CSC 214 - COMPUTER ORGANIZATION AND ARCHITECTURE

CREDIT HOURS:	3
PREREQUISITES:	CSC 202
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 system kernel and selected programming techniques.

PURPOSE OF COURSE

To provide the student with a solid foundation in system level organization and architecture concepts using the operating system’s application programmer’s interface, kernel mechanisms, and data structures. To expose the student to system hardware component relationships and interactions with the system kernel via C language programming. Upon completion of this course, students should have a complete understanding of the role played by each major component of a modern computer system.

EDUCATIONAL OBJECTIVES

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

1. Elaborate the basic principles of computer architecture and organization and to identify the factors that influence the performance of the system.
2. 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.
3. Describe some modern architectures such as RISC, Superscalar, VLIW (very large instruction word).
4. Describe the operation of performance enhancements such as pipelines, dynamic scheduling, branch prediction, and caches.
5. Describe the principles of computer system design.
6. Explore operating system kernel interactions with the memory, I/O, peripherals, and bus system components.
7. Demonstrate an understanding of the standard models of computers including the instruction fetch cycle and the physical components involved in this process; memory, CPU, I/O.
8. Demonstrate skills in problem analysis and program design.

COURSE CALENDAR

This course meets for a minimum of 37.5 lecture contact hours during the semester, including the final exam. Students have significant weekly reading assignments covering the material to be taught. Students are expected to complete 5-6 homework assignments, 2-3 programming assignments, quizzes, and 2-3 periodic exams in addition to the final exam. Students are expected to prepare for any class assignments or quizzes over the material covered in class or in the reading material. Successful completion of these activities requires at a minimum six additional hours of outside of classroom work each week.

CONTENT	**Hours**

Bits, Data Types, and Operations 3
- Bits and the concept of a data type, type conversions
- Logical and arithmetic operations
- Integer and floating point data types, ASCII codes

Digital Logic Structures 3
- Boolean algebra and DeMorgan's Law
- CPU design: registers, and combinatorial logic structures
- Memory design; address space and addressability

Computer structures, function, interconnection 9
- Processor and register organization, bus, clock
- Instruction pipelining
- Memory organization and addressing
- Bus interconnection structures

Input and Output in Interfacing and Communications 3
- I/O architectures, Programmed and Interrupt-driven I/O
- Direct memory access
- I/O channels and processes

Machine Issues and Concepts 6
- Instruction Set Architecture: instruction organizations
- Memory addressing
- CPU structures and operations

Memory Systems Organization 3
- Semiconductor memory design and operation
- Cache memory
- Memory hierarchy

RISC and Multiprocessor Architectures 6
- Parallel and multiprocessor architectures
- RISC, CISC, VLIW, current

High-level Language Utilization of Hardware Components 9
- C data types and variables, global and local scope
- Tables and space allocation for resources
- Control stack organization and allocation
- Expressions and statements; arithmetic and logical operators
- Control structures, data structures, and pointers
- Functions and parameter passing

Exams (plus final) 3

TOTAL 45

REFERENCES

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

Bryant, R. and O'Hallaron, D., Computer Systems: A Programmer's Perspective, Prentice Hall, 2003.

Kelly, A. and Pohl, I., A Book on C: Programming in C, 4th Ed., Addison-Wesley Professional, 1998.

Null, L. and Lobur, J., Essentials of Computer Organization and Architecture, 5th Ed., Jones & Bartlett, 2018.

Patt, Y. and Patel, S., Introduction to Computing Systems Second Edition, McGraw-Hill, 2004.

Petzold, Code, Microsoft Press, 1999.

Seyfarth, Introduction to 64 Bit Intel Assembly Language Programming for Linux: Second Edition, 2012.

Stallings, W., Computer Organization and Architecture, Prentice Hall, 8th Ed., 2010.

Tanenbaum, A. and Austin, T., Structured Computer Organization, Peasrson, 6th. Ed., 2013.

Warford, J., Computer Systems, 5th Ed., Jones & Bartlett, 2017.

WEB REFERENCES

http://www.lulu.com/product/file-download/computer-organization-and-design-fundamentals-e-book/1242053

http://www.cprogramming.com/tutorial/c-tutorial.html