GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

(CURRICULUM DEVELOPMENT CELL)

CURRICULUM

PROGRAMME : DIPLOMA IN ELECTRONICS & TELECOMM. ENGG.

COURSE CODE : EC6404

LEVEL NAME : BASIC TECHNOLOGY COURSES

COURSE NAME : DIGITAL ELECTRONICS

TOTAL CREDITS : 06 THEORY : 04 PRACTICAL : 02

EXAMINATION SCHEME:

MARKS	THEORY			PRACTICAL			TOTAL
	TERM EXAM	PROG TEST	TOTAL	PRACT EXAM	TERM WORK	ORAL EXAM	
MAX.	75	25	100	25	25	----	150
MIN.	30	----	40	10	10	----	60

TIME ALLOTED FOR TERM EXAM : 3 HRS.

TIME ALLOTED FOR PROGRESSIVE TEST : 1 HR

PREREQUISITE : EC6102

• RATIONALE:-

This course forms the foundation of digital electronics to the students of electronics. It deals with designing of basic circuits in digital electronics. Now a days, many electronic systems are digitized. Hence, it is necessary to know the concept of design of a digital systems. This course emphasizes on the combinational and sequential logic design and mainly deals with the medium scale integrated circuits.

• SKILLS:-

1) Understand the fundamentals of digital electronics
2) Understand the concept of designing of a digital circuits.
3) Design the digital systems on the basis of concept
4) Carry out tests on digital circuits.

• OBJECTIVES:-

After completing this course, students will be able to

1) Study the fundamentals of digital electronics
2) Understand the concept of designing of a digital circuits.
3) Design the digital systems on the basis of concept of designing.

- **CONTENTS:-**

A. THEORY

1. Number Systems & Binary Codes (H- 10, M-12)

Introduction to digital Systems, Types :- combinational, sequential
Number Systems –
Binary, Decimal, octal & Hexadecimal, conversion of one number system to other, Binary addition, subtraction, multiplication & division, use of 1's & 2's complements in binary arithmetic.
Binary codes –
BCD numbers, weighted & non-weighted binary codes, 8421 BCD code, Excess-3 code & Gray code, BCD addition & subtraction. Use of 9's & 10's complement in Decimal arithmetic, alphanumeric code, ASCII.

2. Logic Gates (H- 10, M-12)

Basic Logic Gates : NOT,AND,OR gates using semiconductor, Diodes, transistors, symbols, truth tables, logic equations, applications. Universal logic gates – NOR & NAND gates using diodes, transistors symbols, truth table, basic logic gates using universal gates, Exclusive OR/NOR gates. Fundamental Concept of Boolean Algebra-Basic laws, cumulative AND, OR Complementation, Associative, distributive, Laws, De Morgan's theorem, Numerical Examples. Standard form of Boolean function SOP & POS & its application K- map reduction, Method for only SOP function for two, three & four variables.

3. Logic Families (H- 04, M-05)

Characteristics of IC logic gates, IC logic families , TTL & CMOS logic families.
Comparison of logic family.

4. Multiplexer & Demultiplexer (H- 07, M-10)

Necessity of MUX,Principle of multiplexing & their types ,2 to 1, 4 to 1, 8 to 1, & 16 to 1 lines, Block diagrams, Circuit diagrams & operating principles, applications. Multiplexer tree. Necessity of DeMUX. Principle of Demultiplexing & their types1 to 2, 1 to 4, 1 to 8 & 1 to 16 lines, Block diagram, circuit diagram ,Operating principles & Applications.
Demultiplexer tree, Demultiplexer as decoder application

5. Encoder & Decoder (H- 05, M-06)

Encoder – Definition, Decimal to BCD, Octal to Binary, Hexadecimal to Binary.
Decoder – Definition, Display decoders ,Priority Encoder, Binary to seven segment decoder

6. Arithmetic Logic Unit (H- 07, M-06)

Introduction, Adders – Half & Full adders n bit serial & Parallel binary adder, Subtractor – Half & full subtractor.

7. Flip-flop (H- 07, M-08)

Introduction, Types of Digital Systems & their block Diagram, Operation Principle Triggering methods – edge & level, Flip flop – RS FF using BJT's, NOR & NAND gates, clocked RS Flip flop, propagation delay & Race around condition, Master slave (MS) JK Flip-flop with preset & clear T & D type Flip-flops, field of application of flip-flops.

8. Shift register **(H- 07, M-08)**

Introduction, Definition, types – SISO, SIPO, PISO, PIPO, Universal & Bi-directional shift register – Circuit diagram (using D Flip-flop) Working Truth table & timing diagram.

9. Counters **(H- 08, M-08)**

Introduction, Types – Asynchronous, counter – up, down & up down (using TFF) synchronous - up & down (using TFF) Ring Counter- Positive & Negative (Johnson).
MOD N Counter design using Asynchronous counter. Applications of counters & comparison between Asynchronous & Synchronous counter. Comparison between Counters & Registers.

B) LABORATORY / FIELD EXPERIENCES

1. To simulate basic gates using NOR gate and to verify truth table.
2. To simulate basic gates using NAND gate and to verify truth table.
3. Verify De Morgan's theorem.
4. Study of logic gate TTL & CMOS IC's – Pin diagram, specifications & rating.
5. To observe the truth table of MSJK Flip-flop.
6. To observe the truth table of SISO shift register right & left Shift operation.
7. To build and observe the output of asyncronous decade counter using IC 7490.
8. To verify the output waveform of 3-bit Synchronous Counter.
9. To verify the truth table of IC 7490.
10. To verify the truth table of Ring Counter.
11. To verify the truth table of 8:1 multiplexer.
12. To verify the truth table of 1:8 Demultiplexer
13. To verify the truth table of decoder driver IC.
14. To verify the truth table of Half adder & Full adder using Logic gates.
15. To verify the truth table of Half & Full subtractor using Logic gates.
16. Design of 4 bit binary adder IC 7483.

ASSESSMENT OF LABORATORY EXPERIENCES :

Continuous assessment of practicals , viva.

C. SUGGESTED INSTRUCTIONAL STRATEGIES

Reference books, charts, OHP, Transparencies

D. SUGGESTED LEARNING RESOURCES:

PRINT: Text Books, manual
NON PRINT: Transparencies, cutouts, audio-visual

E. REFERENCES :

1. Digital Electronics….R.P.Jain
2. Digital Principles ….Malvino
3. Digital Fundamentals …..Floyd
4. Digital Principles & Applications…..Malvino & Leach
5. Digital Electronics……William Gothman
6. Digital Techniques ----- Sanjeev Kapoor
7. Fundamentals of Digital Circuits ---A. Anand Kumar