

Branch Name:	Electrical Engineering
Program Code	ET403
Course Name:	DIGITAL ELECTRONICS & DIGITAL INSTRUMENTS
Course Code:	2ET4030404
Pre-requisite Course:	

COURSE OBJECTIVE:

1. Use different digital number system & codes.
2. Use digital integrated circuit logic family chips.
3. Perform computational and measurement activities using digital techniques.
4. Build sequential and combinational logic circuits.
5. Analyses working of A/D and D/A converters.
6. Use display devices for digital circuits.
7. Use digital meters for measurements.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment
4	-	2	5	60	40	20	30

DETAILS OF COURSE CONTENTS:

SrNo	Topics and Sub-topics	Total Hours	% Weightage
1	NUMBER SYSTEMS 1.1 Introduction 1.2 Number Systems: 1.2.1 Decimal Number System 1.2.2 Binary Number System 1.2.3 Octal Number System 1.2.4 Hexa decimal Number System. 1.3 Conversion of Number from one Number system to Another Including decimal points. 1.4 Arithmetic operations with binary numbers: 1.4.1 Binary Addition 1.4.2 Binary Subtraction 1.4.3 Binary Multiplication 1.4.4 Binary Division with Examples. 1.5 1's and 2's Complement of Binary numbers. 1.6 Binary subtraction using 1's and 2's Complement method. 1.7 Concepts of Digital codes, BCD, Gray Code, Excess-3 Code and Alphanumeric Codes.	10	20

2	LOGIC GATES AND LOGIC FAMILIES 2.1 Concept of Positive Logic and negative Logic Levels. 2.2 Definition, symbols and truth tables of NOT, AND, OR, NAND, NOR, EX-OR and EX-NOR Gates. 2.3 NAND and NOR as Universal gates. 2.3.1 Develop basic gates using NAND gates. 2.3.2 Develop basic gates using NOR gates. 2.4 Various scales of Integration: SSI, MSI, LSI, VLSI and ULSI. 2.5 Classification of logic families. 2.6 Characteristics of Digital ICs : Logic Voltage level, Fan in, Fan out, Noise margin, Propagation Delay, Power Dissipation, Figure of Merit with reference to logic families. 2.7 Introduction to Resistor Transistor Logic and Diode Transistor Logic. 2.8 Basic logic gates using NMOS, PMOS and CMOS.	10	20
3	BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 3.1 Laws of Boolean algebra. 3.2 Demorgan's theorems. 3.3 Simplification of given Boolean equation. 3.4 Converting Boolean expressions to logic circuits and vice versa. 3.5 Converting Boolean expression to truth tables and vice versa. 3.6 Block diagram of combinational circuits. 3.7 Adders: Definition and Types. 3.7.1 Half Adder: Block diagram, Logic diagram, truth table and working. 3.7.2 Full Adder: Block diagram, Logic Diagram, truth table and working. 3.8 Types of subtractors. 3.8.1 Half Subtractor: Block diagram, Logic diagram, truth table and working 3.8.2 Full Subtractor: Block diagram, Logic diagram, truth table and working. 3.9 Multiplexers: Definition, block diagram. 3.9.1 Classification of Multiplexer. 3.9.2 2:1 Multiplexer. 3.9.3 4:1 Multiplexer. 3.9.4 8:1 Multiplexer 3.9.5 Applications of MUX. 3.10 Demultiplexers: Block diagram. 3.10.1 Classification of Demultiplexer. 3.10.2 1:2 Demultiplexer. 3.10.3 1:4 Demultiplexer. 3.10.4 1:8 Demultiplexer 3.11 Encoders: 3.11.1 Octal to Binary Encoder, 3.11.2 Decimal to BCD Encoder 3.12 Decoders: 3.12.1 3-Line-to-8-Line Decoder, 3.12.2 BCD-to-Seven Segment Decoders.	12	20

4	SEQUENTIAL CIRCUITS 4.1 Block diagram of sequential circuits. 4.2 Comparison of Sequential Circuits with Combinational circuits 4.3 Concept of level and edge triggering. 4.4 Types of Flip-flop. 4.5 R-S flip-flop and clocked R-S flip-flop: Block diagram, truth table, logic diagram using NAND gates and working. 4.6 D flip-flop: Block diagram, truth table, logic diagram and working. 4.7 JK flip-flop: Block diagram, truth table, logic diagram using NAND gates and working 4.8 Master slave JK flip flop with preset and clear input: block diagram only, truth table and working. 4.9 Shift Register: 4-bit Shift Register: Serial-In, Serial-Out Shift Register, Serial-In, Parallel-Out Shift Register, Parallel-In, Serial-Out Shift Register, Parallel-In, Parallel-Out Shift Register using D flip flops. 4.10 Applications of Shift Registers. 4.11 Counters: Classification of Counters, Comparison between Asynchronous and Synchronous counters. 4.11.1 Four-bit Decade counter : Block diagram using JK flip flops, truth table, timing diagram and working.	10	15
5	A TO D AND D TO A CONVERTORS AND DISPLAY DEVICES 5.1 Necessity of A to D and D to A converters.. 5.2 D to A converter specifications: Resolution, accuracy, settling time. 5.3 Digital to Analog conversion: 5.3.1 Weighted Resistor Network type 5.3.2 Binary Ladder Network type 5.4 Analog to Digital conversion: 5.4.1 Successive approximation type 5.4.2 Counter OR Staircase type 5.1 Applications of A to D and D to A Converters. 5.5 Display devices 5.5.1 Mechanical Drum or Disc type 5.5.2 Light Emitting Diode type 5.5.3 Liquid Crystal Display	08	15
6	DIGITAL INSTRUMENTS 6.1 Comparison of digital instrument with analog instrument. 6.2 Basic building blocks of digital instruments. 6.3 Types of Digital Voltmeter. 6.4 Ramp Type Digital Voltmeter. 6.5 Digital Multimeter. 6.6 Digital frequency Meter. 6.7 Digital watt meter	06	10

REFERENCE BOOKS:

1. Dr.B.R.Gupta & V.Singhal, Digital Electronics
2. Pratima Manhas Shaveta Thakral, Digital Electronics (for Polytechnics)
3. RP Jain, Modern Digital Electronics
4. www.kpsec.freeuk.com
5. www.google.com

LIST OF PRACTICAL:

1	To study & verify the truth tables of digital logic gates.
2	To study and perform the functionality of NAND as a universal gate.
3	To study and perform the functionality of NOR as a universal gate.
4	To study and verify various theorems of Boolean algebra.
5	Study and verify De Morgan's laws.
6	Draw logic circuit for a given Boolean expression.
7	Simplify a given Boolean expression & draw its logic circuit.
8	To develop a half adder and verify its operation.
9	To develop a full adder and verify its operation.
10	To develop a half subtractor and verify its operation.
11	To develop a full subtractor and verify its operation.
12	To study and verify the truth table of SR-type flip-flop.
13	To study and verify the truth table of D-type flip-flop.
14	To study and verify the truth table of JK-type flip-flop.
15	To study and perform 4-bit parallel access shift register using IC 7495.
16	To verify the operation of decade counter using IC-7490.
17	To verify the operation of decoder. 1) 2-to-4 line decoder 2) 3-to-8 line decoder using IC-74138

Course Learning Outcomes (CLO):

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain the concept of Digital Number System and solve the problems	2 Understanding 3 Applying,
CLO2	Outline digital integrated circuit logic family chips.	1 Remembering 4 Analyze
CLO3	Understand sequential and combinational logic circuits.	2 Understanding, 6 Create
CLO4	Identify and use of A/D and D/A converters.	3 Applying, 2 Understanding
CLO5	Use different display devices for digital circuits.	5, 3, 4 Evaluate, Applying, Analyze
CLO6	Discuss different digital meters for measurements.	3 Applying,

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M		L		M			L		L			H	H	L
CLO2	L				M								H	M	M
CLO3	L						H				M		L		M
CLO4					L			L						M	M
CLO5					L	M				L			M		
CLO6						M							L	L	

H:High, M:Medium, L:Low