Marwadi University

Syllabus for Diploma Engineering

Computer Engineering

Semester – III

Subject Name: Digital Electronics

Subject Code: 09CT1301

Diploma Branches in which this subject is offered: Computer Engineering

Objective:

The subject aims to prepare the students,

- To understand the basic of Digital Electronic concepts required in analysis and design of digital electronic circuits and systems.
- To understand the number system, logic gates, Boolean algebra, etc.
- To understand Construction and operation of various digital circuits such as Adder, Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, Flip-flops, Counters Registers.
- To devolve the capability to Simplify, Analyze Various Digital Electronic Circuits.

Credits Earned: 3 Credits

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

- Perform conversion between various number systems.
- Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
- Identify, formulate and solve a problem based on combinational and sequential circuits
- Select the appropriate hardware and software tools for combinational and sequential circuit design.
- Design various counters.
- Verify the functions of various digital integrated circuits.
- Evaluate the specifications of logic families.
- Create a course project using digital integrated circuits.

Pre-requisite of course: Elementary knowledge of science and mathematics

Syllabus for Diploma Engineering

Computer Engineering

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term work	
2	0	2	3	50	30	20	25	25	150

Contents:

Unit	Topics	Contact hours	Weightage (%)
1	**Introduction:** Digital and Analog systems, logic level and pulse waveforms, elements of digital logic, Functions of digital logic	1	2
2	**Number systems and binary codes :** **Number System:** Binary number system (addition, subtraction, multiplication, Division), Octal and Hexadecimal Number system, Conversion from binary to decimal, octal and hexadecimal and vice versa, Representation of Signed Numbers. **Codes :** BCD, XS-3, Gray Code (with Conversion), Alphanumerical Code	6	13
3	**Logic Gates & Boolean Algebra** **Logic Gates**: Positive and Negative logic, AND, OR , NOT, NAND, NOR, X-OR Gate, X-NOR Gate (all gates with symbol, working principal and truth table), Conversion from Universal Gate to all other Gates, **Boolean Algebra & Mapping Methods for Simplification:** Boolean Algebra, Karnaugh Maps, Realizing Logic Function with Gates.	7	24
4	**Combinational logic design:** Combinational Circuits and its implementations, Arithmetic Circuits - Adders and Subtractor, BCD Adder, Look-Ahead Carry Generator, Multiplier, Magnitude comparator. Multiplexer and it's application, Encoders, Demultiplexers and Decoders and it's application, Parity Generation and Checking, Code Conversion.	7.5	33
5	**Sequential circuits:** **Flip-flops**: Latch and Flip-flop, S-R flip-flops, D flip flop, J-K flip flop, Application of flip flops **Registers**: Classification , Serial in serial-out, serial-in parallel-out, parallel-in serial-out and parallel-in parallel out shift register **Counters**: Asynchronous (ripple) 4-bit binary counter, BCD Counter,	5	25

	Synchronous counters, UP/DOWN counter, Ring counters.		
6	**Programmable Devices:** Introduction to Programmable Logic Devices, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL).	1.5	**3**
TOTAL HOURS		**28**	**100**

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
15%	20%	30%	20%	10%	5%

Suggested List of Experiments:

Sr. No.	Unit No.	Name of Topics	Contact Hours
1	2	Implement and verify the functionality of Basic and Advance Logic Gates.	2
2	2	Implement and verify 2 input basic logic gates using NAND gate.	2
3	2	Implement and verify 2 input basic logic gates using NOR gate.	2
4	1	Implement and verify a circuit to Convert 4 bit Binary to Gray Code using logic gates and vice versa	2
5	3	Implement and verify half and full Adder Circuit	2
6	3	Implement and verify half and full Subtractor Circuit.	2
7	3	Implement and verify 4 bit Parallel Adder circuit.	2
8	3	Implement and verify the 3X8 Decoder circuit.	2
9	3	Implement and verify the 8X1Multiplexer circuit.	2
10	3	Implement and verify BCD to Seven segment LED Display circuit.	2
11	4	Implement and verify the functionality of the SR & JK	2

		Flip-Flop.	
12	4	Implement and verify the working of the Shift Register.	2
13	4	Implement and verify the working of the 4 bit Ripple Counter.	2
14	4	Implement and verify the working of 4 bit UP - DOWN Counter.	2

Student Activity:

Design and Develop mini project using Various Digital IC and display devices.

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 and class-room.

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

References:

1. Fundamentals of Digital Circuits — A. Anand Kumar — PHI Learning, New Delhi, 2nd Edition or latest

2. Digital Logic and Computer Design — M. Morris Mano — Pearson Education, New Delhi, 2011 or latest

3. Digital Principles and Application — Malvino and Leech — TMH Pub., New Delhi, 6th Edition or latest

4. Morden Digital Electronics — Jain, R P — TMH Education , New Delhi, 3rd Edition or latest

5. Digital Electronics — Kharate G.K. — OXFORD University Press, 2010

Supplementary Resources / Open Source Software:

1. PSpices and NGSpice
2. Xcircuit
3. NPTEL website and IITs virtual laboratory
4. Multisim
5. Quartus