

CSC 343 - COMPUTER ARCHITECTURE

CREDIT HOURS: 3
PREREQUISITES: CSC 214; CSC 241 recommended
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

Architectural structure and organization of computers. Analysis of the processor components, memory structure, I/O section, and bus. Study of system component interrelationships and interactions with the operating system.

PURPOSE OF COURSE

To introduce the student to the hardware components of computer systems through lecture and demonstration. To expose the student to system hardware component relationships and interactions with the operating system via C language programming. To provide the student with a solid foundation in system level programming concepts using the operating system's application programmer's interface, kernel mechanisms, and data structures.

EDUCATIONAL OBJECTIVES

Upon successful completion of the course, students should be able to do the following:

1. Describe the basic principles of computer architecture and organization and what influences the performance of the system.
2. Employ the fundamentals of system level programming.
3. Demonstrate a solid knowledge of and an ability to properly use the following C language features and facilities: indirection (pointers), data storage, selection structures, bit operations, and interrupt facilities.
4. Determine instruction design and implementation requirements.
5. Assess the effect of CPU architecture on application performance and how to improve application performance.
6. Describe some modern architectures such as RISC, Superscalar, VLIW (very large instruction word).
7. Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, and caches.
8. Describe the principles of computer design.
9. Identify the relationship between high-level abstractions and low-level hardware components.
10. Explain operating system kernel interactions with the memory, I/O, peripherals, and bus system components.

CONTENT

HOURS

Computer Architecture	24
Functions of, and communication between, large-scale components of a computer system.	
Hardware implementation and sequencing of instruction fetch, address construction, and instruction execution.	
Data flow and control block diagrams of a simple processor.	
Concept of microprogram and analogy with software.	

Properties of simple I/O devices and their controllers, synchronous control, interrupts.
Modes of communications between processor, memory, bus, and peripheral devices.
Study of an actual microcomputer system.
Introduction to advanced architectures.

Architecture and Operating System Interaction	18
Role of operating system kernel in controlling the large-scale components of a computer system.	
Resource abstractions related to hardware components.	
Resource, memory, device, and file management.	
Using kernel services and interrupts.	
Virtual memory operations.	
Exams (plus final)	3
	TOTAL 45

REFERENCES

Beck, M., et al., Linux Kernel Programming, Addison Wesley Longman, Inc., 3rd Ed., 2002

Bryant, Randel E. and O’Hallaron, David R., Computer Systems A Programmer’s Perspective, Prentice Hall, 2003.

Nutt, Gary J., Kernel Projects for Linux, Addison Wesley Longman, Inc., 2001.

Rubini, A. and Corbet, J., Linux Device Drivers, O’Reilly, 2nd Ed., 2001

Stallings, William, Computer Organization and Architecture, Prentice Hall, 7th Ed., 2006.

Tanenbaum, Andrew S., Structured Computer Organization, Prentice Hall, 5th Ed., 2006.