GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Biomedical Engineering

Semester: 3

Subject Code
Subject Name DIGITAL ELECTRONICS

Sr. No.	Course content
1.	**BINARY NUMBER SYSTEM :** 1.1 Binary number system 1.2 Binary arithmetic: addition, subtraction, multiplication and division 1.3 Complements: 1's, 2's, 9's and 10's 1.4 Subtraction using complements 1.5 Octal number system 1.6 Hexadecimal number system 1.7 Conversion among binary, octal, decimal and hexadecimal number systems 1.8 Codes: BCD, Gray, Excess-3, ASCII, EBCDIC 1.9 The parity bit
2.	**LOGIC GATES AND IC LOGIC FAMILIES :** 2.1 AND, OR, NOT Gates: symbol, operation and truth-table 2.2 NAND, NOR, EX-OR, EX-NOR gates: symbol, operation and truth-table 2.3 Positive and negative logic system 2.4 Saturated and nonsaturated logic 2.5 Introduction to RTL and DTL logic families 2.6 Characteristics of TTL family 2.7 Open collector TTL 2.8 Three state TTL gates 2.9 Characteristics of MOS and CMOS families 2.10 Comparison of different logic families 2.11 Two input NAND gate circuit using DTL, TTL, MOS and CMOS families
3.	**BOOLEAN ALGEBRA :** 3.1 De Morgan's theorems 3.2 The universal building blocks, NAND and NOR 3.3 Laws and theorems of Boolean algebra 3.4 Algebraic simplification of Boolean expression 3.5 Fundamental products 3.6 Sum of products and product of sums expression 3.7 AND-OR network 3.8 Truth table and karnaugh maps 3.9 Four variable karnaugh maps and their simplification techniques 3.10 Don't care condition 3.11 NAND-NAND networks

4.	**COMBINATIONAL LOGIC CIRCUITS :** 4.1 Arithmetic Circuits: Half adder, full adder, parallel binary adder, 1's complement subtractor circuit, 2's complement subtractor/adder circuits, 8421 adder, half and full subtractor, parallel binary subtractor 4.2 Bin to gray and gray to bin code converters 4.3 Decoder and Encoder 4.4 Comparator 4.5 Parity Generators and Checkers 4.6 Multiplexer and Demultiplexers
5.	**FLIP-FLOPS :** 5.1 S-R flip-flops asynchronous and synchronous S R flip flops 5.2 D flip flop and T flip flop edge triggered 5.3 J K flip flop and J K master slave flip flop
6.	**COUNTERS AND REGISTERS :** 6.1 Asynchronous 4-bit binary counter, binary ripple counter, asynchronous counter with feedback 6.2 Synchronous counters: Parallel counters, combination counters, binary decade counters with decoding gates, BCD counter. 6.3 UP/DOWN counter 6.4 Ring counters 6.5 Applications of counters 6.6 Registers 6.7 Shift register: Block diagram representation and waveforms of serial-in serial-out, serial-in parallel-out, parallel-in serial-out and parallel-in parallel out
7.	**MEMORY AND PROGRAMMABLE LOGIC :** 7.1 Memory Classifications 7.2 RAM: Static and Dynamic 7.3 ROM: ROM, PROM, EPROM 7.4 Flash memory 7.5 Programmable Logic Array: Structure
8.	**ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERSION :** 8.1 Digital to analog converters: Variable register and Binary ladder networks 8.2 D/A converter specifications: resolution, accuracy and conversion s peed 8.3 Analog to Digital converters Simultaneous A/D converter Counter type A/D converter Successive approximation A/D converter 8.4 A/D converter specifications: resolution, accuracy, conversion speed, sampling speed

LABORATORY EXPERIENCES:

The sample experiments to be performed include, but are not limited to the following.

1. To realize the basic logic gates.
2. To realize the NAND gate as a universal building block.
3. To realize the NOR gate as a universal building block.
4. To realize the HALF ADDER circuit
5. To realize the FULL ADDER circuit.
6. To realize the HALF SUBTRACTOR circuit.
7. To realize the AND-OR-INVERT circuit.
8. To realize the parity checker circuit.
9. To Test the Ripple counter.
10. To realize the exclusive-OR gate.
11. To realize the SR flip-flop.
12. To realize the JK flip-flop.
13. To test the shift register.
14. To test the digital to analog converter circuit.
15. To test the analog to digital converter circuit.

Reference Books:

1. Digital Electronics - Gothmen - PHI
2. Digital Electronics Principles - Malvino & Leech - MGH
3. Digital fundamentals - Thomes L.Floyd and Jain - Pearson
4. Modern Digital Electronics - R.P. Jain - TMH
5. Digital Electronics -Tokneinh - MGH
6. Digital Electronics - Morris Mano – Pearson