

Introduction to Computer Science

CSCI 109

Fall 2019

Review

Dec 2nd, 2019

Schedule

Date	Topic		Assigned	Due	Quizzes/Midterm/Final	Slide Deck
26-Aug	Introduction	What is computing, how did computers come to be?				1
2-Sep	Labor day					
9-Sep	Computer architecture	How is a modern computer built? Basic architecture and assembly	HW1			2
16-Sep	Data structures	Why organize data? Basic structures for organizing data			Quiz 1 on material taught in class 8/26 and 9/9	3
23-Sep	Data structures	Trees, Graphs and Traversals	HW2	HW1		4
30-Sep	More Algorithms/Data Structures	Recursion and run-time				5
7-Oct	Complexity and combinatorics	How "long" does it take to run an algorithm. P vs NP			Quiz 2 on material taught in class 9/16 and 9/23	5
14-Oct	Algorithms and programming	Programming, languages and compilers		HW2	Quiz 3 on material taught in class 9/30	7
21-Oct	Operating systems	What is an OS? Why do you need one?	HW3		Quiz 4 on material taught in class 10/7	8
28-Oct	Midterm	Midterm			Midterm on all material taught so far.	
4-Nov	Computer networks	How are networks organized? How is the Internet organized?		HW3		9
11-Nov	Artificial intelligence	What is AI? Search, planning and a quick introduction to machine learning			Quiz 5 on material taught in class 9/4	10
18-Nov	The limits of computation	What can (and can't) be computed?	HW4		Quiz 6 on material taught in class 11/11	11
25-Nov	Robotics	Robotics: background and modern systems (e.g., self-driving cars)			Quiz 7 on material taught in class 11/18	12
2-Dec	Summary, recap, review	Summary, recap, review for final		HW4	Quiz 8 on material taught in class 11/25	13
13-Dec	Final exam 11 am - 1 pm in SGM 123				Final on all material covered in the semester	



Check your grades

- ◆ By Friday please check BB for quiz scores and homework #1-3 scores
 - ❖ Quiz scores will move to Blackboard later today
- ◆ If there are any errors, please bring them to our attention on Piazza
- ◆ HW #4 will be graded this week, any disputes must be lodged promptly
- ◆ All scores will be finalized on Wed Dec. 11th, no new disputes will be accepted after this date
- ◆ TAs and Professor will hold office hours in the week of Dec. 9th but these cannot be used for disputing scores on homework, midterm or quizzes. They should be used for study help and review questions.

Final

- ◆ Final on Dec. 13th at 11 am in SGM 123
- ◆ Final is comprehensive but will have a slightly higher proportion of problems on the material after the midterm
- ◆ The final will be multiple choice
- ◆ Bring pencils. Scantron will be provided
- ◆ 35 questions

Review



What follows is a review of many of the course highlights. It is not an exhaustive list.

Introduction

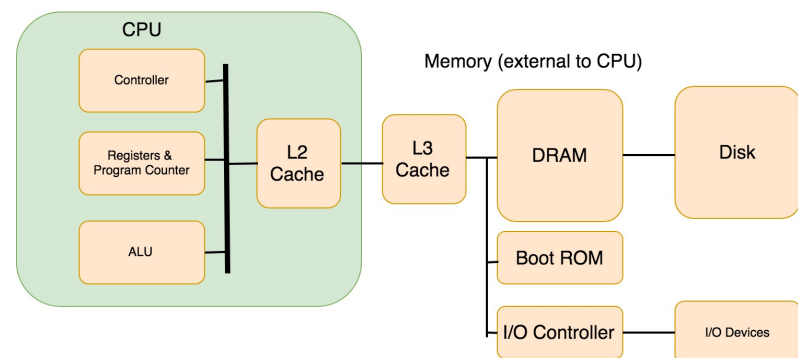
- ◆ You are expected to understand arithmetic in base 10, base 2 and by extension other bases
- ◆ You are expected to understand how to read and interpret a truth table
- ◆ Understand encoding, state, abstraction, and the meaning of discrete vs. continuous
- ◆ Jacquard loom
- ◆ What makes a computer

AND	0	1
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1	0	1

Architecture

- ◆ All constituents of the von Neumann architecture, how they are connected and their functions
- ◆ Understand the memory hierarchy
- ◆ Read, understand and write simple assembly-like programs

```
M100    SET R1 MI
M101    SET R2 0
M102    SET R3 1
M103    SET R6 0
M104    ADD R1 R2 R4
M105    SUB R1 R3 R5
M106    MOVE R5 R1
M107    MOVE R4 R2
M108    COND_GOTO R1 R6 104
M109    WRITE R2 M2
M110    END
```



Data Structures and Algorithms

- ◆ Lists
 - ❖ Sorting and searching
- ◆ Trees
 - ❖ Traversals (BFS and DFS), search
- ◆ Graphs
 - ❖ Spanning trees (both algorithms), Dijkstra's algorithm
- ◆ Recursion
- ◆ Complexity and Big O
- ◆ Tractable and intractable
- ◆ P and NP (unknown tractable vs. intractable)

Programming

- ◆ Why program in a high-level language
- ◆ What is a compiler
- ◆ Compiler steps, optimization, machine independent/dependent
- ◆ Parsing a simple program (i.e. figuring out what it does)

Operating Systems

- ◆ Purpose of an OS, what problems do OS solve?
- ◆ Roles, design criteria
- ◆ What is a policy? How are policies evaluated? Making simple calculations with policies
- ◆ Multitasking (process scheduling)
- ◆ Resources (CPU, memory, I/O)

Networks

- ◆ Background, motivation for packets/packet switching
- ◆ Packets and packet switching
- ◆ Protocols and their properties
- ◆ Layers
- ◆ Internet structure and components
- ◆ Physical links (media)
- ◆ Internet design goals

Artificial Intelligence

- ◆ Definitions, what is intelligence
- ◆ Main technological innovations behind
 - ❖ IBM Deep Blue, IBM Watson, Google DeepMind Alpha Go
- ◆ Minimax search and the notion of a search tree
- ◆ Philosophical issues in AI
- ◆ Connections to machine learning

Abstract Machines and Theory

- ◆ Finite state machines: properties, limitations
- ◆ Turing machines: properties, evaluation
- ◆ The notion of undecidability
- ◆ The halting problem

Robotics

- ◆ Definitions
- ◆ State
- ◆ Spectrum of robot control approaches
- ◆ Shakey, Tortoises, Self driving cars

Finis

Good luck!



Quiz #8

- ◆ <https://forms.gle/AFsZgDT34z5W8LxH7>

