

1. ECE 452: Computer Organization and Architecture
2. 3 credits: 2-75 minute lecture sessions/week
3. Sudeep Pasricha
4. Computer Organization and Design: The Hardware/Software Interface. Patterson, D. A. and Hennessy, J. L. 2014.
5. Course Information
 - a. CPU design; microarchitecture; data path and control path; pipelining; memory system; I/O system; program optimization by system software/hardware
 - b. Prerequisites: ECE 251 with a C or higher
 - c. Required: Computer Engineering
Selected Elective: Electrical Engineering
6. Goals for the Course
 - a. Course Learning Objectives
 - i. Model and evaluate hardware components (processors, memories, accelerators, peripherals, sensors/actuators) and their numerous configurations as used in contemporary computing platforms at various scales (e.g., IoT devices, smartphones, servers, and supercomputers)
 - ii. Understand the detailed interactions between software applications, operating systems, and hardware in computing systems
 - iii. Write assembly code in MIPS, optimize assembly code, and optimize high-level (e.g., C) programs for various hardware platforms
 - iv. Understand the importance of memory and network architectures in computing platforms; optimize these components for improved performance and energy efficiency
 - v. Utilize skills required to succeed in doing research in computer architecture
 - a. Student Outcomes
 1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
 2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors
7. Topics Covered
 - Computer abstractions, performance, power, and technology
 - MIPS Instruction Set Architecture (ISA)
 - Computer arithmetic
 - Processor internals: introduction to pipelining
 - Memory hierarchy: caches, buffers, and main memory
 - Mobile computing
 - Storage and other IO topics

Multicores, multiprocessors, and clusters
Interconnection networks
Game console architectures