Lok Jagruti Kendra University
University with a Difference

Diploma in Electronics & Communication Engineering

LJ Polytechnic

Course Code: 025030304

Digital Electronics

Programme / Branch Name			Diploma in Electronics and Communication Engineering			
Course Code	Digital Electronics				**Course Code**	025030304
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				Evaluation Scheme			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**Total**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics and Mathematics (Pre-university level)
- ✓ Measure basic electrical quantities/parameters
- ✓ Use major electrical/electronic machines//instrument/equipment

3. Rationale

Digital electronics is a field of electronics involving the study of digital signals and the engineering of devices that use or produce them. It is essential to understand wide range of applications from industrial electronics to the fields of communication, from micro embedded systems to military equipment. The main and perhaps the most revolutionary advantage of digital electronics is the decrease in size and the improvement in technology. A basic understanding of this subject is therefore essential to effectively maintain digital electronic devices. The study of this course will enable the students to test the working and rectify the faults of common digital circuits.

4. Objectives

✓ Learn the logical steps or procedure about how to convert any number from its main format to another.

✓ Learn solving procedure of logical expressions and designing procedures of logical circuits

✓ Applications of the Digital concepts using combinational and sequential digital circuits

✓ Students can understand the basic working process of any Digital Systems.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weightage	Hours
1	**Number Systems**	1.1. Concepts of Binary Language / Binary Numbers system. 1.2. Classification of the Number System for conversions. 1.3. Conversions of Numbers from one System to other system. 1.4. Arithmetic Operations with Binary Numbers 1.5. Complements of Binary numbers 1.6. Classification / types of Codes	• Decimal Number System, Binary Number System, Hexadecimal Number System • Binary Addition, Binary Subtraction, Binary Multiplication Binary Division • 1's and 2's Complements • Binary Subtraction using 1's complement • Binary Subtraction using 2's Complement • 9's and 10's Complements • R's and (R-1)'s Complements • Code Conversion	15	8
2	**Logic Gates And Boolean Algebra**	2.1 Logic Levels & Logic Circuits 2.2 Logic Gates 2.3 UNIVERSAL Gates 2.4 Boolean algebra 2.5 Basic theorems 2.6 Properties and Laws of Boolean algebra 2.7 De-Morgan's Theorems 2.8 Drawing logic circuit from Boolean Equation.	• NOT Gate • AND Gate • OR Gate • NAND Gate • NOR Gate • XOR Gate • XNOR Gate • NAND Gate as Universal Gate • NOR Gate as Universal Gate	25	8
3	**Boolean Function Implementation**	3.1 Karnaugh Map 3.2 K-Map Construction Method 3.3 Simplification Of 3.4 Karnaugh Map 3.5 A-O-I, NAND/NOR 3.6 Implementation of 3.7 Boolean Function	• SOP (Sum of Product), POS (Product of Sum), MIN Term Canonical Sum of Product, MAX Term, • 2,3,4 – Variable K-Map, Don't Care Condition • Logic circuit using A-O-I Logic circuit using NAND, Logic circuit using NOR	15	8

4	**Combinational Circuits**	4.1 Design procedure of combinational logic 4.2 Adder 4.3 Subtractor 4.4 Comparators 4.5 Decoder 4.6 Encoder 4.7 Multiplexer 4.8 Demultiplexers	• Half Adder, Full Adder,4 Bit parallel Binary Adder • Half Subtractor, Full Subtractor, • 4 Bit parallel Binary Subtractor • 1-Bit Magnitude Comparator • 2-Bit Magnitude Comparator • 2 – 4 Decoder, 3– 8 Decoder • 4 – 2 Encoder, 8 – 3 Encoder • 2 – 1 Multiplexer, • 4 – 1 Multiplexer • 1 – 4 Demultiplexers	25	8
5	**Sequential Logic Circuits**	5.1 Types of flip-flops 5.2 Registers 5.3 Counter 5.4 A/D Converter & D/A Converter	• Latch and Flip-flop, S-R Flip-flops, asynchronous and synchronous S R flip flops, D flip flop, J-K flip flop, JK master slave flip flop, T Flip Flop, Edge triggered Flip Flops. • Classification of Shift Register, Serial in serial-out, serial-in parallel-out, parallel-in serial-out and parallel-in parallel out. • Working of A/D Converter & D/A Converter	20	10
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Sr. No	Practical / Exercises	Key Competency	Hours
1	Realize and Verify the Logic Gates withTruth-Table.	Trainer kit	2
2	Realize and verify the Ex-OR Gateusing A-O-I gates.	Trainer kit	2
3	Realize and Verify the NAND Gate asUniversal Gate.	Trainer kit	2
4	Realize and Verify the NOR Gate asUniversal Gate.	Trainer kit	2
5	Design and Implement Half AdderCircuit.	Trainer kit	2
6	Design and Implement Full AdderCircuit.	Trainer kit	2
7	Design and Implement Half SubtractorCircuit.	Trainer kit	2
8	Design and Implement Full SubtractorCircuit.	Trainer kit	2
9	Design and Implement 1 – Bit Magnitude Comparator Circuit.	Trainer kit	2
10	Realize and Verify the Decoder andEncoder Circuit.	Trainer kit	2
11	Realize and Verify the Multiplexer andDemultiplexer Circuit.	Trainer kit	2
12	Design and Realize the Display DecoderUsing 7-Segment Display.	Trainer kit	2
13	Build/Test the working of J-K master-slave flip flop.	Trainer kit	2
14	Study of Shift Registers (SISO, SIPO, PISO, PIPO)	Trainer kit	2
15	Design of Ripple Counter using suitable Flip Flops	Trainer kit	2

7. Suggested Specification Table with Hours

Unit No.	Chapter Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1	Number Systems	8	20	20	20	20	10	10
2	Logic Gates and Boolean Algebra	8	20	20	10	20	20	10
3	Boolean Function Implementation	8	10	20	20	15	20	15
4	Combinational Circuits	10	20	20	15	20	10	15
5	Sequential Logic Circuits	9	20	10	20	20	15	15

Legends: R-Remembering C- Creating
U- Understanding E- Evaluating
App- Applying An- Analyzing

8. Textbooks

1) Fundamentals of Digital Circuits by Anand Kumar, Prentice-Hall
2) Digital electronics Principles by Malvino & Leech, Tata McGraw-Hills Publication

9. Reference Books

1) Digital logic and Computer design by M. Morris Mano, Pearson Publication
2) Modern Digital Electronics by Jain R.P, Tata McGraw-Hills Publication
3) Digital Principles & Logic Design by A. Saba & N. Manna, Infinity Science Press LLC

10. Open Sources (Website, Video, Movie)

1) http://www.asic-world.com/digital/tutorial.html
2) https://youtube.com/playlist?list=PLSQj2zZx2KxcJ9AnTLpX9CSU1xo1ILkE3