

GOVERNMENT POLYTECHNIC, PUNE
(An Autonomous Institute of Govt. of Maharashtra)

Programme	:	Diploma in ET/CE/EE//ME/MT/CM/IT/DDGM
Programme Code	:	01/02/03/04/05/06/07/08/21/22/23/24/26/16/17
Name of Course	:	Digital Electronics
Course Code	:	ET 388

Teaching Scheme:

	Hours /Week	Total Hours
Theory	03	48
Practical	02	32

Evaluation Scheme:

	Progressive Assessment	Semester End Examination			
		Theory	Practical	Oral	Term work
Duration	Two class tests, each of 60 minutes	3 Hrs.	3 Hrs.	3 Hrs. For batch of 20 students	--
Marks	20	80	25	---	25

Course Rationale:

This subject forms the foundation of digital electronic systems. It is essential to know these fundamentals to understand the concept of microprocessors & its applications.

Course Objectives:

After studying this course, the student will be able to

- Know the Concept of Digital system.
- Understand the operations of fundamental digital circuits.
- Simplify logic circuits using Boolean algebra
- Construct simple logic circuits.
- Understand and implement the operations of combinational and sequential circuit.
- Understand the functions of various ICs of data converters and memories.

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Course Content:

Chapter No.	Name of Topic/Sub topic	Hrs	Marks
1.	Number system		
	1.1 Introduction to digital system <ul style="list-style-type: none"> • Analog signal Vs Digital signal • Number systems (Decimal, binary, octal, hexadecimal) conversion of one system into other 	08	14
	1.2 Binary Arithmetic: - (Numerical) <ul style="list-style-type: none"> • Addition, • Subtraction(1's and 2's complement) • Multiplication • Division • BCD addition and subtraction using 9's and 10' complement 		
	1.3 Codes: <ul style="list-style-type: none"> • BCD • Grey • EX-3 • ASCII 		
2.	Logic families and gates		
	2.1 Logic families such as TTL, CMOS. <ul style="list-style-type: none"> • Characteristics of logic families & Comparison between different logic families • TTL NAND gate – Totem pole output • CMOS Inverter 	06	12
	2.2 Logic Gates <ul style="list-style-type: none"> • Basic gates and Derived gates (IC diagram) • NAND and NOR as Universal gates • Fundamentals of Boolean laws (Numerical) • Duality Theorem, De Morgan's theorems.(Numerical) 		
3.	Combinational Logic Circuits		
	3.1 K-map reduction techniques (up to 4 variable maps) using SOP & POS Forms	10	16
	3.2 Design using K-map <ul style="list-style-type: none"> • Half and Full Adder, • Half and Full Subtractor 		

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	<p>3.3 Code Converter using K-map</p> <ul style="list-style-type: none"> • Gray to Binary, • Binary to Gray Code (upto 4bit) <p>3.4 IC 7447 as BCD to 7 segment decoder – driver</p> <p>3.5 IC 7483 as Adder & Subtractor, 1 digit BCD adder.</p> <p>3.6 ALU (Truth table & Block Diagram)</p> <ul style="list-style-type: none"> • IC 74181 • IC 74381. <p>3.7 Applications and realization</p> <ul style="list-style-type: none"> • Necessity of combinational circuit. • Multiplexers(MUX): study of IC 74151 ,MUX tree • Demultiplexers (DEMUX): study of IC 74155 ,Demultiplexer tree, Demultiplexer as decoder • Encoder: Priority Encoder 8:3, Decimal to BCD Encoder • Tristate logic, Unidirectional & bidirectional buffer ICs: IC 74244 and IC 74245 		
4.	Sequential Logic Circuits		
	<p>4.1 Sequential circuits:</p> <ul style="list-style-type: none"> • Comparison between Combinational & Sequential circuits, • One bit memory cell - RS latch – using NAND & NOR. • Edge and level trigger • Flip Flops - S R Flip flop, Clocked SR flip flop with preset and clear, • Drawbacks of SR Flip flop • Clocked JK Flip flop with preset & clear, Race around condition in JK flip-flop, Master slave JK flip flop. • D and T type flip flop. • Excitation table of flip flops. <p>4.2 Study of Counters :</p> <ul style="list-style-type: none"> • Counter: Modulus of counter, their types as Asynchronous and Synchronous counter. • Asynchronous counter: (Ripple counter , 4 bit up/down Counter • Synchronous counter: Excitation table of flip flops, implementation of 3bit synchronous counter, its truth table and waveforms. • Block schematic and waveform , IC 7490 as MOD-N Counter 	10	16

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	4.3 Shift Register: <ul style="list-style-type: none"> • Logic diagram , Truth Table and waveforms of : 4-bit Shift registers (SISO,SIPO, PISO,PIPO) • 4 Bit Universal Shift registers. Applications of Shift Register (Logic Diagram with waveforms) of: Ring counter, Twisted ring counter 		
5.	Analog to Digital and Digital to Analog converter		
	5.1 Necessity of Code	08	14
	5.2 Digital to Analog converter <ul style="list-style-type: none"> • Types of DAC along with Mathematical derivation: Weighted resistor method and R-2R Method • Comparison of types of DAC 		
	5.3 Analog to Digital converter (Block diagram & working) <ul style="list-style-type: none"> • Single slope ADC • Dual slope ADC • SAR ADC 		
	5.4 Use of IC 0800, 0809 in practical applications		
6.	Memories		
	6.1 Principle of operation and classification of memory. <ul style="list-style-type: none"> • Organization of memories • RAM (Static, Dynamic), Volatile and Non-Volatile • ROM (PROM, EPROM, EEPROM) • Flash memory. • Comparison between EPROM and Flash 	06	08
	6.2 Study of memory ICs : <ul style="list-style-type: none"> • Identification of IC number and their function of following ICs: IC 7481& IC 6116. 		
	TOTAL	48	80

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List of Practical/Experiments/Assignments:

Sr. No.	Name of Experiment/Assignment
1.	To check different IC's using IC tester.
2.	Verify Truth table of basic logic gates ,universal gate.
3.	Verify NAND and NOR gate as universal logic gate.
4.	Verify De Morgan's Theorem
5.	Realize half Adder & Full Adder
6.	Realize Half Subtractor & Full subtractor
7.	Verify the operation of Multiplexer IC 74151 and Demultiplexer IC 74155.
8.	Verify truth table of Encoder & Decoder
9.	Realize and verify RS flip flop using NAND gate and verify master slave JK Flip-Flop
10.	Implement 4 bit ripple counter/Decade counter.
11.	Verify the operational features of ADC – IC 0809/IC 0808 and DAC 0800
12.	Implement 3 bit R-2R D/A converter
13.	To study ALU IC 74181

Instructional Strategy:

Sr. No.	Topic	Instructional Strategy
1.	Number System	Classroom Teaching
2.	Digital Logic Families	Classroom Teaching & Laboratory work
3.	Combinational Logic Circuits	Classroom Teaching & Laboratory work
4.	Sequential Logic Circuit	Classroom Teaching & Laboratory work
5.	Analog to Digital and Digital to Analog converter	Classroom Teaching & Laboratory work
6.	Memories	Classroom Teaching ,Projector & PPTs

Text Books:

Sr. No	Author	Title	Publication
1.	Malvino Leach	Principles of Digital Electronics	Mcgraw Hill
2.	R.P.Jain	Digital Electronics	Tata Mcgraw Hill
3.	Anand Kumar	Fundamental of Digital Electronics	PHI

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Reference Books:

Sr. No	Author	Title	Publication
1.	Anil K. Maini	Digital Electronics, Principles and Integrated Circuits	Wiely India Edition
2.	Mathur	Introduction to microprocessor	Tata Mcgraw Hill

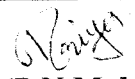

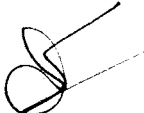

Learning Resources :

Reference Books, Manuals and journals of devices, Components brochures

Specification Table:

Sr. No.	Topic	Cognitive Levels			Total
		Knowledge	Comprehension	Application	
1.	Number System	4	8	2	14
2.	Logic families and gates	2	4	6	12
3.	Combinational Logic Circuits	4	8	4	16
4.	Sequential Logic Circuit	4	8	4	16
5.	Analog to Digital and Digital to Analog converter	2	8	4	14
6.	Memories	4	4	--	08
Total		20	40	20	80

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