Computer Organization
CS224 : 4 (3, 0, 2)

Prerequisites:
CS105 Discrete Structures
CS106 Digital Logic

Objectives:

1. Summary of the main learning outcomes for students enrolled in the course.
Upon successful completion of the course, the student should be able to:
(a) Understand data structures at the machine level (e.g., binary representation of common data items, such as integers, logic values, and characters…).
(b) Understand the structure of a modern computer system (e.g., processors, memory, and I/O devices).
(c) Understand the translation of a programming language (e.g., compilation, interpretation, linking, loading).
(d) Understand the function of a computer system at the machine level (e.g., typical components of a run-time environment, such as the stack and heap; procedure calls and parameter passing; operating system support for program execution).
(e) Have an understanding of machine language and the way the instructions are executed by the processor.
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)
    (a) Introducing more up to date examples.

Course Description:
* General description in to be used for the Bulletin or Handbook
Introduction to general concepts of computer system organization. Exploration of the Instruction Cycle. Description of the organization of the CPU, I/O and Memory units.

Syllabus:
1- **Introduction:** Review of Digital Logic Circuits; Combinational Circuits; Flip Flops; Sequential Circuits.
2- **Review of Digital Components:** Decoders; Multiplexers and Arithmetic Circuits; Binary Registers and Counter; Finite State Machines.
3- **Register Transfer and Micro operations:** Register Transfer Language; Register Transfer; Bus and Memory Transfer; Arithmetic Microoperations; Logic Microoperations; Shift Microoperations Arithmetic Logic Shift Unit.
4- **Basic Computer Organization & Design:** Basic Instruction Codes; Computer Registers; Computer Instructions; Timing & control; Instruction Cycle; Memory Reference Instructions; Input-Output & Interrupt.
5- **The organization of Central Processing Unit:** Introduction; General Register Organization; Stack Organization; Instruction Formats; Addressing Modes; Data Transfer & Manipulation.
6- **Input-Output Organization:** Peripheral Devices; Input-Output Interface; Asynchronous Data Transfer; Modes of Transfer; Direct Memory Access; Input-Output Processor; Serial Communication.
7- **Memory Organization:** Memory Hierarchy; Main Memory; Auxiliary Memory; Associative Memory; Cache Memory; Virtual Memory

References:
1- Required Textbox :
Computer System Architecture, Morris Mano, 3rd edition, Prentice Hall, 1992.
The Essentials of Computer Organization and Architecture, Null and Lobur, Jones and Bartlett Pub, 2012.

2- Essential References
Logic and computer Design Fundamentals, Mano & Kime, 4th ed, Prentice Hall, 2007.
Digital Design, Frank Vahid, Wiley, 2006.
Computer Organization: A Top-Down Approach, Scragg, McGraw-Hill, 1992.
Computer Organization and Design: The Hardware/Software Interface, Patterson, Hennessy, and Ashenden, Morgan Kauffmann, 2004.