

DIGITAL SYSTEMS AND COMPUTER ARCHITECTURE

Unit 1: Fundamentals of Electronic Circuits:

System of Units (SI), Current flow, Electric Charge, Electric Potential, Energy, Power, Resistors, Ohm's Law, Resistor Color Codes with Power Ratings. Sensors, Independent Voltage and Current Sources, Conservation of Energy, Kirchhoff's Voltage Law, Kirchhoff's Current Law, Resistors in Series and Parallel. Inductors, Capacitors, Passive Filters. AC Signals, Conductors, insulators and semiconductors, Diodes and Transistors.

Unit 2: Digital Logic and Binary Systems:

Analog Vs Digital, Binary, Octal and Hexadecimal. Conversions from one to the other, Binary codes: Weighted codes, Binary Coded Decimal (BCD), Non-weighted codes, gray code, ASCII codes. 7-Segment Display, Basic and Universal Logic Gates, Binary Addition, Half and Full Adder Circuits, Binary Subtraction, Half and Full Subtractor Circuits, Binary arithmetic. Simplification Techniques: Using Boolean Algebra, Decoder, Encoder, Multiplexers, Demultiplexers.

Unit 3: Sequential Circuits and Storage Elements:

Sequential Circuits, Classification of Sequential Circuits, Storage Elements, SR-Latches, D Latch, Latches and Flip-flops Level and Edge-triggered clocks. Edge-triggered D Flip-flops, JK Flip-flop, T Flip-flop, 4-bit Asynchronous Up counter and Down counter, Serial to Parallel Data Converter.

Unit 4: Computer Architecture and Memory

Systems: Evolution of computers, Moore's law, CPU clocks, Memory Read/Write cycles, PC motherboard, BIOS/POST, I/O devices, Clock signals, CPU Vs Memory, Sequential model, von Neumann Model, Harvard Architecture, Memory Layout of C Program, Global Variables, Initialized and Uninitialized Static Variables, Stack and Heap.

Unit 5: CPU Design and Instruction Cycles:

CPU Design, General purpose registers, assembly instructions, Memory hierarchy, Different memory types, Datapath and Control Unit of a CPU, Register Unit, CPU Design based on General Purpose Register, Instruction Fetch, Memory Read and Write cycles, Instruction Fetch, Data Write.