B.E. /B.Tech in Computer Science & Business Systems

Semester 3

COMPUTER ORGANIZATION & ARCHITECHTURE (PCC-CS 402)

Revision of basics in Boolean logic and Combinational/Sequential Circuits.

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.

Instruction set architecture of a CPU: Registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Outlining instruction sets of some common CPUs.

Data representation: Signed number representation, fixed and floating point representations, character representation.

Computer arithmetic: Integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic, IEEE 754 format.

Introduction to x86 architecture.

CPU control unit design: Hardwired and micro-programmed design approaches, design of a simple hypothetical CPU.

Memory system design: Semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text Books:

1. *Computer System Architecture* M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
2. *Computer Organization and Design: The Hardware/Software Interface*, David A. Patterson and John L. Hennessy.
3. *Computer Organization and Embedded Systems*, Carl Hamacher.

Reference Books:

1. *Computer Architecture and Organization*, John P. Hayes.

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2. *Computer Organization and Architecture: Designing for Performance*, William Stallings.
3. *Computer System Design and Architecture*, Vincent P. Heuring and Harry F. Jordan.