



MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Department of Electronics & Communication Engineering
Course Hand-out

Computer Organization and Architecture | EC 1304 | 4 Credits

Session: July 14 – Dec. 14 | Faculty: Ms. Deepika Bansal | Class: Core Course

Course Outcomes: At the end of the course, students will be able to

- [1304.1]. Apply the knowledge of digital logic circuits to computer organization and architecture.
- [1304.2]. Analyse functional units of the processor such as the registers, arithmetic logical unit, addressing modes and instructions sets.
- [1304.3]. Perform binary addition, subtraction, multiplication and division of integers and floating-point numbers.
- [1304.4]. Analyse the organization of the control unit, memory unit and the I/O unit.
- [1304.5]. Relate instruction level parallelism and interconnection networks with multiprocessors systems to make them employable in industry.

A. SYLLABUS

Basic structure and operation of Computers: Introduction to the basic operational concepts of digital computer. Von-Neumann and Harvard Architecture; Overview of typical computer architecture: Accumulator based, General Register based and Stack based.

Instruction Set: Instruction formats, types and addressing modes. Reverse Polish notation. Opcode Encoding techniques, Stack Addressing, RISC and CISC architecture.

Data Path and Control Unit Design: Basic concepts, Data path: Fast adders, subtractors, Types of Bus structures. Control Unit design methods-Hardwired and micro programmed.

Computer Arithmetic: Multiplication of signed and unsigned integers, Booths multiplication Algorithm, Division, Floating Point Arithmetic Operation.

Memory Organization: Memory hierarchies: types of ROMs, Main memory: SRAM and DRAM, Memory Address Map; Cache memory: mapping functions – associative, direct and set-associative.

Input/Output Organization: Introduction to Input/output Organization: Types of I/O: Isolated I/O, memory mapped I/O, programmed I/O, Interrupt driven I/O; Introduction to Direct Memory Access (DMA) & DMA Controller, DMA transfer methods; Introduction to Arbiters and Bus Arbitration methods;

Introduction to Multicore and Multi-processor Systems: Parallel Processing, Pipelining Structure of General-purpose Multiprocessor, Interconnection networks, Memory organization in Multiprocessors, Cache Coherence, Multicore organization: hardware and software performance issues.

B. TEXT BOOKS

- M. Morris Mano, *Computer System Architecture*, Pearson, 8th Ed, 2011.
- W. Stallings, *Computer Organization and Architecture: Designing for Performance*, Prentice Hall, 7th Ed, 2006.
- V.C. Hamacher, Z. Vranesic & S. Zaky, *Computer Organization*, McGraw Hill International Edition, Computer Science series, 5th Ed, 2002.
- J.L. Hennessy and D. A. Patterson, *Computer Architecture: A Quantative Approach*, Morgan Kauffman Publication, 5th Ed., 2007.

