and manycore processors. You will learn how to make the best use of the underlying hardware to build applications that can take advantage of the on-chip parallelism.

I also hope that this course helps you to build a vision on where the software and hardware are heading in the future and how they are interacting.

## **Course Goals**

- Understand the shift from single core to multicore processors
- Understand how the multicore revolution affects software development
- Learn about parallelism and concurrency
- Understand the different parallel programming models
- Think in parallel!
- Reason about parallel programs performance
- Learn how to make the best use of the underlying hardware

## **Syllabus**

- The Multicore/manycore revolution
- Parallelism and concurrency
- The memory hierarchy
- Coherence and consistency models
- Parallel programming models
- OpenMP
- Performance evaluation
- Heterogeneous multicore
- Hardware constraints

## **Grading**

- Programming assignments: 25%
- Homework assignments: 25%
- Project: 50%

**Good Luck and Have fun!**