

CS 5621: Computer Architecture (4)

Catalog Description:

Computer organization from a software point of view. Relations among CPU organization, assembly language, and operating systems. System organization, including memory hierarchy, input/output. In-depth analysis of hardware performance and pipelining. Alternative CPU organizations.

Textbook: Vincent Heuring and Harry Jordan, *Computer Systems Design and Architecture*, Prentice Hall, 1997.

References:

Course Goals:

This course introduces the fundamentals of the operation and design of computers from the computer architect's point of view, as a base for the understanding of current design technological trends (CISC, RISC), the implementation of some design principles, and the elements of the computer system.

Prerequisites by Course & Topic

CS 2521: Computer Organization and Architecture – representation of programs and data, assembly language, addressing.

Major Topics Covered in the Course

- Processor Design
- Pipelining
- Memory System Design
- Input and Output
- Peripheral Devices

Class/Laboratory Schedule: Lecture: 3 hours per week, Laboratory: 1

Laboratory Projects

- Pipeline simulator (6)
- Cache simulator (6)

Course Contribution to Program Objectives and Outcomes:

1. Students gain further understanding of the components of a computer including attributes such as the instruction set, registers and memory organization. (*c, d*)
2. Students understand the relations between hardware and assembly language, and the involvement of the operation system in executing software. (*c*)
3. Students comprehend the principles of memory hierarchy and its performance evaluation. (*c, d*)
4. Students recognize the problems related to pipelined CPU implementations. (*a, d*)
5. Student have the ability to work independently and in teams on hard problems including hardware simulation (*b, c, e, f*)

Estimate CSAB Category Content

	CORE	ADVANCED		CORE	ADVANCED
Data Structures			Computer Organization and Architecture		3
Algorithms			Concept of Programming Languages		
Software Design		1			

Oral and Written Communications

Every student is required to submit at least 2 written reports (not including exams, tests, quizzes, or commented programs) of typically 2 pages and to make 2 oral presentations of typically 15 minutes duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.

Theoretical Content

- Register transfer notation (3 hours).
- Computer performance (5 hours).
- Input/output devices functioning (5).

Problem Analysis

- Pipeline hazards (10).
- Memory resources administration (8).

Solution Design

- Instruction set upgrades (3).
- Data path upgrades (6).

Coordinator/Prepared by: P. Windyga