

**Course description:**

This course will describe the basics of computer organization. Topics include computer system performance, instruction set architectures, assembly languages as well as the interaction between programming languages and machine languages.

By the end of the course, students will be able to:

- Add and subtract and convert, signed and unsigned integers, using bases 2, 10 and 16.
- Enumerate the functional components of a computer; explain trade-offs in computer design as they relate to cost and function and performance; outline computer architectural enhancements beyond the von Neumann model.
- Explain the basic operation of interrupts and microcode.
- Program in x86 assembly language and ARM assembly language
- Link assembler subroutines with a High Level Language.
- Convert symbolic assembler code into machine code and convert machine code into symbolic assembler code.
- Explain the basic operation of the Java Virtual Machine and Java Bytecode.
- Understand the trends of computer system development.

**Instructor:**

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**Textbook:**

Computer Organization and Design: The Hardware Software Interface: ARM Edition (The Morgan Kaufmann Series in Computer Architecture and Design) 1st Edition.

David A. Patterson, John L. Hennessy (Highly Recommended)

**Grading:**

20% midterm

30% final (The final will be cumulative.)

10% assignments

20% projects

10% class participation (We will be using clickers in the class!)

10% reading quizzes

**Lecture schedule:**

Date	Topic	Reading (H&P)
1/11/2017	Intro	
1/18/2017	Instruction Set Architectures & Performance (I)	Chapter 1
1/23/2017	Performance (II)	
1/25/2017	Performance (III)	

1/30/2017	Performance (IV)	Chapter 2.4, 3.1-3.5
2/1/2017	ARM: Fundamental	Chapter 2.1-2.3, 2.5-2.7
2/6/2017	ARM: Using Android Studio and Emulator	
2/8/2017	No lectures (make up session on 2/10, EB2 1021)	
	Project: writing the first/simple ARM assembly code	
2/10/2017	(Make session for 2/8 @ EB2 1021)	
2/13/2017	ARM: Logical operations and number systems	
2/15/2017	ARM: Interacting with memory	
2/20/2017	ARM: Supporting procedure calls and other programming language features	Chapter 2.8, 2.10, 2.12
2/22/2017	ARM: Variables, pointers, and memory	
2/27/2017	ARM: Hacking into the machine binary	Chapter 2.5 and 2.10
3/1/2017	Midterm Review	
3/15/2017	Midterm	
3/20/2017	x86: overview	<a href="#">Chapter 2.18 and x86-64 M</a>
3/22/2017	x86: ALU/interacting with memory	
3/27/2017	x86: control flow and interrupt	<a href="#">Interrupt</a>
3/29/2017	x86: procedure calls	
4/3/2017	x86: advanced instructions/Play x86 asm in C	Chapter 3.9, 4.12
4/5/2017	Introduction to JavaVM	
4/10/2017	Pipeline processors	Chapter 4.5, 4.7, 4.8
4/12/2017	Pipeline hazards and code optimization	
4/17/2017	Data hazards & control hazards	
4/19/2017	Modern deep pipeline processors & Multithreaded processors and parallel processing	Chapter 6.1-6.5
4/24/2017	Modern computer organization and future perspective	Chapter 6.6
4/26/2017	Final Review	
5/10/2017	Final (8am-11am)	