Course Title: Digital Logic Design **Credit: 3**
Course No.: CSIT.122
Nature of the Course: Theory+Lab **Total hours: 48**
Level: B.Sc.CSIT **Year: First** **Semester: Second**

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1. Course Description

General concepts to be used in the design and analysis of digital systems and introduces the principles of digital computer organization and design.

2. Course Objectives

- Introduce fundamental digital logics and switching networks. Exposure of Boolean algebra and its application for circuit analysis.
- Introduction to multilevel gates networks, flip-flops, counters and logic devices.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the concept of Data and Information. • Differentiate between the Analog Verses digital Signals. • Deal with the different number system in arithmetic. • Understand the binary codes and arithmetic with binary codes. • Work with error handling and error detection codes. • Learn the basics about the ASCII, EBCDIC & UNICODE and use the codes in arithmetic.	**Unit 1: Data and Information (8 Hrs.)** 1.1. Features of Digital Systems 1.2. Number Systems- Decimal, Binary, Octal, Hexadecimal and their inter conversions 1.3. Representation of Data: Signed Magnitude, one's complement and two's complement, 1.4. Binary Arithmetic, Fixed point representation and Floating point representation of numbers. 1.5. **Codes:** BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE), **1.6.** Error detecting and error correcting codes.
• Understand the concept of Boolean Logic • Learn the concept of Logic gates with the help of Diagrams. • Understanding the Universal Gates and their circuit implications. • Learn about Exclusive OR & NOR gates. • Understand the Boolean algebra and laws of Boolean Algebra .	**Unit 2: Boolean algebra and Logic Gates (6 Hrs.)** 2.1. Basic definition of Boolean Algebra 2.2. Basic Theory of Boolean Algebra, Boolean Functions, Logical operations 2.3. Logic Gates, IC Digital Logic Families. Basic gates (AND, OR, NOT gates) 2.4. Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates) 2.5. Boolean identities, De Morgan Laws.
• Understand the building and working of KARNAUGH MAP. • Simplify Boolean expressions • Learn the Quine McClusky Method	**Unit 3: Simplification of Boolean Functions (7 Hrs.)** 3.1. K-map, two and three Variable Maps, Four variable Maps 3.2. Product of Sums, sum of product simplification 3.3. Don't care conditions

	3.4. NAND and NOR implementation 3.5. Quine McClusky method.
• Understand the basics of Combinational Circuits. • Design Combination circuits • Learn working of parallel and Decimal adder	**Unit 4: Combinational Circuit Design (7 Hrs.)** 4.1. Half adder, full adder, 4.2. Code converters 4.3. Multiplexers and demultiplexers 4.4. Encoders, decoders 4.5. Combinational Circuit design 4.6. Binary Parallel Adder 4.7. Decimal Adder 4.8. BCD Counter
• Understand the basics of Sequential Logic Circuits. • Know about different types of flip-flops • Analyze and design synchronous sequential circuits • Analyze asynchronous sequential circuits	**Unit 5: Sequential Circuit Design (7 Hrs.)** 5.1. Flip-flops: RS, JK, D, and T , Latches 5.2. Analysis of synchronous sequential circuit 5.3. Design of synchronous sequential Circuits: Counters, state diagram, state reduction, state assignment 5.4. Analysis of asynchronous sequential circuit 5.5. Problems of asynchronous sequential circuit design
• Understand counters & Shift Registers. • Learn electronics part of memories • Describe digital logic families	**Unit 6: Memories, Registers, and Programmable Logic Devices (6 Hrs.)** 6.1. Resisters, Shift registers 6.2. Memories: ROM, PROM, EPROM 6.3. PLD, PLA 6.4. Digital Logic Families: TTL, ECL, and CMOS
• Understand basics of VHDL • Design simple circuits by using VHDL	**Unit 7: VHDL** 7.1. RTL Design, Combinational Logic, Types, Operators, Packages, sequential Circuits, Subprogram, **7.2.** Example: Adders, Counters, Flip-flops, Multiplexers, Demultiplexers

6. Recommended Books:

- R. P. Jain, " **Modern Digital Electronics**", 3rd Edition, McGraw Hill
- M. Morris Mano, "**Logic & Computer Design Fundamentals**", Pearson Education.
- Morris Mano, **Digital logic and computer design**, PHI 23rd Reprint October 2000.
- Raj Kamal "Digital System Principles and Design" Pearson Education 2nd Edition, 2007
- Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition
- A.Anand Kumar, **Fundamentals of Digital Electronics**, PHI Publications 2001
- Myke Predko, **Programming and Customizing the 8051 Microcontroller**, Tata McGraw Hill publishing.
- James Antonakosm, **An Introduction to the Intel family Microprocessors, A hands on Approach utilizing the 80x86 microprocessor family**, Person Education Asia
- Peter Abel, **IBM PC Assembly Language and Programming**, Prentice Hall of India .
- Dr. N. S. Gill and J. B. Dixit, " **Digital Design and Computer Organisation**", University Science Press

Course Title: **Digital Logic Design LAB** Credit: **1**
Course No.: **CSIT.122**
Nature of the Course: **LAB**
Level: B.Sc. CSIT Year: **First** Semester: **Second**

Laboratory Work Guidelines: Students will have to complete the assigned practical work throughout the semester and Practical examination will be conducted at the end of academic year. The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation (Lab Book or Journal)	25 %
Final Exam Written	50 %
Final Exam Oral	25 %

Following are the guideline for the lab work:

1. There should be a lab book for the practical work related to the subject
2. The lab book will contain details of all practical's to be conducted in the lab
3. Students should read the lab book before coming to the lab
4. Every practical should have:
    a. Title
    b. Objectives
    c. Description
    d. Examples
    e. Self Activities
        i. Objective questions
        ii. Sample programs to be typed and executed
    f. Task list to be decided by the lab in-charge.
    g. Outputs to be verified by the lab in-charge.
5. Each practical should be conducted in the following manner:
    a. Explanation by lab in-charge – 10 minutes
    b. Self activities by students
    c. Lab in-charge will allocate tasks to each student (selection from a list / modify given task / specify new task)
    d. At the end of the slot, the lab in-charge has to verify the outputs and give a remark (Complete / Incomplete / Needs Improvement)

Assignment List for Lab Work

The main objective of Practical work in the course is to familiarize students with

- Digital components, Logic Gates, its types, specifications, data sheets etc.
- Know various Test and Measurement instruments
- Use of various Test and Measuring Instruments

All the students will have to complete the following Sample Lab work list. Lab in-charge may assign additional assignment depending upon the time available.

1. Familiarization with logic gates
2. Encodes and decodes
3. Multiplexer and de-multiplexer
4. Design of simple combination circuits
5. Design of adder/subtractor
6. Design f Flip-Flop
7. Clock driven sequential circuits
8. Conversion of parallel data into serial format
9. Generation of timing signal for sequential system

Recommended Books

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- Morris Mano, **Digital logic and computer design**, PHI 23rd Reprint October 2000..
- Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition
- A.Anand Kumar, **Fundamentals of Digital Electronics**, PHI Publications 2001
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