Catalog Description: Covers basic concepts of computer system design and communication between components, along with current and historical examples of computer architecture.

This course is an intensive introduction to the fundamentals of computer architecture. We will discuss the basic design, or architecture, of computing hardware. Computer systems involve architecture design at many levels. We will focus on the instruction set architecture (ISA) level (the interface between the software and computing hardware) and the microarchitecture level (the computing hardware itself). We will examine to some extent, the level above the instruction set (the programming language level) and the level below the microarchitecture (the logic gate level) in order to deepen our understanding of computing systems. This course has a demanding design component; you will implement some of the basic concepts presented in lecture using real hardware design tools.

Topics will include a detailed look at instruction set architecture, integer and floating point computer arithmetic, control unit design, single-cycle & multi-cycle CPU design, datapath pipelining, virtual memory and caches.

Text:

David Patterson and John Hennessy, Computer Organization and Design: The Hardware/Software Interface, 3rd Edition Revised Printing, Morgan Kaufmann

Optional VHDL reference:


Grading Policy:

Exams: 13% Midterm #1 13% Midterm #2 24% Final
Projects: 5% MP1 10% MP2 20% MP3
Homework: 10% (due every Thursday)
Class Participation: 5%
Students needing special assistance:
If you feel you need special assistance, please contact me by the third week of classes.

Collaboration:
Unauthorized collaboration of any kind is strictly prohibited and will result in the strictest disciplinary action available. Copying of any kind on any assignment will not be tolerated. However, students are encouraged to work together on homework. MP3 will be completed in small groups. No collaboration of any kind is allowed on exams.

Late submission policy:
Late homework (up to one week late) will be accepted for exactly one submission per student. No credit will be given to late project submissions. Exceptions due to illness or other extraordinary circumstances should be requested before the class in which the assignment is due.

Machine Problems:
This course features significant design and simulation projects using HDL Designer and ModelSim by Mentor Graphics. The first two projects (called machine problems or MPs) will be completed individually. The final project will be completed in small teams.