

CSE 305: **Computer Architecture**

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Syllabus of the first part

Reference Book

- Computer Organization and Design: The Hardware/Software Interface, *Fifth Edition*
 - David A. Patterson
 - John L. Hennessy

1 Computer Abstractions and Technology

- Chapter 1 of the reference book
- Section 1.1 - 1.11
 - mainly follow lecture slides and have a quick skim through the book sections
- Eight great ideas in computer architecture
 - not just memorize them, try to understand their patterns through various examples
 - identify their patterns in several design decisions
- Measuring computer performance
 - crack all the class and book examples
 - practice the class test questions at least once before the exam
 - give special importance to classic CPU performance equation, Amdahl's law, MIPS equation, etc.
 - practice exercise problems, 1.5, 1.6, 1.7, 1.9, 1.13, 1.14

2 Instructions: Language of the Computer

- Chapter 2 of the reference book
- Section 2.1, 2.2, 2.3, 2.4, **2.5**, 2.6, **2.7**, **2.8**, **2.10**, **2.11**, 2.12, 2.19, 2.20
 - mainly follow class lectures and have a quick skim through the book sections
- Three design principles behind various MIPS instruction set architecture design decisions
- Important topics include
 - how instructions are stored
 - branching instructions
 - supporting procedures in MIPS

- addressing branches and jumps
- three different MIPS instruction formats
- five different MIPS addressing modes
- synchronization instructions in MIPS
- Solve the class test questions from this chapter

3 Arithmetic for Computers

- Chapter 3 of the reference book
- Section 3.1, 3.2, 3.3, 3.4, 3.5
 - mainly follow class lectures
- For addition and subtraction, identify overflow conditions and derive logical formula for overflow boolean variable
- For multiplication and division,
 - understand the step by step refinement of various hardware to improve efficiency
 - grasp the corresponding algorithms and practice respective simulations
- Understand how floating-point numbers are represented in computers
 - know the floating point addition algorithm

4 Datapath and Control Unit Design

- Just follow class lectures (two lecture slides)
- Chapter 4 of the reference book
- Section 4.1, 4.2, 4.3, 4.4
- Understand how a datapath is built
- For any given datapath,
 - identify the control variables
 - for various instructions, obtain the values of these control variables
- Solve the class test questions from this chapter

Best of luck for the upcoming exams, 😊