LJ University

University with a Difference

Diploma in Computer Science and Engineering

Course Code: 025130203

Digital Electronics

Progrmme / Branch Name			Diploma in Computer Science and Engineering			
Course Name	Digital Electronics				**Course Code**	025130203
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				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

In reality Digital is a not a Natural entity, its modified version of the Analog concept so, for better understanding of digital concepts, students need to have knowledge about the basic concept of Analog quantity like Voltage, Current, Power etc.

3. RATIONALE

Digital device technology plays a very important role in the modern world. Digital circuits are used in various day to day applications like toys, computers, calculators, satellites, microwave ovens, cellular phones etc. The digital systems with some kind of human interface will perform highly complex tasks with very high reliability and speed, unattainable by any other means. This course enables the students to learn the basic principles used in digital systems.

4. OBJECTIVES

- ✓ Convert one code foam to other code foam (Learn the logical steps or procedure about how to convert any number from its main format to another format).
- ✓ Write the Boolean expression for a logic circuit (Learn solving procedure of logical expressions and designing procedures of logical circuits).
- ✓ Design combinational and sequential digital circuit. (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.	Chapter Name	Topic / Sub-Topic		Learning Outcome	% Weightage	Hours
1	Binary Systems	**1.1**	**Introduction of Digital Computers and Digital Systems**	• Comprehend Number systems and binary codes • Convert Number systems and its complements	20%	10
		1.2	**Concepts of Binary Language / Binary Numbers system.**			
		1.3	**Classification of the Number System for conversions.**			
		1.3.1	Decimal Number System			
		1.3.2	Binary Number System			
		1.3.3	Octal Number System			
		1.3.4	Hexadecimal Number System			
		1.4	**Conversions of Numbers from one System to other system.**			
		1.5	**Arithmetic Operations with Binary Numbers**			
		1.5.1	Binary Addition			
		1.5.2	Binary Subtraction			
		1.5.3	Binary Multiplication			
		1.5.4	Binary Division			
		1.6	**Complements of Binary numbers**			
		1.6.1	1's and 2's Complements			
		1.6.2	Binary Subtraction using 1's Complement			

		1.6.3	Binary Subtraction using 2's Complement			
		1.6.4	9's and 10's Complements			
		1.6.5	R's and (R-1)'s Complements			
		1.7	**Classification / types of Codes**			
2	**Logic Gates And Boolean Algebra**	**2.1**	**Logic Levels & Logic Circuits**	• Explain Binary Logic • List and explain working of Logic Gates • Solve Boolean algebra Define and solve various • Boolean theorems	20%	6
		2.2	**Logic Gates**			
		2.2.1	NOT Gate			
		2.2.2	AND Gate			
		2.2.3	OR Gate			
		2.2.4	NAND Gate			
		2.2.5	NOR Gate			
		2.2.6	XOR Gate			
		2.2.7	XNOR Gate			
		2.3	**UNIVERSAL Gates**			
		2.3.1	NAND Gate as Universal Gate			
		2.3.2	NOR Gate as Universal Gate			
		2.4	**Boolean algebra**			
		2.5	**Basic theorems / Properties and Laws of Boolean algebra**			
		2.6	**De-Morgan's Theorems**			
		2.7	**Drawing logic circuit from Boolean Equation.**			
3.	**Boolean Function Implementation**	**3.1**	**Karnaugh Map**	• Solve Boolean expression	20%	10
		3.1.1	SOP (Sum Of Product)			
		3.1.2	POS (Product Of Sum)			
		3.1.3	MIN Term			

		3.1.4	Canonical Sum Of Product	• Explain Boolean function • Implementation and simplification		
		3.1.5	MAX Term			
		3.1.6	Canonical Product Of Sum			
		3.2	**K-Map Construction Method**			
		3.2.1	2 – Variable K-Map			
		3.2.2	3 - Variable K-Map			
		3.2.3	4 – Variable K-Map			
		3.3	**Simplification Of Karnaugh Map**			
		3.3.1	The Octet			
		3.3.2	The Quad			
		3.3.3	The Pair			
		3.3.4	Rolling the Map			
		3.3.5	Don't Care Condition			
		3.4	**A-O-I, NAND/NOR Implementation of Boolean Function**			
		3.4.1	Logic circuit using A-O-I			
		3.4.2	Logic circuit using NAND			
		3.4.3	Logic circuit using NOR			
4	**Combinational Circuits**	**4.1**	**Design procedure of combinational logic**	• Explain Basic Combinational Logic • Design half adder, full • adder, Half Subtractor & • full Subtractor • Calculate code conversion	30%	12
		4.2	**Adder**			
		4.2.1	Half Adder			
		4.2.2	Full Adder			
		4.2.3	4 Bit parallel Binary Adder			
		4.3	**Subtractor**			
		4.3.1	Half Subtractor			
		4.3.2	Full Subtractor			
		4.3.3	4 Bir parallel Binary Subtractor			
		4.4	**Code Conversion**			

		4.41	BCD to Excess-3 conversion	• Explain decoder and encoder • Explain Multiplexer and Demultiplexers		
		4.5	**Comparators**			
		4.5.1	1-Bit Magnitude Comparator			
		4.5.2	2-Bit Magnitude Comparator			
		4.6	**Decoder**			
		4.6.1	2 – 4 Decoder			
		4.6.2	3 – 8 Decoder			
		4.7	**Encoder**			
		4.7.1	4 – 2 Encoder			
		4.7.2	8 – 3 Encoder			
		4.8	**Multiplexer**			
		4.8.1	2 – 1 Multiplexer			
		4.8.2	4 – 1 Multiplexer			
		4.9	**Demultiplexers**			
		4.9.1	1 – 4 Demultiplexers			
5	**Introduction to Logic Families & Memory**	**5.1**	**Classification Of Logic Families**	• Logic Families • Memory	10%	4
		5.2	**Important Parameters of Digital IC.**			
		5.3	**Levels of Integration of Digital ICs.**			
		5.4	**Classifications of Memory**			
				Total Hours		**42**

6. LIST OF PRACTICAL / EXERCISE

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

Note: However, if these practical/exercises are completed appropriately, they would also lead to the development of certain outcomes in an affective domain which would, in turn, lead to the development of Course Outcomes related to the affective domain. Thus, the overall development of Programme Outcomes (as given in a common list at the beginning of the curriculum document for this Programme) would be assured. Faculty should refer to that common list and should ensure that students also acquire outcomes in an affective domain which are required for the overall achievement of Programme Outcomes/Course Outcomes.

Sr. No	Practical / Exercises	Key Competency	Hours
1	Realize and Verify the Logic Gates with Truth-Table.	Basic Logic Gates	2
2	Realize and verify the Ex-OR Gate using A-O-I gates.	Ex-OR using A-O-I Gates	2
3	Realize and Verify the NAND Gate as Universal Gate.	NAND Gate using Universal Gates	4
4	Realize and Verify the NOR Gate as Universal Gate.	NOR Gate using Universal Gates	4
5	Design and Implement Half Adder Circuit.	Half Adder	2
6	Design and Implement Full Adder Circuit.	Full Adder	2
7	Design and Implement Half Subtractor Circuit.	Half Subtractor	2
8	Design and Implement Full Subtractor Circuit.	Full Subtractor.	2
9	Design and Implement 1 – Bit Magnitude Comparator Circuit.	Magnitude Comparator	2
10	Realize and Verify the Decoder and Encoder Circuit.	Decoder and Encoder	2
11	Realize and Verify the Multiplexer and Demultiplexer Circuit.	Multiplexer and Demultiplexer circuit	2
12	Design and Realize the Display Decoder Using 7-Segment Display.	7 – Segment Display using Decoder	2
		Total Hours	**28**

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	Binary Systems	10	20	40	40	-	-	-
2	Logic Gates And Boolean Algebra	06	20	40	40	-	-	-
3	Boolean Function Implementation	10	30	30	40	-	-	-
4	Combinational Circuits	12	20	40	40	-	-	-
5	Introduction to Logic Families & Memory	4	20	40	40	-	-	-

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

8. TEXTBOOKS

1. Fundamentals of Digital Circuits by Anand Kumar, Prentice-Hall

9. REFERENCE BOOKS

1. Digital logic and Computer design by Mano ,M. Morris, Pearson Publication
2. Modern Digital Electronics by Jain R.P, Tata McGraw-Hills Publication
3. Digital electronics Principles by Malvino & Leech, Tata McGraw-Hills Publication
4. 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