LNMIIT, Jaipur Department of Electronics & Communication Engineering	LNMIIT The LNM Institute of Information Technology

Programme: B. Tech. (ECE)	Course Title: Digital Circuits and Systems			Course Code: ECE214
Type of Course: Program Core	Prerequisites: Basic Electronics			Total Contact Hours: 40
Year/Semester: 2/Odd	Lecture Hrs/Week: 3	Tutorial Hrs/Week: 0	Practical Hrs/Week: 0	Credits: 3

Learning Objective:

Introduction to the Digital Circuits and Systems (DCS) is towards the aim of designing the fastest growing digital technology systems over given specifications. Some very common and daily life examples of digital systems out of millions are as follows: digital watch, vending machine controller (ATM machine), digital scientific calculator using CORDIC algorithms, washing machine controller (hardware part), digital remote controls, automatic digital locks, digital games, automatic digital control in cars, robots, digital cameras, mobile phones etc. Students will gain the necessary skills to design and implement practical digital systems.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO-1	**Understand** the basics of number systems, various digital codes and their arithmetic.	2
CO-2	**Analyze** the Boolean expressions using Boolean algebra, K maps, VEM and QM method.	4
CO-3	**Analyze** combinational circuits including adders, encoder, decoders, multiplexers and complex structures using logic gates	4
CO-4	**Analyze** various sequential circuits like latches, flip flops and counter using logic gates.	4
CO-5	**Evaluate** different Finite State Machines (FSM).	5
CO-6	**Understand** the basic fundamentals of digital system design.	2

Course Topics	Lecture Hours		CO
UNIT – I (Number Systems & Codes)	**5**	**5**	**CO1**
1.1 Positional Number Systems, Octal and Hexadecimal Numbers, Number System Conversions	**1**		
1.2 Representation of negative numbers, Two's complement arithmetic	**2**		
1.3 Codes and arithmetic: Weighted and non-weighted, BCD, XS-3, ASCII, EBCDIC and Gray code	**2**		

UNIT – II (Boolean Algebra and Minimization techniques)	**5**	**5**	**CO2**
2.1 Axioms, up to 6 variable K-map minimization	**2**		
2.2 Duality, Standard representation, combinational circuit minimization using K-Maps, VEM method	**2**		
2.3 QM method	**1**		
UNIT – III (Combinational Circuit Design)	**10**	**10**	**CO3**
3.1 Introduction to Combinational logic circuit design, various adders, subtractors, array multipliers, array dividers	**4**		
3.2 Combinational design using multiplexers and demultiplexers	**3**		
3.3 Combinational design using encoders and decoders	**3**		
UNIT-IV (Sequential circuit Design)	**10**	**10**	**CO4**
4.1 Basic elements of sequential logic: Latches and flip-flops, Conversions of flip-flops.	**3**		
4.2 Counters: Asynchronous (ripple), synchronous and synchronous decade counter, Modulus counter, skipping state counter, counter design. Ring counter, Counter applications:	**4**		
4.3 Registers: buffer register, shift register	**3**		
UNIT-V (Finite State Machines)	**6**	**6**	**CO5**
5.1 Definition, classification, state machine analysis, excitation table of flip flops	**2**		
5.2 Designing various synchronous sequential circuits using state machines.	**2**		
5.3 Design Problems (Sequence detectors, Vending Machine Controllers etc.)	**2**		

UNIT-VI (Introduction to Digital System design)	**4**	**4**	**CO6**
6.1 Introduction, type of digital systems, digital systems specification	**1**		
6.2 Memory and programmable logic – RAM, memory decoding, ROM, PLA, PAL, SPLD	**2**		
6.3 Introduction to practical system design considerations – timing diagrams, static and dynamic hazards	**1**		
Total = 40			

Textbook references (IEEE format):

Text Book:

1. *Digital Design, M. Morris Mano 5th edition* Pearson Education.
2. Digital Systems : Principles and Application by Ronald J. Tocci, Prentice Hall
3. Digital design by M. Morris Mano, Prentice Hall.

Reference books:

1. *CMOS Digital Circuits: Analysis and Design*, Sung-Mo Kang and Yusuf Leblebici, Tata McGraw Hill.
2. *Digital Circuits and Design*, S. Salivahanan & S. Arivazhagan, Vikas Publication House Pvt. Ltd., 2nd Ed.

Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):

https://onlinecourses.nptel.ac.in/noc15_ec01

Evaluation Method		
Item	**Weightage (%)**	**CO mapping**
Quiz 1	5	CO1 to CO2
Quiz 2	5	CO3
Quiz 3	5	CO4
Quiz 4	5	CO5 to CO6
Midterm	30	CO1 to CO3
Final Examination	50	CO1 to CO6

*Please note, as per the existing institute's attendance policy the student should have a minimum of 75% attendance. Students who fail to attend a minimum of 75% lectures will be debarred from the End Term/Final/Comprehensive examination.

CO and PO Correlation Matrix (for ECE, all programs, same matrix)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1									1	3	1	1
CO2	3	2	2									1	3	1	1
CO3	3	3	3									1	3	1	1
CO4	3	3	3									1	3	1	1
CO5	3	3	3	2								2	3	2	2
CO6	3	2	1									1	3	1	1

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Approved By: