

Semester – IV

Subject Code	Subject Name	Core/ Elective	L-T-P	Credits
CSEC	Computer Organization and Architecture	C	3-0-0	3

Course Objective:

Students will be able to understand the organization of computer, performance evaluation of memory and CPU. They will also learn to design various components of computer system.

Course outcomes:

- 1 Understand basic structure and operation of digital computer
- 2 Understand the design of ALU to perform arithmetic and logic operations on fixed point and floating numbers
- 3 Understand different types instructions and addressing modes supported in the instruction set of CPU
- 4 Understand the design of control unit
- 5 Understand instruction and arithmetic pipeline processing
- 6 Understand different types of memory devices used in the computer system including cache memories
- 7 Understand different types of I/O communication techniques and standard I/O interfaces

UNIT I Basic Structure of Computers

Functional units – Bus structures – Instruction set architecture: Instruction formats - addressing modes - Architecture and instruction set of 8086/8088 microprocessor- Assembly language programming - Fixed point and floating point operations – ALU design

UNIT II Basic Processing Unit

Fundamental concepts – Execution of a complete instruction – Hardwired control – Micro programmed control design- Nano programming- CISC-RISC- principles

UNIT III Pipeline Processing

Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards. Pipeline optimization techniques: Compiler techniques for improving performance

UNIT IV Memory System

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements–Associative memories–Secondary storage devices.

UNIT V I/O Organization

Accessing I/O devices – Programmed Input/output - Interrupts – Direct Memory Access– Interface circuits – Standard I/O Interfaces - I/ O devices and Processors.

List of practical experiments:

- 1 Assembly language programming
- 2 Development of simulator for a hypothetical CPU
- 3 Development of Assembler for hypothetical CPU
- 4 Design of Hardwired control unit for a hypothetical CPU
- 5 Design of Microprogrammed control unit for a hypothetical CPU

Books of Study:

1. Computer System Architecture, Morris Mano, Third edition, Pearson publications
2. Computer Organization, Carl Hamacher, Zvonko Vranesic and Safwat Zaky, V Edition, McGraw-Hill publications
3. "Computer Organization and Architecture – Designing for Performance", William Stallings, Ninth edition, Pearson publications

References:

1. Structured Computer Organization, Andrew S. Tanenbaum
2. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface"
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill
4. V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", Second Edition, Pearson Education