Digital System Design

Semester: III	Subject Code: BS31605	Lectures: 60

Objectives:

The syllabus aims in equipping the students,
- To study the applications of logic gates.
- To use K-maps for digital circuit design.
- To study computer organization
- To study and understand basics of microprocessors.

Unit 1: Introduction to digital circuit design	4

- Examples of digital system and their design.
- Concept of excitation table and state table, Circuit design of 3-bit up counter , Chocolate vending machine.

Unit 2: Memory	16

- Classification of memory (semiconductor), Memory Parameters (Access time, capacity, cost),
- Memory Architecture, Static RAM cell and Dynamic RAM cell,
- Chip arrangement and concept of memory maps
- Memory Hierarchy
- Associative memory, Block diagram, Read/Write data in Associative memory, match logic for single bit
- Cache memory need, Hit and miss ratio with calculation. Need for mapping and mapping techniques used in cache
- Virtual memory: need of virtual memory, Pages and blocks, segment ,mapping techniques for virtual memory(Paging, Segmentation)

Unit 3: CPU Organization	8

- Block Diagram of CPU ,Concept of ALU, one stage AL and shift unit
- Register organization in CPU : Special Function Registers -SP,PC, instruction register, MAR, MBR, DR, AC, General Purpose Registers
- Timing and control unit.
- Need of a bus, types of buses in CPU and function

24

12

Unit 4: I/O organization	12

- Need of I/O interface, Block diagram of a general parallel I/O interface
- Types of I/O, Programmed I/O, Interrupt initiated I/O (Daisy chain, polling, parallel priority).
- DMA: Needs of DMA, Types of DMA transfer, DMA controller and process of DMA transfers.
- Serial Communication: Types of Serial Communication, advantages and disadvantages. Data formats and serial communication interface, Serial communication standard RS232, USB

Unit 5: Introduction to microprocessor	8

- Block diagram of microprocessor.
- Evolution: address bus, data bus, speed, presence of cache, pipelines, on chip coprocessor. Comparison of processors on basis of above features.
- Harvard and Von Neumann architecture
- RISC and CISC processor
- Pipelining concept
- Concept of multicore
- Case study of Pentium processor
- Comparison of Desktop, Laptop, Tablet- similarities and differences.

*Contact hours – 12 hours

Reference Books:

- R. P. Jain, *Fundamental of Digital Electronics*
- M. Morris Mano, *Digital design*, Prentice-Hall of India
- Morris Mano, *Computer System Architecture*, Prentice-Hall of India
- James Antonakos, *The Pentium Microprocessor*
- Barry B Brey, *The Intel Microprocessors*, Pearson Education Asia