Lesson plan

Subject Name; Digital Electronics and Computer Organization

Branch: Computer Science engineering

3rd Semester(winter 2025)

Name of Faculty : Samir Kumar Sethi

Semester: 14/07/2025 To 15/11/2025

Total weeks: 15 weeks

week	Three Classes per week	Theory Topic
1st	1st	Overview of digital electronics, analog vs. digital systems, importance in computer engineering.
	2nd	Number systems: Binary, Octal, Decimal, Hexadecimal; conversions between number systems.
	3rd	Binary arithmetic: Addition, subtraction, multiplication, division; 1's and 2's complement.
2nd	1st	Introduction to logic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR.
	2nd	Boolean algebra: Laws, theorems, and De Morgan's theorems.
	3rd	Simplification of Boolean expressions using Boolean algebra and Karnaugh Maps (K-Maps).
3rd	1st	Introduction to combinational circuits; Half Adder and Full Adder.
	2nd	Half Subtractor and Full Subtractor.
	3rd	Design of Multiplexers (MUX) and Demultiplexers (DEMUX).
4th	1st	Encoders and Decoders: Design and Applications.
	2nd	Comparators and Parity generators/checkers.
	3rd	Code converters: Binary to Gray, BCD to Excess-3.
5th	1st	Introduction to sequential circuits; difference between combinational and sequential circuits.
	2nd	Flip-flops: SR, JK, D, and T flip-flops; truth tables and excitation tables.
	3rd	Applications of flip-flops in counters and registers.
6th	1st	Counters: Synchronous and asynchronous counters; design of up/down counters.
	2nd	Shift registers: Types (SISO, SIPO, PISO, PIPO) and applications.
	3rd	State diagrams and state tables for sequential circuits.
7th	1st	Overview of computer organization; basic computer architecture (Von Neumann model).
	2nd	Functional units of a computer: CPU, memory, input/output, and system bus.
	3rd	Instruction cycle: Fetch, decode, execute, and store.

8th	1st	CPU architecture: ALU, control unit, and registers.
	2nd	Instruction set architecture (ISA): RISC vs. CISC.
	3rd	Addressing modes: Immediate, direct, indirect, indexed, and register addressing.
9th	1st	Review of digital electronics concepts (number systems, gates, circuits).
	2nd	Review of computer organization basics (architecture, CPU).
	3rd	Mid-term quiz or progressive assessment.
10th	1st	Memory hierarchy: Registers, cache, main memory, and secondary storage.
	2nd	Types of memory: RAM, ROM, SRAM, DRAM, and their characteristics.
	3rd	Cache memory: Mapping techniques (direct, associative, set-associative).
11th	1st	I/O organization: I/O modules, programmed I/O, interrupt-driven I/O.
	2nd	Direct Memory Access (DMA) and its applications.
	3rd	I/O interfacing: Buses, USB, and peripheral connections.
12th	1st	Pipelining: Concepts and benefits in CPU performance.
	2nd	Parallel processing: Multiprocessors and multicore systems.
	3rd	Memory management: Virtual memory and paging.
13th	1st	Role of digital circuits in CPU design (ALU, control unit).
	2nd	Memory interfacing with digital circuits.
	3rd	Case study: Designing a simple microprocessor using digital components.
14th	1st	Applications of digital electronics in modern computing systems.
	2nd	Review of key concepts: Combinational/sequential circuits, CPU, memory, I/O.
	3rd	Problem-solving session: Design and troubleshoot digital circuits.
15th	1st	Comprehensive review of digital electronics and computer organization.
	2nd	Practice questions for end exam preparation.
	3rd	Discussion of sample projects or case studies in digital systems.

Teaching Methodology

Lectures: Use slides, animations, and circuit simulations to explain concepts.

Hands-On Exercises: Use simulation tools (LT Spice, Multisim) for circuit design.

Assignments: Weekly problem sets to reinforce theoretical concepts.

Group Discussions: Encourage discussions on real-world applications.

Quizzes: Conduct periodic quizzes to assess understanding.

Case Studies: Analyze practical applications of digital electronics in computer systems.

Assessment Strategy

Progressive Assessment (30 marks):

Weekly Assignments: 5 Marks

IA-1: 10 Marks

IA-2:10 Marks

Class participation and discussions: 5 Marks