Syllabus for Diploma Engineering

Electrical Engineering

Semester – IV

Subject Name: Digital Electronics and Instruments

Subject Code: 09EE2404

Diploma Branches in which this subject is offered: Electrical Engineering

Objective: Aim of this course is to familiarize the students about concept of digital logic devices, number system, sequential circuits and digital instruments to develop ability of students in such a way to withstand in modern digital era.

Credits Earned: 2 Credits

Course Outcomes: After completion of this course, student will be able to

1. Apply knowledge of numbers system, logic gates, and Boolean algebra to various code conversions.
2. Understand basic architectures of data conversion.
3. Analyze various combinational and sequential logic circuits.
4. Analyze working of A/D and D/A converter.
5. Analyze various instruments by testing various digital logic circuits.

Pre-requisite of course: DC Circuits, AC Circuits, Basic Electronics, Electric Measurements& Instrumentation Skill

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
0	0	4	2	00	30	20	25	25	100

Contents:

Unit	Topics	Contact hours	Weightage (%)
1	**Digital Number Systems:** • Introduction to digital systems • Different numbers systems: Decimal, binary, octal, hexadecimal • Conversion of numbers from one number system to other number system • Binary arithmetic operations: Binary addition, subtraction, multiplication and division. • Complements of numbers and its arithmetic • Codes for digital system: BCD code, XS3 code, gray code, error detecting and correcting codes, ASCII code.	**4**	**7**
2	**Logic Gates and Boolean Algebra:** • Logic Gates: AND, OR, NOT, NOR, NAND, X-OR, and X-NOR : ICs, Symbol and Truth Table, • Universal gates- NAND and NOR • Boolean Algebra: Law of Boolean Algebra, De Morgan's theorem, Various identities • Build logic circuit for a given Boolean expression • K-map (up to 4 variables) • Logic Families**:**TTL,NMOS, PMOS, CMOS, ECL	**10**	**18**
3	**Combinational & Sequential Logic Circuits:** • Combinational circuits: Half adder, full adder, Half subtractor and Full Subtractor, Multiplexer , Demultiplexer , Encoder and Decoder, BCD to seven segment decoder • Flip flops and Latches: RS flip-flop, JK flip-flop, D flip-flop, T flip-flop, Master slave flip flop. • Latches: SR Latch, D-Latch- 74LS373 • Shift Registers: series, parallel left and right • Counters: Asynchronous and synchronous counters (7493 and 7490) • Comparator: Magnitude comparator (up to 2 bit), comparator Ics • Semiconductor memories : RAM, ROM, PROM, EPROM and EEPROM	**28**	**50**
4	**A to D and D to A Conversion:** • D to A conversion and its types: Weighted Resistor Network type, Binary Ladder Network type • A to D converters and its type : Parallel Comparator type, Successive approximation type, Staircase type	**4**	**7**
5	**Digital Instruments** • Introduction to digital instruments • Comparison between analog and digital instruments	**10**	**18**

	• Construction and working of various digital instruments: voltmeter, ammeter, watt meter, energy meter, frequency meter, clamp on meter, multimeter		

Suggested List of Practical:

Sr. No.	Unit No.	Name of Topics	Contact Hours
1	1	To understand various numbers systems	4
2	2	To Verify truth table of various Logic gates.	4
3	2	To Implement various Logic gates using Universal gate.	4
4	2	To verify Demorgan's theorems	2
5	3	To Implement half adder, full adder, half subtractor and full subtractor using Logic gate.	6
6	3	To Verify function of Binary to Grey code and Grey to Binary code conversion.	4
7	3	To Verify the function of 3 to 8 line decoder and 8 to 3 line encoder.	4
8	3	To Verify function of 4 to 1 multiplexer 1 to 4 DE multiplexer.	6
9	3	Verification of shift left/ right register.	4
10	3	To Verify the counter circuits.	4
11	4	To implement the Digital to Analog converter vice versa	4
12	5	To demonstrate digital ammeter, voltmeter, Wattmeter and energy meter.	6
13	5	To demonstrate multi meter and clamp on meter.	4

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

e. Show video or animation of working of various types of logic gates and digital instruments.

References:

1. Anand Kumar A., *"Fundaments of Digital Circuits"*, PHI Learning Pvt. Ltd, 2016.
2. M. Morris Mano, *"Digital logic and Computer Design"*, Pearson Publication, India, 2016.
3. Donald P Leach, *"Digital Principles and Applications"*,Tata McGraw Hill education Pvt. Ltd, 2011.
4. Jan M. Rabaey, *"Digital Integrated Circuits"*, PHI Learning Pvt. Ltd, 2013.
5. David J. Comer, *"Digital Logic and State Machine Design"*, Oxford University press, 1995.

Supplementary Resources:

1. Learning resource by NPTEL https://nptel.ac.in/courses/117106086/**,** DigitalCircuits and Systems, Prof. S. Srinivasan, IIT Madras.
2. Learning resource by Neso Academy https://www.youtube.com/playlist?list=PLBlnK6fEyqRjMH3mWf6kwqiTbT798eAOm.
3. http://www.electrodiction.com/videolist/play/74-ls-373-latch-chip.