GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma Engineering				Branch	Mechatronics Engineering		
Semester	III				Version	1.0.0.0		
Effective from Academic Year			2019-20		Effective for the batch Admitted in			June 2018
Subject code	1MC2302		Subject Name		Analog & Digital circuits			
Teaching scheme					Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:
None

Course Learning Outcomes:
The course content should be taught and implemented with an aim to develop different skills leading to the achievement of the following competencies and course learning outcomes: T1. To understand concepts of analog and digital electronics. T2. To apply digital electronics fundamentals in understanding digital circuits T3. To develop basic digital electronics circuits T4. To implement concepts of digital electronics in designing various control circuits T5. To Verify the functionalities of digital circuits The practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, psychomotor and affective domain to demonstrate course learning outcomes.

Course Content				
Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
Number System and Binary Codes	1.1 Introduction to different number systems – Decimal, Binary and Hexadecimal 1.2 conversion between number systems 1.3 Binary arithmetic: operations-addition, subtraction, multiplication and division 1.4 Binary subtraction using complements 1.5 Digital codes: BCD, Excess-3 and Gray codes	1a. Convert number systems and its complements 1b.Solve problems of number systems, binary arithmetic and binary codes	12	8
Logic Gates	2.1 Basic Logic Gates: AND, OR , NOT gate 2.2 Derived Logic Gates: NAND, NOR, EX-OR, EX-NOR 2.3 Implementation using Basic	2a. Describe functions of Binary Logic 2b. Differentiate the functions of Basic Logic Gates and Universal Logic Gates	12	8

	Gates 2.4 Universal Logic Gates: NAND, NOR gate 2.5 Implementation using NAND and NOR gate	2c. Explain the Truth table of various logic gates		
Boolean Function Realization	3.1 Boolean Function: Laws of Boolean Algebra and De-Morgan's Theorems 3.2 Sum of Product (SOP) Form, Product of Sum (POS) Form, Minterms and Maxterms 3.3 Simplification of Boolean Function using Boolean Algebra 3.4 Construction of K-map Up to four Variable 3.5 Simplification of Boolean Function using K-map 3.6 Don't Care Condition	3a. Simplify the Boolean function using Boolean theorems and Boolean Algebra 3b. Differentiate between SOP and POS 3c. Simplify Boolean function using K-map	12	9
Combinational Circuits	4.1Introduction to combinational circuits 4.2 Adder : Half Adder, Full Adder 4.3 Subtractor : Half and Full Subtractor 4.4 2-bit Magnitude Comparator 4.5 Multiplexer and Demultiplexer: Multiplexer (4:1), Demultiplexer (1:4) 4.6 Encoder and Decoder: 8 to 3 Encoder, 3 to 8 Decoder, BCD to 7-segment Decoder	4a. Implement half adder, full adder,half Subtractor and full Subtractor 4b. List Applications of multiplexers and Demultiplexers 4c. Differentiate Encoder and Decoder 4d. Explain the working of a BCD to 7-segment Decoders	10	8
Sequential, Circuits	5.1 Introduction to sequential circuits 5.2 S-R Latch: NOR Latch, NAND Latch 5.3 Clocked Flip Flops: S-R, J-K, T and D Flip- Flop 5.4 Applications of Flip Flops 5.5 Shift Register : Series and Parallel Shift, Left and Right Shift 5.6 Counters: Asynchronous, Synchronous and UP/DOWN counters	5a. Design clocked Flip Flops using S-R Latch 5b. Explain the working of shift left and shift right register 5c. Distinguish between 4-bit Asynchronous, Synchronous and UP/DOWN counters	10	8
Analog Circuits	6.1 Introduction of A.C and D.C. waveforms 6.1Clipper and Clamper circuit	6a. Observe different waveforms of various circuits using C.R.O.	4	4

List of Practical		
No.	Unit	Name of Practical
1	I	Convert decimal number system to binary and hex. Convert binary, and hex to decimal.
2	I	Convert binary to BCD, Excess-3 and gray code Convert BCD, Excess-3 and gray code to binary
3	II	Test the functionality of the AND gate using IC 7408, OR gate using IC 7432 and NOT gate using IC 7404.
4	II	Test the functionality of the EX-OR gate using IC 7486 and EXNOR gate using IC 74266
5	II	Implement Boolean expression using basic logic gates
6	II	Test the functionality of the NAND gate using IC 7400 and NOR gate using IC 7402.
7	II	Test the functionality of NAND / NOR gate as a universal building block.
8	IV	Design and implement Half Adder and full adder circuit using IC 7486, 7408 and 7404.
9	IV	Design and implement Half Subtractor and full Subtractor circuit using IC 7486, 7408 and 7404.
10	IV	Design and implement 2-bit magnitude comparator using basic logic gates
11	IV	Build and Test 4:1 Multiplexer and 1:4 Demultiplexer circuit
12	IV	Build and Test 4:2 Encoder and 2:4 Decoder circuit
13	V	Realize Clocked S-R Flip Flop and clocked D Flip Flop
14	V	Realize Clocked T Flip Flop and clocked J-K Flip Flop
15	V	Implement UP/DOWN decade counter

List of Instruments / Equipment / Trainer Board	
1	Breadboard
2	Digital ICs
3	DC Power supplies
4	Experimental Boards

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Digital Logic and Computer Design	Mano M. Morris	Pearson publication, Latest Edition
2	Digital Electronics Principles	Malvino and Leech	Tata McGraw-Hill, New Delhi, Latest Edition
3	Fundamentals of Digital Circuits	A. Anand Kumar	PHI Learning, Latest Edition

Link of Learning Web Resource	
1	www.alldatasheet.com
2	http://www.asic-world.com/digital/tutorial.html
3	www.nptel.com