Marwadi University
Marwadi Chandarana Group

INSTITUTE	DIPLOMA STUDIES
PROGRAM	DIPLOMA ENGINEERING (COMPUTER ENGINEERING)
SEMESTER	3
COURSE TITLE	DIGITAL ELECTRONICS
COURSE CODE	09CT1301
COURSE CREDITS	3

Objective:

1. 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.

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

1. Perform conversion between various number systems.
2. Apply knowledge of Boolean algebra and other minimization techniques for digital circuit design.
3. Identify, formulate and solve a problem based on combinational and sequential circuits
4. Design various counters
5. Verify the functions of various digital integrated circuits.
6. Evaluate the specifications of logic families.

Pre-requisite of course: Digital Electronics syllabus for diploma Computer students

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Module-1 Introduction** Digital and Analog systems, logic level and pulse waveforms, elements of digital logic, Functions of digital logic	
2	**Module-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	

Contents : Unit	Topics	Contact Hours
3	**Module-3 Logic Gates & Boolean Algebra** Logic Gates: Positive and Negative logic, AND, OR , NOT, NAND, NOR, X-OR Gate, X-NOR Gate, Conversion from Universal Gate to all other Gates,, Boolean Algebra & Mapping Methods for Simplification:, Boolean Algebra, Karnaugh Maps, Realizing Logic Function with Gates.	
4	**Module-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, Generation and Checking, Code Conversion.	
5	**Module-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, Synchronous counters, UP/DOWN counter, Ring counters.	
6	**Module-6 Programmable Devices** Introduction to Programmable Logic Devices, Programmable Logic Arrays (PLA),, Programmable Array Logic (PAL).	
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Module-1 Introduction** Digital and Analog systems, logic level and pulse waveforms, elements of digital logic, Functions of digital logic	
2	**Module-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	
3	**Module-3 Logic Gates & Boolean Algebra** Logic Gates: Positive and Negative logic, AND, OR , NOT, NAND, NOR, X-OR Gate, X-NOR Gate, Conversion from Universal Gate to all other Gates,, Boolean Algebra & Mapping Methods for Simplification:, Boolean Algebra, Karnaugh Maps, Realizing Logic Function with Gates.	

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
4	**Module-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,, Generation and Checking, Code Conversion.	
5	**Module-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, Synchronous counters, UP/DOWN counter, Ring counters.	
6	**Module-6 Programmable Devices** Introduction to Programmable Logic Devices, Programmable Logic Arrays (PLA),, Programmable Array Logic (PAL).	
7	**Implement and verify the functionality of Basic and Advance Logic Gates.** mplement and verify the functionality of Basic and Advance Logic Gates	2
8	**Implement and verify 2 input basic logic gates using NAND gate.** Implement and verify 2 input basic logic gates using NAND gate	2
9	**Implement and verify 2 input basic logic gates using NOR gate** Implement and verify 2 input basic logic gates using NOR gate	2
10	**Implement and verify a circuit to Convert 4 bit Binary to Gray Code using logic gates and vice versa** Implement and verify a circuit to Convert 4 bit Binary to Gray Code using logic gates and vice versa	2
11	**Implement and verify half and full Adder Circuit** implementation verify half and full adder circuit	2
12	**Implement and verify half and full Subtractor Circuit** implement and verify half and full subtractor circuit	2
13	**Implement and verify 4 bit Parallel Adder circuit.** implement and verify 4 bit parallel adder circuit	2
14	**Implement and verify the 3X8 Decoder circuit.** implement and verify the 3*8 decoder cicuit	2
15	**Implement and verify the 8X1Multiplexer circuit.** implement and verify the 8*1 multiplexer circuit	2
16	**Implement and verify the functionality of the SR & JK flip flop** implement and verify the functionality of the SR&JK flip flop	2
17	**Implement and verify BCD to Seven segment LED Display circuit.** implement and verify BCD to Seven segment led display circuit	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
18	**Implement and verify the working of the Shift Register.** implement and verify the working of the shift register	2
19	**Implement and verify the working of the 4 bit Ripple Counter.** implement and verify the working of the 4 bit ripple counter	2
20	**Implement and verify the working of 4 bit UP - DOWN Counter.** implement and verify the working of 4 bit up- down counter	2
Total Hours		**28**

Textbook :

1   Digital Electronics , Kharate G.K. , OXFORD University Press, 2010

References:

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

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

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking**
15.00	20.00	30.00	20.00	10.00	5.00

Instructional Method:

1   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.

2   The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

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

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

Supplementary Resources:

1   PSpices and NGSpice

2   NPTEL website and IITs virtual laboratory