

III Semester
Course 7: Computer Organization
Credits -3

Course Objectives

To familiarize with organizational aspects of memory, processor and I/O.

Course Outcomes

Upon successful completion of the course, the students will be able to

1. Identify different types of instructions
2. Differentiate between micro-programmed and hard-wired control units.
3. Analyse the performance of hierarchical organization of memory.
4. Summarize different data transfer techniques.
5. Demonstrate arithmetic operations on fixed- and floating-point numbers and illustrate concepts of parallel processing.

UNIT – I

Register Transfer Language and Micro Operations: Introduction- Functional units, computer registers, register transfer language, register transfer, bus and memory transfers, arithmetic, logic and shift micro-operations, arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, instruction cycle.

Register reference instructions, Memory – reference instructions, input – output and interrupt.

UNIT – II

CPU and Micro Programmed Control: Central Processing unit: Introduction, instruction formats, addressing modes. Control memory, address sequencing, design of control unit - hard wired control, micro programmed control.

UNIT – III

Memory Organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache Memory and mappings.

UNIT – IV

Input-Output Organization: Peripheral Devices, input-output interface, asynchronous data transfer, modes of transfer- programmed I/O, priority interrupt, direct memory access, Input – Output Processor (IOP).

UNIT – V

Computer Arithmetic and Parallel Processing: Data representation- fixed point, floating point, addition and subtraction, multiplication and division algorithms.

Parallel Processing-Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

Text Books:

1. M. Moris Mano, “Computer Systems Architecture”, 3rd edition, Pearson/ PHI.

Reference Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky, “Computer Organization”, 5th edition, McGraw Hill.
2. William Stallings, “Computer Organization and Architecture”, 8th edition, Pearson/PHI.

SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:

Unit 1: Activity: Quiz competition on micro-operations.

Evaluation Method: Accuracy and speed in answering quiz questions.

Unit 2: Activity: Instruction Format Puzzle: Solving a puzzle to decode and understand instruction formats.

Evaluation Method: Accuracy and speed in completing the puzzle.

Unit 3: Activity: Memory Hierarchy Poster: Creating informative posters or infographics on memory hierarchy.

Evaluation Method: Clarity of information, presentation and creativity of visual design.

Unit 4: Activity: I/O Troubleshooting Challenge

Evaluation Method: problem identification, feasibility of proposed solutions, and clarity of explanations.

Unit 5: Activity: Case Study on Parallel processing architecture.

Evaluation Method: Understanding of parallel processing concepts and architectures.

III Semester

Course 3: Computer Organization

Credits -1

Lab Experiments

1. Implement a C program to convert a Hexadecimal, octal, and binary number to decimal number vice versa.
 2. Implement a C program to perform Binary Addition & Subtraction.
 3. Implement a C program to perform Multiplication of two binary numbers.
 4. Implement arithmetic micro-operations using logic gates.
 5. Implement logic and shift micro-operations using logic gates.
 6. Implement a C program to perform Multiplication of two binary numbers (signed) using Booth's Algorithms.
 7. Implement a C program to perform division of two binary numbers (Unsigned) using restoring division algorithm.
 8. Implement a C program to perform division of two binary numbers (Unsigned) using non-restoring division algorithm.
 9. Write assembly language code for $A+B*(C-D)$ using various instruction formats in MASM or any open-source assembler.
 10. Write assembly language code for $A+B*C$ using various addressing modes in MASM or any open-source assembler.
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