B.E. Semester: 3
Electronics & Communication Engineering
Subject Name: Digital Logic Design
Subject Code: EC-304

A. Course Objective :

The educational objectives of this course are

- To present a problem oriented introductory knowledge of Digital Electronics.
- To address the underlying concepts and methods behind Digital Logic Design

B. Teaching / Examination Scheme :

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EC 304	Digital Logic Design	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus :

1. **Binary System :** Digital computer and digital systems, Binary Number, Number base conversion Octal and Hexadecimal Number, complements, Binary Codes, Binary Logic
2. **Boolean Algebra and Logic Gates :** Basic Definition, Axiomatic Definition of Boolean Algebra, Basic Theorem and Properties of Boolean Algebra, Standard Representation of Logical Functions, Universal Gate, Minterm And Maxterm, Logic Operations, Digital Logic Gates
3. **Simplification of Boolean Functions:** Different types Map method, Product of sum Simplification, NAND or NOR implementation, Don't Care condition, Tabulation method
4. **Combinational Logic Circuits :** Introduction, Design Procedure, adder, subtractor , Parity checker Parity Generator, Code Conversion.
5. **Combinational Logic With MSI AND LSI :** Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoder, Multiplexer, ROM, Programmable Logic Array.
6. **Sequential Logic Circuits:** Introduction, Flip-Flops, Triggering of Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design of Counters, Design with State Equations
7. **Registers Transfer Logic & Micro-Operation :** Introduction, Inter-register Transfer, Arithmetic, logic and shift Micro- Operations, Conditional Control Statements, Fixed-Point Binary Data, overflow, Arithmetic Shifts, Decimal Data, Floating-Point Data, Instruction Codes, Design of Simple Computer
8. **Registers, Counters and the Memory unit :** Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, Memory Unit
9. **Logic Families :** Digital IC specification terminology, Logic families, Transistor as Switch, RTL, DCTL, DTL, TTL, Open collector gate, TTL subfamilies, IIL, ECL, MOS, CMOS, Dynamic MOS Logic, Comparison of CMOS and TTL families

D. Lesson Planning :

Sr. No.	Lectures (Hours)	Weightage in % in Exam	Topics
1	02	12	**Binary System ::** Digital computer and digital systems,
2	03		Binary Number, Number base conversion Octal and Hexadecima Number, complements, Binary Codes, Binary Logic
3	03	12	**Boolean Algebra and Logic Gates :** Basic Definition, Axiomati Definition of Boolean Algebra, Basic Theorem and Properties o Boolean Algebra
4	02		Standard Representation of Logical Functions, Universal Gate Minterm And Maxterm, Logic Operations, Digital Logic Gates
5	01		Digital Logic Gates
6	04	12	**Simplification of Boolean Functions:** Different types Ma method, Product of sum Simplification, NAND or NOR implementation, Don't Care condition, Tabulation method
7	02		NAND or NOR implementation, Don't Care condition, Tabulatio method .
8	02		Tabulation method
9	04	10	**Combinational Logic Circuits :** Introduction, Design Procedure adder, subtractor , Parity checker Parity Generator, Cod Conversion
10	01		Code Conversion.
11	04	10	**Combinational Logic With MSI AND LSI :** Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator,
12	03		Decoder, Multiplexer, ROM, Programmable Logic Array.
13	03	12	**Sequential Logic Circuits:** Introduction, Flip-Flops, Triggering o Flip-Flops, Analysis of Clocked Sequential Circuits, Stat Reduction and Assignment, Flip-Flop Excitation Tables, Desig Procedure, Design of Counters, Design with State Equation
14	08	10	**Registers Transfer Logic & Micro-Operation :** Introduction Inter-register Transfer, Arithmetic, logic and shift Micro Operations, Conditional Control Statements, Fixed-Point Binary Data, overflow, Arithmetic Shifts, Decimal Data, Floating-Poin Data, Instruction Codes, Design of Simple Computer
15	08	10	**Registers, Counters and the Memory unit :** Introduction Registers, Shift Registers, Ripple Counters, Synchronous Counters Timing Sequences, Memory Unit
16	06	12	**Logic Families :** Digital IC specification terminology, Logi families, Transistor as Switch, RTL, DCTL, DTL, TTL, Oper collector gate, TTL subfamilies, IIL, ECL, MOS, CMOS, Dynami MOS Logic, Comparison of CMOS and TTL families
TOTAL	**60**	**100**	

E. Instructional Method & Pedagogy :

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weight age should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- Experiments shall be performed in the laboratory related to course contents.

F. Suggested list of Experiments :

1. To Study & verify the Truth tables of Digital logic Gates.
2. To Study and verify various theorems of Boolean algebra including De-morgan's.
3. To Study and perform the Functionality of NAND and NOR GATE as Universal Gate.
4. To develop Adder and Subtractor and verify its operation.
5. To verify the operation of decoder
   - 2 to 4 line Decoder
   - 3 to 8 line Decoder using IC-74138
6. To study and verify the Truth tables of 8:1 Multiplexer using IC 74151A.
7. To verify the operation of 4-bit comparator using ic 7485.
8. To study & perform Parity Generator / Checker.
9. To test the seven segment display using 7447 IC.
10. To study & verify the Truth tables of Different types of Flip-Flops.
    - R-S (Reset-Set) flip-flop
    - Clocked R-S flip-flop
    - D (Delay) flip-flop
    - Clocked D flip-flop
    - J-K flip-flop
    - T (Toggle) flip-flop
11. Implementation of basic logic gates and its testing using MATLAB
12. Implementation of adder circuits and its testing using MATLAB
13. Implementation 4 to 1 multiplexer and its testing using MATLAB
14. Implementation of 3 to 8 decoder and its testing using MATLAB
15. Implementation of J-K and D Flip Flops and its testing using MATLAB
16. Implementation of sequential adder and its testing using MATLAB

G. Students Learning Outcomes :

On successful completion of the course

- The student can identify different areas of Digital circuits. Can find the applications of all the areas in day to day life. Can identify the operations, working, construction, material etc. aspects of Digital devices, ICs, Logic Gates etc.

H. Recommended Study Materials :

- **TEXT & REFERENCE BOOKS:**

1. M. Morris Mano- Digital logic and computer Design, PHI
2. G.K.Kharate-Digital Electronics,Oxford
3. A. Anand Kumar- Fundamentals of Digital Circuits, PHI
4. R.P.Jain- Digital Electronics, TMH
5. B. Somanathan Nair- Digital Electronics and Logic Design, PHI