Digital Logic & Computer Organization and Architecture

(Code : CSC304)

Semester III – Computer Engineering / Computer Science and Engineering / Artificial Intelligence and Data Science/ Machine Learning/ Cyber Security/ Internet of Things(IoT) / Data Engineering / Data science Internet of Things and Cyber Security Including Block Chain Technology

(Mumbai University)

Strictly as per New Choice Based Credit and Grading System Syllabus
(Revise 2019 'C' Scheme) of Mumbai University with effective from Academic Year 2020-2021

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We dedicate this Publication soulfully and wholeheartedly,

in loving memory of our beloved founder director,

Late Shri. Pradeepji Lalchandji Lunawat,

who will always be an inspiration, a positive force and strong support behind us.

"My work is my prayer to God"

- Lt. Shri. Pradeepji L. Lunawat

Soulful Tribute and Gratitude for all Your Sacrifices, Hardwork and 40 years of Strong Vision…

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Syllabus…

DLCO&A : Sem. III, CE / CSE / AI and Data Science/ Machine Learning/ Cyber Security/ IoT / Data Engg. / Data science IoT and Cyber Security Including Block Chain Technology (MU)

Course Code	Course Name	Credit
CSC304	Digital Logic & Computer Organization and Architecture	3

Pre-requisite : Knowledge on number systems

Course Objectives :

1. To have the rough understanding of the basic structure and operation of basic digital circuits and digital computer.
2. To discuss in detail arithmetic operations in digital system.
3. To discuss generation of control signals and different ways of communication with I/O devices.
4. To study the hierarchical memory and principles of advanced computing.

Course Outcome :

1. To learn different number systems and basic structure of computer system.
2. To demonstrate the arithmetic algorithms.
3. To understand the basic concepts of digital components and processor organization.
4. To understand the generation of control signals of computer.
5. To demonstrate the memory organization.
6. To describe the concepts of parallel processing and different Buses.

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Module 1

Computer Fundamentals :

Introduction to Number System and Codes Number Systems: Binary, Octal, Decimal, Hexadecimal, Codes: Grey, BCD, Excess-3, ASCII, Boolean Algebra. Logic Gates: AND,OR,NOT,NAND,NOR,EX-OR, Overview of computer organization and architecture. Basic Organization of Computer and Block Level functional Units, Von- Neumann Model.

(Refer chapter 1)

Module 2

Data Representation and Arithmetic algorithms :

Binary Arithmetic: Addition, Subtraction, Multiplication, Division using Sign Magnitude, 1's and 2's compliment, BCD and Hex Arithmetic Operation. Booths Multiplication Algorithm, Restoring and Non-restoring Division Algorithm. IEEE-754 Floating point Representation. **(Refer chapter 2)**

Module 3

Processor Organization and Architecture :

Introduction: Half adder, Full adder, MUX, DMUX, Encoder, Decoder(IC level). Introduction to Flip Flop: SR, JK, D, T (Truth table). Register Organization, Instruction Formats, Addressing modes, Instruction Cycle, Interpretation and sequencing. **(Refer chapter 3)**

Module 4

Control Unit Design :

Hardwired Control Unit: State Table Method, Delay Element Methods. Microprogrammed Control Unit: Micro Instruction-Format, Sequencing and execution, Micro operations, Examples of microprograms.

(Refer chapter 4)

Module 5

Memory Organization :

Introduction and characteristics of memory, Types of RAM and ROM, Memory Hierarchy, 2-level Memory Characteristic, Cache Memory: Concept, locality of reference, Design problems based on mapping techniques, Cache coherence and write policies. Interleaved and Associative Memory. **(Refer chapter 5)**

Module 6

Principles of Advanced Processor and Buses :

Basic Pipelined Data path and control, data dependencies, data hazards, branch hazards, delayed branch, and branch prediction, Performance measures-CPI, Speedup, Efficiency, throughput, Amdhal's law. Flynn's Classification, Introduction to multicore architecture. Introduction to buses: ISA, PCI, USB. Bus Contention and Arbitration.

(Refer chapter 6)

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Module 1

Syllabus : Introduction to number system and codes, Number systems : Binary, Octal, Decimal, Hexadecimal, Codes : Gray, BCD, Excess-3, ASCII, Boolean algebra, Logic gates : AND, OR, NOT, NAND, NOR, EX-OR, Overview of computer organization and architecture, Basic organization of computer and block level functional units, Von-Neumann model.

Syllabus : Binary arithmetic : Addition, Subtraction, Multiplication, Division using sign magnitude, 1's and 2's compliment, BCD and Hex arithmetic operation, Booths multiplication algorithm, Restoring and non-restoring division algorithm, IEEE-754 floating point representation.

Syllabus : Introduction : Half adder, Full adder, MUX, DMUX, Encoder, Decoder (IC level), Introduction to Flip Flop : SR, JK, D, T (Truth table), Register organization, Instruction formats, Addressing modes, Instruction cycle, Interpretation and sequencing.

Module 4

Syllabus : Hardwired control unit : State table method, Delay element methods, Microprogrammed control unit : Micro instruction-format, Sequencing and execution, Micro operations, Examples of microprograms.

Module 5

Syllabus : Introduction and characteristics of memory, Types of RAM and ROM, Memory hierarchy, 2-level memory characteristic, Cache memory : Concept, Locality of reference, Design problems based on mapping techniques, Cache coherence and write policies, Interleaved and associative memory.

Module 6

Syllabus : Basic pipelined data path and control, Data dependencies, Data hazards, Branch hazards, Delayed branch and branch prediction, Performance measures - CPI, Speedup, Efficiency, Throughput, Amdhal's law, Flynn's classification, Introduction to multicore architecture, Introduction to buses : ISA, PCI, USB, Bus contention and arbitration.

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