

CDA 5155: Computer Architecture Principles (3 Credits)

Grading Scheme: Letter

Prerequisite: CDA 3101, COP 3530, and COP 4600.

From Catalog: Fundamental design issues of processor and computer architecture, a variety of design approaches for CPU, memory, and system structure.

- **Instructor:** Dr. Jih-Kwon Peir, peir@cise.ufl.edu, Office: E338, CSE

- **Course Objectives and Outline:**

This course teaches students fundamental and advanced knowledge in Computer Architecture and Microarchitecture. The course covers the basic organizations of computer systems including instruction-set architecture, execution pipeline, memory hierarchy, and I/O subsystem. It also addresses advanced processor microarchitecture issues such as dynamic instruction scheduling, branch prediction, lock-up free caches, instruction-level parallelism, multiple instruction fetch/issuing, speculative execution, etc. to improve computer processor performance. Shared-memory multiprocessor systems with coherent caches to reduce memory access latency, the basic virtual machine concept is also covered. Furthermore, the advanced data-level and thread-level parallelisms are included. The newly emerged request-level parallelism and the domain-specific architectures are described. In addition, crypto processors which enforce computer security are also discussed. Term projects will be assigned to study wide-range issues of high-performance processors.

See details in outline of course schedule.

- **Textbook:**

1. **Computer Architecture: A Quantitative Approach, 6th Ed. (Required)**

John L. Hennessy, David Patterson

ISBN: 978-0-12-811905-1, Pub. Date: 2019

Publisher: Morgan Kaufmann Publishers

2. **Computer Organization and Design: The Hardware/Software Interface, RISC-V Ed. (Recommended)**

David A. Patterson, John L. Hennessy

ISBN: 978-0-12-812275-4, Pub. Date: 2018

Publisher: Morgan Kaufmann Publishers

- **Class Schedule and Room:** M, W, F, Period 9 (4:05 – 4:55pm), CSE E122

- **Outline of Course Schedule:**

Week 1: Chapter 1: Introduction to computers, architectures, technology, and performance metrics

Week 2: RISC-V Instruction Set Architecture

Weeks 3-4: Chapter 2: Memory Hierarchy Design

Weeks 5-7: Chapter 3: Instruction-Level Parallelism

Weeks 8-9: Chapter 4: Data-Level Parallelism, Vector, SIMD, GPU

Weeks 10-11: Chapter 5: Thread-Level Parallelism

Week 12: Chapter 6: Warehouse-Scale Computers

Weeks 13-14: Chapter 7: Domain-Specific Architectures

Weeks 15-16: Computer Security, Cryptoprocessors

- **Grading Policy:**

Homework (20%)

Project (20%)

Midterm exam (30%)

Final exam (30%)

Pop quiz (extra credit)

Your final letter grade will be based on your accumulated score.

A: above 86

A-: 82-85.99

B+: 78-81.99

B: 74-77.99

B-: 70-73.99

C+: 68-69.99

C: 65-67.99

C-: 63-64.99

Ds: 55-62.99

E: below 55

For more information on grades and grading policies, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

- **Project:**

A two-person group term project will be assigned. Topics can be selected among the subjects covered in the course. Each team needs to submit three reports: 1. Topic of the project and literature survey; 2. Outline of the research and expect results; 3. Final report and presentation. More details will be given later.

- **Important Notes:**

1. All exams are open-book and open-notes. A student with a proper excuse of being absent from the examination must inform and get a permission from the instructor **prior** to the time of an examination. Any students who do not take the examination at the scheduled time will receive a zero score.
2. Course information will be posted on Elearning / Canvas.
3. All homework must be submitted using Elearning / Canvas before the due date. No credit will be given to any late submission. Handwritten solution will not be considered. Homework and project will be assigned at proper time. Details will be announced.
4. You should try to be as clear and precise as possible in your answers of homework assignments, project and exams. Correctness of a solution will be determined solely by the information on the exam or the homework paper.
5. To request a **re-grade** of homework and exams, you should attach a short note stating the reasons that you think a re-grade is necessary and submit to the instructor **within a week** from the date that the paper is returned.
6. Attending lectures are the responsibility of students. All homework, projects and exams will be from the material covered in the lectures.
7. Distance-learning (EDGE) students are given one extra day comparing with on-campus students to finish all the assignments. However, EDGE students must take the midterm and final exam on the SAME day as on-campus students. Details will be announcement.
8. Pop quiz may be given to on-campus students and will be counted for extra credits. Note, for those who have a schedule conflict of attending the course must email the instructor the schedule conflict at prior.