

**Course Title: Digital Logic Design**  
**Course No.: CSIT.122**  
**Nature of the Course: Theory+Lab**  
**Level: B.Sc.CSIT      Year: First**

**Credit: 3**  
**Total hours: 48**

**Semester: Second**

**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
<ul style="list-style-type: none"> <li>• Understand the concept of Data and Information.</li> <li>• Differentiate between the Analog Verses digital Signals.</li> <li>• Deal with the different number system in arithmetic.</li> <li>• Understand the binary codes and arithmetic with binary codes.</li> <li>• Work with error handling and error detection codes.</li> <li>• Learn the basics about the ASCII, EBCDIC &amp; UNICODE and use the codes in arithmetic.</li> </ul>	<p><b>Unit 1: Data and Information ( 8 Hrs.)</b></p> <p>1.1. Features of Digital Systems</p> <p>1.2. Number Systems- Decimal, Binary, Octal, Hexadecimal and their inter conversions</p> <p>1.3. Representation of Data: Signed Magnitude, one’s complement and two’s complement,</p> <p>1.4. Binary Arithmetic, Fixed point representation and Floating point representation of numbers.</p> <p>1.5. <b>Codes:</b> BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE),</p> <p><b>1.6.</b> Error detecting and error correcting codes.</p>
<ul style="list-style-type: none"> <li>• Understand the concept of Boolean Logic</li> <li>• Learn the concept of Logic gates with the help of Diagrams.</li> <li>• Understanding the Universal Gates and their circuit implications.</li> <li>• Learn about Exclusive OR &amp; NOR gates.</li> <li>• Understand the Boolean algebra and laws of Boolean Algebra</li> </ul>	<p><b>Unit 2: Boolean algebra and Logic Gates (6 Hrs.)</b></p> <p>2.1. Basic definition of Boolean Algebra</p> <p>2.2. Basic Theory of Boolean Algebra, Boolean Functions, Logical operations</p> <p>2.3. Logic Gates, IC Digital Logic Families. Basic gates (AND, OR, NOT gates)</p> <p>2.4. Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates)</p> <p>2.5. Boolean identities, De Morgan Laws.</p>
<ul style="list-style-type: none"> <li>• Understand the building and working of KARNAUGH MAP.</li> <li>• Simplify Boolean expressions</li> <li>• Learn the Quine McClusky Method</li> </ul>	<p><b>Unit 3: Simplification of Boolean Functions (7 Hrs.)</b></p> <p>3.1. K-map, two and three Variable Maps, Four variable Maps</p> <p>3.2. Product of Sums, sum of product simplification</p> <p>3.3. Don’t care conditions</p>

	<p>3.4. NAND and NOR implementation</p> <p>3.5. Quine McClusky method.</p>
<ul style="list-style-type: none"> <li>• Understand the basics of Combinational Circuits.</li> <li>• Design Combination circuits</li> <li>• Learn working of parallel and Decimal adder</li> </ul>	<p><b>Unit 4: Combinational Circuit Design (7 Hrs.)</b></p> <p>4.1. Half adder, full adder,</p> <p>4.2. Code converters</p> <p>4.3. Multiplexers and demultiplexers</p> <p>4.4. Encoders, decoders</p> <p>4.5. Combinational Circuit design</p> <p>4.6. Binary Parallel Adder</p> <p>4.7. Decimal Adder</p> <p>4.8. BCD Counter</p>
<ul style="list-style-type: none"> <li>• Understand the basics of Sequential Logic Circuits.</li> <li>• Know about different types of flip-flops</li> <li>• Analyze and design synchronous sequential circuits</li> <li>• Analyze asynchronous sequential circuits</li> </ul>	<p><b>Unit 5: Sequential Circuit Design (7 Hrs.)</b></p> <p>5.1. Flip-flops: RS, JK, D, and T , Latches</p> <p>5.2. Analysis of synchronous sequential circuit</p> <p>5.3. Design of synchronous sequential Circuits: Counters, state diagram, state reduction, state assignment</p> <p>5.4. Analysis of asynchronous sequential circuit</p> <p>5.5. Problems of asynchronous sequential circuit design</p>
<ul style="list-style-type: none"> <li>• Understand counters &amp; Shift Registers.</li> <li>• Learn electronics part of memories</li> <li>• Describe digital logic families</li> </ul>	<p><b>Unit 6: Memories, Registers, and Programmable Logic Devices (6 Hrs.)</b></p> <p>6.1. Resisters, Shift registers</p> <p>6.2. Memories: ROM, PROM, EPROM</p> <p>6.3. PLD, PLA</p> <p>6.4. Digital Logic Families: TTL, ECL, and CMOS</p>
<ul style="list-style-type: none"> <li>• Understand basics of VHDL</li> <li>• Design simple circuits by using VHDL</li> </ul>	<p><b>Unit 7: VHDL</b></p> <p>7.1. RTL Design, Combinational Logic, Types, Operators, Packages, sequential Circuits, Subprogram,</p> <p><b>7.2.</b> Example: Adders, Counters, Flip-flops, Multiplexers, Demultiplexers</p>

## 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 23<sup>rd</sup> Reprint October 2000.
- Raj Kamal “Digital System Principles and Design” Pearson Education 2<sup>nd</sup> 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