

Instructor: Dr. Sudeep Pasricha (sudeep@colostate.edu), ENGR B119

Lectures: Tu/Thu 11:00am – 12:15pm, BHSCI 107 (recorded lectures will be available asynchronously via Echo360 on the course Canvas page at or before these times; in-class lectures will begin once CSU gives permission)

Office Hours: 9:30am – 10:30am, Fridays via Zoom (link on Canvas page)

Course TA: Janaki Subramani (janaki.subramani@colostate.edu)

TA Hours: Monday, Thursday, 1pm-2pm via MS Teams (link on Canvas page)

Course Description: The objective of the course is to provide students with a solid foundation in computer system design, spanning the spectrum of smart mobile devices and high performance supercomputing. Modern computer technology requires professionals to understand both hardware and software concepts. Accordingly, this course focuses on the interaction between hardware and software at a variety of levels to promote a deep understanding of the fundamentals of computing and foundations of parallelism. Topics that will be covered include instruction set architectures, computer arithmetic, RISC CPU and pipelining, memory hierarchy, networks on chip, parallel programming models, multicores and multiprocessors, graphics and computing GPUs, deep learning accelerator architectures, storage and I/O technologies, and ethics in computing.

Prerequisites: ECE251 or equivalent computer organization course; C programming

Textbook: Computer Organization and Design MIPS Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design) 5th Edition

Syllabus: Here is a tentative outline and syllabus for this course:

Week	Module
1	Introduction: Computer Abstractions, Performance, Power, and Technology
2-4	MIPS Instruction Set Architecture (ISA)
4-5	Computer Arithmetic and Approximate Computing
5-7	Processor Architectures: Pipelining, Hazards, Prediction
7-8	Memory Architectures: Caches, Main Memory, Virtual Memory, Paging
9	Spring Break
10	Memory Architectures: Caches, Main Memory, Virtual Memory, Paging
11-12	Multicore CPUs, GPUs, and Parallelism
13-14	Interconnection Networks
14	Storage and I/O
15	Domain Specific Architectures
15-16	Ethics in Computing
17	Finals

Grading: Grading is based on the following components:

- Homework Assignments (7): 20%

- Reading Assignments (8): 20%
- Class participation: 10%
- Weekly Quizzes: 10%
- Examinations (closed book): 50%
 - Midterm: 15%
 - Comprehensive Final: 25%

Grading Scale:

>95%	90-94%	85-89%	80-84%	75-79%	70-74%	65-69%	55-64%	40-55%	<40%
A+	A	A-	B+	B	B-	C+	C	D	F

Assignments: Homework assignments will involve solving problems related to computer systems, as well as tools for computing platform design and exploration. Reading assignments will involve reading technical research papers and summarizing their key contributions and a critique in around 500 words.

Submission Policy: Homework and reading assignments will be assigned throughout the semester. You are allowed late submission up to 3 days on one homework and one reading assignment. You can also skip one reading assignment of your choice, without impacting your grade. Otherwise all homework and reading assignments should be submitted before the deadline via Canvas, and **late submissions will not be graded!**

Re-grading Policy: Re-grading requests should be made within a week from the date of the graded item (homework, exam, or project) becoming available.

Academic Integrity: All submitted work should be your own. Copying of language, structure, images, ideas, or thoughts of another, and representing them as one’s own without proper acknowledgement (from github code repos, other web sites, books, papers, other students, etc) and failure to cite sources properly is not acceptable. Sources must always be appropriately referenced, whether the source is printed, electronic, or spoken. Minor first infraction in HWs and presentations will lead to a zero score + one letter level (e.g. A to B) reduction in course grade. Project or Major or repeated infractions in HWs and presentations will result in “F” grade for the course + report to Dean’s Office. For more information see CSU’s Academic Integrity Policy: <https://tilt.colostate.edu/AcademicIntegrity/> (Links to an external site.) and Student Conduct Code: <https://resolutioncenter.colostate.edu/student-conduct-code/> (Links to an external site.)

Attendance: I encourage everyone to attend all the lectures and actively participate in class discussions.

Appointment: I encourage you to make at least one appointment with me during the semester for advice or to discuss research opportunities, independent study, research ideas, course suggestions, concerns, or any other topic you feel is appropriate.