Syllabus
Paper I
Computer organization
Introduction to microprocessors and computer architecture
Theory
Section I

Unit I: (15 Lectures)

Introduction :
Computers: History of computers and their classification
Basics of modern computer systems: View of a computer as an integrated system,
Neumann machine, block diagram of a computer system.
Information - Definition, Characteristics and interpretation, Data and its logical and
physical concepts, binary form of program and instruction.
Number Systems – Binary, Decimal, Octal, Hexadecimal and their inter-conversions.
Computer Arithmetic – Binary addition and subtraction using signed-Magnitude, 1’s
complement and 2’s complement, Binary multiplication and division, Floating point
representation and arithmetic, arithmetic through stacks.
Codes for character representation – hexadecimal, BCD, Excess-3, Gray code,
ASCII, EBCDIC, Unicode.

Ref: 1) Computer organization and architecture:
William Stallings, PHI, Sixth edition
2) Computer System architecture:
M. Morris Mano, PHI, edition

Unit II: (15 lectures)

Digital logic circuits:

Boolean algebra – Basic identities of Boolean Algebra, Boolean function
Logic Gates – AND, OR, NOT, NOR, NAND, EX-OR EX-NOR operations and their
truth table, Minimization of gates by K-maps.
Digital Circuits – Half Adder, Full Adder, Binary adder-subtractor, binary
incrementer, Multiplexers, Encoder and decoder
Flip Flops – Concept of sequential circuits, concept of clock and synchronization, S-
R, J-K, Preset and Clear, Master-Slave J-K, D, T Flip Flops, their truth tables and
identities, Conversion from one type to another type of Flip Flop, concept of counters
and registers, shift registers.

Ref: 1) Computer System architecture: M. Morris Mano
PHI, edition

Unit III: (15 lectures)

Introduction to computer components:

Memory –
Primary Memory – RAM, SRAM, DRAM, ROM, EPROM.
Secondary Memory – Magnetic Floppy and Hard Disk.
Optical Memory – CDROM, WORM.
Concept of Virtual Memory
Concept of Cache and their need.
Memory hierarchy.

**Input/output devices** –
Input/output devices, input/output interface, asynchronous data transfer, modes of data transfer..

**CPU** –
Functions of CPU, register classification and organization, instruction sets and examples of instruction set, addressing schemes, instruction formats, instruction cycle and instruction pipelining.

**Ref:** 1) Computer organization and architecture:
   William Stallings, PHI, Sixth edition
   2) Computer System architecture:
   M. Morris Mano, PHI, edition

**Section II**

**Unit IV:** (15 lectures)

**Internal memory organization:**
   DRAM, SRAM, ROM types, Cache Memory Principles, elements of cache design, Pentium 4 cache.

**External Memory organization:**
   Magnetic disk, RAID, Optical memory, Magnetic tape

**Input/Output device organization:**
   External devices, I/O modules, Concepts of programmed I/O, interrupt Drive I/O, DMA, I/O processors.
   References: 1) Computer organization and architecture:
      William Stallings, PHI, Sixth edition
   2) Computer System architecture:
      M. Morris Mano, PHI, edition

**Unit V:** (15 lectures)

**Operating System Support:**
   Basic Concepts, Batch, Multiprogramming and Time-Sharing, scheduling, scheduling, Memory Management.

**Introduction to multiprocessors:**
   Characteristics of Multiprocessors, Time-Shared Bus, Multi-port memory.

**Unit VI:** (15 lectures)

**Introduction and programming with Microprocessors:**
   Introduction to 8085 Architecture and its extension to architecture to 8086, functional block diagram, Bus interface unit, Execution unit, general purpose registers, segment...
registers, pointers and index registers basic instruction set and organization of 8086.
8086 Assembly language programming.

References:
1. Microprocessor architecture, programming and applications with 8085:
   Ramesh Gaonkar, Fourth edition, Penram international.
2. Introduction to 8086 programming:

   Practical
   Section I

A) Introduction to Operating system desktop, folders, files, shortcuts, popular menus,
   using notepad, word, excel, power point.
B) Introduction to windows wildcard characters, absolute path, relative path and
   commands like md, cd, rd, copy, ren, del etc.

1) Demo practical on various internal and external parts of computer and their
   interconnection/working.
2) Demo hands on assembly of PC.
3) Study of basic gates.
4) Implementation of Boolean equations using basic gates.
5) Study of flip-flops.
6) Study of 4 to 1 multiplexer.
7) Study of decoder
8) Study of counters.
9) Study of universal shift registers.
10) Study of 4 bit adder/subtractor.

Note: 1) Practical A and B are compulsory. They are to be written in journal but should not be
      the part of practical examination.
      2) Eight practical from the list should be performed.

Section II

1) Demo practical on working of 8085.
2) Study of internal memory, I/O modules.
3) Study of operating system.
4) Study of networking of computers and other devices.
5) Study of concepts of parallel processing.
6) Study of 8086 architecture.
7) Study of 8086 instruction set
8) Writing programs with 8086 microprocessor for
   a) Addition of 1 to n numbers
   b) Finding largest/smallest from n given numbers.
9) Writing program with 8086 microprocessor for demonstration of use of JUMP
   instructions.

10) Writing programs with 8086 microprocessor for
a) Use of I/O ports.
b) Block transfer of memory.

Note: 1) **Any five** experiments from 1 to 7 practical should be performed.
2) Experiments from 8 to 10 are compulsory.