

## COMPUTER SCIENCE 381

### COMPUTER SYSTEMS & ARCHITECTURE DESIGN

#### I. Introduction

##### A. Catalog description

The study of the functionality and implementation of computing machines. Topics include central processor design, memory hierarchies, and parallel architectures. The class explores the motivations behind the fundamental concepts as well as analyzes their particular implementation in existing machines. *Prerequisite: CSCI 281*. Offered every other Spring; not offered 2006-2007.

##### B. Objectives

This course introduces the student to the concept of a computer systems' architecture and its implementation as a hierarchy of hardware and software components. The student will study advanced architectural concepts and discover how these concepts are implemented in current architectures.

##### C. Prerequisites

CSCI 281 – Assembly Language and Computer Architecture. A grade of C- or better is required in prerequisite courses.

#### II. Required Topics

##### A. Perspective

1. Eras of computers
2. Von Neumann architecture

##### B. Central processor design

1. Control and data organization
2. Instruction set design
3. Vertical and horizontal microcode
4. Pipelining
5. Prefetching

##### C. Memory hierarchies

1. Buses
2. Virtual Memory
3. Caches

##### D. Parallel architectures

1. Vector processors
2. Flynn's taxonomy
3. Amdahl's law

III. Optional Topics

- A. Performance evaluation
- B. Special purpose architectures
- C. VLSI design issues

IV. Bibliography

Patterson and Hennessy *Computer Organization and Design; A Quantitative Approach*

Siewiorek, Bell and Newell *Computer Structures: Principles and Examples*

Stallings *Computer Organization and Architecture*

Tanenbaum *Structured Computer Organization*