EEL 6764 001

Principles of Computer Architecture

MW 5 – 6:15 pm CWY 109

CRN 15508 3 credit hours

Course Handout

**Instructor:** Dr. Srinivas Katkoori

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Office Hours: MW 2 pm – 4 pm

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**Teaching Assistant(s):** Lakshmi Kavya Kalyanam and Varun Sai Raigir

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**Course Catalog Description:** Arithmetic algorithms, CPU speedup techniques, memory hierarchies, virtual memory, input-output. Study of the number systems and the algorithms used for digital arithmetic computation with emphasis on their implementation, speed and reliability considerations.

**Prerequisites (No Exceptions):**

* CDA 3201 Computer Logic Design or equivalent
* CDA 4205 Computer Architecture or equivalent

**Co-Requisites:** None.

**Instruction Method:** In person. All lectures and exams will be held in room CWY 109.

**Description and Objectives:**

This course covers principles of modern computer architecture, and quantitative analysis approaches to design tradeoffs in terms of cost, performance, and power/energy efficiency, etc. It introduces designs and tradeoffs of main computer elements including instruction set architectures, memory hierarchy, processor pipelining, multiprocessing, etc.

* Understanding of the technology impacts on architectures.
* Understanding of various types of parallelisms for performance, e.g., instruction-level, thread-level, and data-level parallelism.
* Understanding of principles of modern computer architecture designs – memory hierarchy, instruction set design, pipelining, out-of-order execution, speculation, multiprocessing, etc., and how they exploit different types of parallelism.
* Ability to quantitatively evaluate design tradeoffs in terms of different parameters.
* Understand the interplay between architecture design and software and how they impact each other.

**Course Textbook:**

* J. L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantitative Approach*, Morgan Kauffman, 6th Edition, ISBN 9780128119051.

**References:**

* D. A. Patterson and J. L. Hennessy, *Computer Organization and Design, The Hardware/Software Interface*, Morgan Kauffman, 5th Edition, ISBN13: 978 -- 0124077263, 2013.

**Course Notes:** Slides will be posted on Canvas no later than one hour before the lecture.

**Grade Distribution:**

Homeworks: 10% Midterm: 40% Final Exam: 50%

**Grading Policy:**

|  |  |  |
| --- | --- | --- |
| **A+:** > 95% | **A:** 90-95% | **A-:** 87-90% |
| **B+:** 84-87% | **B:** 80-84% | **B-:** 77-80% |
| **C+:** 74-77% | **C:** 70-74% | **C-:** 65-70% |
| **F: < 65%** |  |  |

**Tentative Class Schedule:**

|  |  |
| --- | --- |
| **Topic** | **Chapters** |
| Introduction | Ch. 1 |
| Instruction set principles | App. A |
| Memory hierarchy design | Ch. 2, App. B |
| Instruction level parallelism and pipelining | Ch. 3, App. C |
| Thread-level parallelism and multiprocessors | Ch. 5 |
| Data level parallelism and vector processing | Ch. 4, App. G |
| Interconnection networks | App. F |
| Secure architecture design | - |

**Course Policies:**

* **Canvas:** We will use Canvas extensively for: (a) course related announcements; (b) course notes; (c) homework and hints/solutions; and (d) test samples, etc. You are strongly advised to regularly monitor the canvas course homepage.
* **Email:** will be the primary mode of communication outside the classroom. Therefore, you are strongly encouraged to check your email regularly. We will use your primary email address on your Canvas account.
* **Course Slides:** will be posted on Canvas.
* **Homework:** I consider homework to be essential in preparing you for the exams. All efforts should be made to submit your homework.
  + Four (4) homeworks will be assigned.
  + Unless stated otherwise, homework is due in a week.
  + I strongly encourage you to submit your homework on Canvas (by scanning your HW). Only reports in PDF format will be accepted.
* **Late Work**: Late homework will not be accepted.
* **Grading Discrepancies:** Any grading discrepancies must be resolved within **one week** of posting the grades. After this period, no requests will be entertained.
* **Midterm Exam:** One midterm exam will be held during the 8th week of classes. The tentative date is **Wednesday, 5th March.** Review for the exam will be held on Monday of that week.
* **Exams - Photo ID**: For exam(s) your photo ID may be verified during the exam.
* **Re-grading**: Homework/exams written in pencil will not be re-graded.
* **Class Attendance:** You are expected to attend all classes, though **no** record of attendance will be maintained.
* **Class Absence**: You are responsible for all the material that is covered in the class. If you are absent from a class (whatever may be the reason), you are responsible to learn from your colleagues or Canvas about what has been covered/announced in the missed class.
* **Cheating:** Academic dishonesty will not be tolerated and the student, in question, will be dealt in accordance with the University policies. Some examples:
  + Copying solution from another student.
  + Out-sourcing or buying ready-made solution(s).
  + Copying solution from textbook solutions manual.
* **Independent Work:** You are expected to work independently on all your homework. While general discussion is allowed with other students, detailed solutions to homework problems should not be discussed/exchanged/compared.
* **Special Accommodations**: If you need any special accommodation according to the American Disability Act, please let me know.
* **Incomplete Grade**: Incomplete (I) grades will not be given in this course. Your final grade will be decided on the completed work by the end of the semester.
* **Final Grade Curving**: Depending on the clusters of grades, I may curve the grades.
* **Drop Date without Academic Penalty**: Saturday, 29th March
* **Final Exam**: There will be a final comprehensive exam that will be held during the exam week in the allotted time slot for the course.
* **Religious Observances**: Students who anticipate the necessity of being absent from classdue to the observation of a major religious observance must provide notice of the date(s) inwriting by the *second-class* meeting.
* **Standard University Policies:** Policies about disability access, religious observances, academic grievances, academic integrity and misconduct, academic continuity, food insecurity, and sexual harassment are governed by a central set of policies that apply to all classes at USF. These may be accessed at:

<https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

* **Covid-19 Procedures:** All students must comply with university policies and posted signs regarding COVID-19 mitigation measures, including wearing face coverings and maintaining social distancing. Additional details are available on the University’s Core Syllabus Policy Statements page:

<https://www.usf.edu/provost/faculty/core-syllabus-policy-statements.aspx>

* **Important Dates to Remember:** All dates of the exams are tentative and are subject to change at the discretion of the instructor.
  + Midterm Exam Wednesday, 5th March
  + Drop date without penalty Saturday, 29th March
  + Spring final exam week 3rd May – 8th May
  + Comprehensive final exam 3 – 5 pm, Monday, 5th May

Best of Luck!