# GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

## **COURSE CURRICULUM**

PROGRAMME : DIPLOMA IN CM/IT

LEVEL NAME : ENGINEERING SCIENCES AND TECHNICAL ARTS COURSES

COURSE CODE : EC310E

COURSE TITLE : DIGITAL TECHNIQUES

PREREQUISITE : NIL

TEACHING SCHEME: TH: 03; TU: 00; PR: 02(CLOCK HRs.)

TOTAL CREDITS : 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)

TH. TEE : 03 HRs

PR. TEE : 02 HRs (Internal)

PT. EXAM : 01 HR

#### **\*** RATIONALE:

This course forms the foundation of digital electronics to the students of Information Technology. It deals with learning the concepts of number Systems logic gates, combinational and sequential logic circuits. Now a day, many electronic systems are digitized. Hence, it is necessary to know the concept of design of a digital system. This course emphasizes on the combinational and sequential logic design.

#### **COURSE OUTCOMES:**

#### After completing this course students will be able to-

- 1. Analyze digital logic circuits.
- 2. Perform conversion of different number system
- 3. Describe operation of various digital circuits like combinational circuits and sequential circuits.
- 4. Identify various pins of logic gate ICs.
- 5. Assemble various digital circuits like combinational circuits, Sequential circuits on breadboard.
- 6. Interpret the output of various combinational and sequential circuits.

# **COURSE DETAILS:**

# A. THEORY:

Units	Specific Learning Outcomes	Topics and subtopics	Hrs.
	(Cognitive Domain)		
1.Digital	1. Define the terms analog and	1.1 Digital and Analog System,	08
system and	digital system.	1.2 Comparison of analog and	
Number	2. Describe various logic levels.	digital system	
system	3. Solve numerical on	1.3 Logic levels.	
	conversion of number system	1.4 Binary, decimal, octal and	
	4. Perform binary addition and	hexadecimal number systems and	
	subtraction.	their conversions.	
		1.5 Binary addition and subtraction.	
		1.6 Binary subtraction by using 1's &	
		2's complement	
2.Logic gates	1. Define logic gates.	2.1 Definition and types of logic	08
& Boolean	2. Describe various logic gates.	gates	00
Algebra	3. Draw various logic gates	2.2 Operating principle, truth table,	
	using universal gates.	2.3 Boolean equation and symbol	
	4. Solve various Boolean	of NOT, OR, AND, NAND,	
	expressions.	NOR, EX-OR and EX-NOR	
	5. State and prove De-Morgans	gates.	
	theorem.	2.3 Universal logic gates. Design of	
	4/2	other logic gates using universal	
	- Million /	gates.	
	19	2.4 Basic laws of Boolean	
	W. W.	algebra.2.5De-Morgan's	
		theorem.	
3.Combinatio	1. Define min term and max	3.1 Min-term and Max-term	10
nal circuits	term.	representation of logical function.	10
	2. Describe K-map method of	3.2 K-map minimization up to 4	
	simplification	variables. Don't care condition.	
	3. Design adder and subtractor	3.3 Binary half & full adder and	
	using logic gates.	binary half and full subtractor.	
	4. Design BCD to 7 segments	3.4 BCD to7Segment decoder.	
	decoder.	3.5 Binary to gray and gray to binary	
	5. Design binary to gray and	conversion.	
	gray to binary converter.		
43534	1. State the need of multiplexers	4.1 Types, advantages, design steps	0.0
4.Multiplexe	and de multiplexers.	and applications of multiplexers	08
rs and	2. Design of various	2:1, 4:1, 8:1 and 16:1	
Demultiplux	multiplexers and de	multiplexers up to 16:1.	
ers	multiplexers using logic	4.2 Multiplexers tree	
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gares. 3. Design higher order multiplexers and demultiplexers using lower order. 4. Compare multiplexers and demultiplexers. 4. Compare multiplexers and demultiplexers. 5. Sequential Circuits 5. Sequential Circuits 6. Compare latch and flip flop. 3. Design of various flip flops. 4. Describe Race around condition. 5. List various applications of flip flops. 6. Counters & 1. Define Counters. Shift 2. Compare Asynchronous and Synchronous Counters. 4. Define various shift registers. 5. Design Bi-directional and circulating shift registers. 6. List various applications of shift registers. 6. List various applications of shift registers. 6. List various applications of shift registers. 7. Design Bi-directional and circulating shift register. 8. Bift registers 9. Design of asynchronous counter (UP and DOWN) using JK or T flip flop (up to 4 bit) 1.3 MOD – N Counter 1.4 Ring Counter, Johnson Counter. 1.5 Decade counter IC 7490. 1.6 Definition and types of shift registers (SISO, SIPO, PISO, PIPO) 1.7 Bi-directional shift register. 1.8 Universal Shift Register. 1.9 Application of shift register		getes	1.2 Types adventages and application	
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Total Hrs. 48				
			Total Hrs.	48

# B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical's	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify different pins of logic gate IC, apply input, measure output and relate it with the truth table		02
2	Assemble various basic gates using universal gates and relate it with the truth table.	Logic gates &	02
3	Assemble the logic circuit using AND/OR/NOT logic gatesand NAND gates for verification of Boolean expression.	Boolean algebra	02
4	Assemble the logic circuit using AND/OR/NOT logic gatesand NAND gates for verification of De Morgan's Theorem		02
5	Identify different pins of 8:1 multiplexer IC, apply input, measure output and relate it with the truth table.	Multiplexers and	02
6	Identify different pins of 1: 8 de multiplexer IC, apply input, measure output and relate it with the truth table.	Demultiplexers	02
7	Assemble the logic circuit for half adder and full adder using logic gates and verify its truth table.	Combinational Circuits	02
8	Identify different pins of S R flip flop IC, apply input, measure output and relate it with the truth table.		02
9	Identify different pins of S R flip flop IC, apply input, measure output and relate it with the truth table.	Sequential	02
10	Identify different pins of D flip flop IC, apply input, measure output and relate it with the truth table.	Circuits	02
11	Identify different pins of T flip flop IC, apply input, measure output and relate it with the truth table.		02
12	Assemble 4 bit synchronous counter using Flip Flop, show its output on LED and relate it with the truth table.		02
13	Assemble decade counter using IC 7490, show its output on LED and relate it with the truth table	Counters &	02
14	Assemble 4 bit SISO register using flip flop, show its output on LED and relate it with the truth table	shift registers	02
15	Assemble 4 bit PIPO register using flip flop, show its output on LED and relate it with the truth table.		02
		Skill Assessment	02
		Total Hrs	32

## **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit	Units	Levels from	evels from Cognition Process Dimension				
No.		R	U	A			
01	Digital System and Number System.	02(00)	04(04)	04(00)	10(04)		
02	Logic Gates& Boolean Algebra	04(04)	04(04)	04(00)	12(08)		
03	Combinational Circuits	06(02)	04(06)	04(00)	14(08)		
04	Multiplexerand De multiplexers	02(00)	04(06)	04(00)	10(06)		
05	Sequential Circuits	06(04)	06(00)	00(04)	12(08)		
06	Counters&Shift registers	06(00)	06(00)	00(06)	12(06)		
	Total	<b>26(10)</b>	28( <mark>20</mark> )	16( <mark>10</mark> )	<b>70</b> ( <b>40</b> )		

R – Remember U – Understand A – Analyze / Apply

## **\*** QUESTION PAPER PROFILE FOR THEORY PAPER:

									- 1-2		14								
Q.		Bit 1	1		Bit 2	2	Λ	Bit :	3		Bit 4	4	10	Bit 5	5		Bit 6	5	option
No	T	L	M	T	L	M	T	L	M	Т	L	M	Т	L	M	T	L	M	option
01	1	R	2	2	R	2	3	R	2	4	R	2	2	R	2	3	R	2	5/ <mark>7</mark>
01	3	U	2																3/1
02	1	A	4	2	A	4	3	R	4	1	U	4	2	U	4				3/5
03	1	U	4	2	U	4	3	U	4	2	R	4	5	R	4				3/5
04	3	A	4	4	U	4	4	A	4	3	U	4	5	A	4				3/5
05	5	R	6	5	U	6	4	U	6										2/3
06	6	R	6	6	U	6	6	A	6										2/3

T= Unit/Topic Number L= Level of Question M= Marks

A-Analyze/ Apply R-Remember U-Understand

# \* ASSESSMENT AND EVALUATION SCHEME:

	V	Vhat	To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
ory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20		Test Answer Sheets	1, 2, 3
Direct Assessment Theory	COnti Assess	Assignments	Stud	Continuous	10		Assignment Book / Sheet	1, 2, 3
Direct Asse	TEE (Term End Examination)	End Exam	Students	End Of the Course	70	28	Theory Answer Sheets	1, 2, 3
				Total	100	40		
	essment)	Skill Assessment		Continuous	20		Rubrics & Assessment Sheets	4,5,6
Direct Assessment Practical	CA (Continuous Assessment)	Journal Writing	Students	Continuous	05		Journal	4,5,6
ssessme	(Cor			TOTAL	25	10		
Direct As	TEE (Term End Examination)	End Exam	Students	End Of the Course	50	20	Rubrics &Practical Answer Sheets	4,5,6
ssessment		Feedback on ourse	Students	After First Progressive Test	Stud	Student Feedback Form		1, 2, 3, 4,5,6
Indirect Assessment	End (	Of Course	Students	End Of The Course		Questionn	aires	1, 2, 3, 4,3,0

## **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, truth table, writing procedure etc.	10
2	Identifying various pins of IC	10
3	Performance on bread board	20
4	Viva voce	10
	TOTAL	50

# **\*** MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes				Progr	am Ou	itcome	s (POs)	)			PS	Os
(COs)	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	- 7	S	5		-	-	3	-	-
2	-	3	-	57	2	0	73	-	-	3	-	-
3	-	3	-0	1-			-/	5-	-	3	-	-
4	-	3	2	2	(61	W)	2	2	-	3	-	-
5	-	3	2	2	ZIĥ.		2	2	-	3	-	-
6	_	3	2	2	-		2	2	-	3	-	-

1: Slight (Low) 2: Moderate (Medium)

3: Substantial (High)

## **\*** REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Digital Integrated Electronics	H. Taub and D.Schilling. McGraw-Hill, 2008, Second	ISBN 10: 0070857881 ISBN 13: 9780070857889
2.	Digital Principles and Applications	Edition  Malvino Leach. McGraw-Hill, Seventh Edition,2011	ISBN 10: 0070398836 ISBN 13: 9780070398832
3.	Digital electronics- R.P.Jain.	R.P.Jain. McGraw-Hill, Third Edition,2003	SBN 10: 0070669112 ISBN 13: 9780070669116
4.	CMOS/TTL: A user's guide with projects	Carr, Joseph J. Tab Books; 1st edition (1984)	SBN 10: 0830616500 ISBN 13: 9780830616503

#### **E-REFERENCES:** \*

- www.electrical4u.com/digital-electronics, assessed on 20<sup>th</sup> January 2016
- http://nptel.ac.in/courses/108108076/1, assessed on 20th January 2016
- http://www.electrical4u.com, assessed on 20th January 2016
- https://www.youtube.com/watch?v=A9KSGAnjo2U, assessed on 20th January 2016

## LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- 1. Digital Multi-Meter.
- 2. Logic Gates ICs (7400,7402,7404,7408,7432,7486)
- 3. Multiplexer and De multiplexer IC(74150,74151,74138,74139)
- 4. Flip Flops ICs (7472,7474,74H71,74L71)
- Breadboard and LEDs.
- 6. Power Supply

#### LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS **CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Prof. A A Ali	HOD in Electronics and	Government Polytechnic,
	100	Telecommunication Engg.	Nagpur
	4	(II Shift)	
2.	Prof. V M Sakode	Lecturer in Electronics	Government Polytechnic,
		and Telecommunication	Nagpur
		Engg.	
3	Mr. Sandip V Darwhekar	Director	Beta computronics Pvt Ltd,
			Nagpur
4	Mrs Gajala Ali	Head of Electronics Engg	Anjuman Polytechnic,
			Nagpur
5	Mr. S. M. Kale	Lecturer, Electronics	Government Polytechnic,
		Engg.	Gadchiroli.

(Member Secretary PBOS)	(Chairman PBOS)