204190   Computer Organization

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/ Week   **Theory Online :** 50 Marks

                                                          Theory Paper   : 50 Marks

Course Objectives and Outcomes:

Computer has become an integral part across all the branches of engineering. It is essential for an electronics and telecommunication engineering student to know the fundamental concepts of computer organization and its architecture.   In spite of the variety and pace of change in the computer field, certain fundamental concepts apply consistently throughout. The objective of this course is to provide a thorough discussion of the fundamentals of computer organization and architecture and to relate these contemporary computer organization, architecture and design issues.

Having successfully completed this course, the student will be able to:

1. Understand and describe the basic structure of a computer, machine instruction and their execution.
2. Understand and analyze performance issues in computer system.
3. Understand, apply and carry out binary arithmetic operations such as high speed addition, multiplier including the algorithms
4. Understand, and explain the instruction execution, internal functions of processor and control unit design.
5. Understand and describe the various way of communication with I/O devices and standard I/O interfaces.
6. Understand and describe the memory organization and hierarchical memory system.
7. Understand and explain the various aspects of   8086 (16 bit microprocessor) processor as a case study.

Unit I : Basic Structure of Computer   6L

Computer types, Functional units - input unit; output unit; ALU; control unit; memory unit, Basic operational concepts, Bus structure, Software, Performance – processor clock; basic performance equation; pipelining and superscalar; operation; clock rate; instruction set: CISC & RISC;

Multiprocessors & Multi computers, Historical perspective (generations of a computer).

Unit II : Arithmetic Unit   6L

Addition and subtraction of signed binary numbers, Design of fast adders, Multiplication of positive numbers, Signed Operand Multiplication, Booths Algorithm, Fast multiplication, Integer Division, Floating point Numbers and Operations, IEEE standards, Floating point arithmetic.

Unit III : Control Unit   8L

Single Bus Organization - register Transfer; performing an arithmetic or logic operation; fetching and storing word from/to memory; execution of complete instruction; branch instruction, Multi-bus organization, Hardwired Control- Design methods – state table and classical method, A complete processor, Micro-programmed Control- microinstructions, micro- program sequencing, wide branch addressing, microinstructions with next address field, perfecting microinstructions, emulation.

Unit IV : Input-Output Organization   6L

I/O Organization- accessing I/O devices, Interrupts- interrupt hardware, enabling and disabling interrupts, handling multiple requests, controlling devices, exceptions, interface circuits, Direct memory access – bus arbitration, Buses- Synchronous; asynchronous, Interface circuits- parallel; serial, Standard I/O- PCI, SCSI, USB.

Unit V : Memory Organization   6L

Memory Hierarchy, Semiconductor RAM memories- internal organization of memory chips; static memories; asynchronous and synchronous DRAM; Structure of larger memories, Cache memory, Virtual Memories.

Unit VI : Microprocessor   8L

The 8086 microprocessor, architecture of 8086, Pin diagram, Programming model of 8086, Logical to physical addressing, Addressing modes, Interrupt structure.

Text Books :

1. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 2002, 5th edition.
2. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006.

Reference Books :

1. J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0–07–100479–3
2. Stallings William, "Computer Organization and Architecture: Principles of structure and function", 2nd Ed, Maxwell Macmillan Editions, 1990 ISBN 0 – 02 –946297 – 5.
3. John Uffenbeck, "The 8086/88 Family: Design, Programming & Interfacing", PHI.
4. Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI, 2005.