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| | **Department of Technical Education** | |
| | Diploma Programme | |
| | **FIRST SEMESTER** | |
| ***SUBJECT : DIGITAL ELECTRONICS-1*** | | |
| | *Common to E&C ,EI&C, CS&E & IS&E* | |
| | **No.of Hrs/Wk : 4** **Total No. of Hours/Sem: 64** | |
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| | **CONTENT LIST & TIME ALLOCATION** | |
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| | **UNIT-1** | **18 Hrs** |
| | Number Systems and Codes | 10 |
| | Logic Gates | 5 |
| | Logic Families | 3 |
| | **UNIT-2** | **18 Hrs** |
| | Combinational Logic Circuits | 18 |
| | **UNIT-3** | **28 Hrs** |
| | Boolean Algebra | 13 |
| | Sequential Logic Circuits | 15 |
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| | **TOTAL** | **64** |
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| | **GENERAL OBJECTIVES** | |
| | On completion of the course, the student | |
| 1 | will be able to comprehend the number systems and codes | |
| 2 | will be familiar with logic gates | |
| 3 | can realise logic expressions using gates | |
| 4 | will be able to construct and verify the operation of arithmetic & logic circuits | |
| 5 | can understand and appreciate the relevance of combinational circuits | |
| 6 | will know various logic families | |
| 7 | will be able to realise various flip-flops using logic gates | |
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| | **SPECIFIC OBJECTIVES** | |
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| **1** | **NUMBER SYSTEMS AND CODES** | |
| 1.1 | List different number systems & their relevance: binary, octal, decimal, hexadecimal | |
| 1.2 | Study the Conversion from one number system to another | |
| 1.3 | Perform Arithmetic operations on all number systems | |
| 1.4 | Represent the Concept of complementay numbers: 1's & 2's complementary of binary numbers | |
| 1.5 | Perform Subtraction of binary numbers using complementary numbers | |
| 1.6 | Study Codes: definition,relevance,types (BCD, Gray, Excess-3, ASCII & EBCDIC) and applications | |
| 1.7 | Examples for the above | |
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| **2** | **LOGIC GATES** | |

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| 2.1 | Illustrate the Difference between analog signals & systems and digital signals & systems | |
| 2.2 | Discuss the Types of logics & representation using electric signals | |
| 2.3 | Know the Definition of gate | |
| 2.4 | Learn the Basic Logic Gates (NOT, OR, AND, NOR, NAND, EX-OR & EX-NOR) - symbol,function, expression, truth table . | |
| 2.5 | Define Universal Gates with examples & realisation of other gates | |
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| **3** | **BOOLEAN ALGEBRA** | |
| 3.1 | Understand Boolean: constants, variables & functions | |
| 3.2 | Comprehend the Laws & Identities of Boolean algebra | |
| 3.3 | State and prove Demargan's Theorems | |
| 3.4 | Represent Logic Expression: SOP & POS forms & conversion | |
| 3.5 | Simplify the Logic Expressions / Functions (Maximum of 4 variables) : using Boolean algebra and Karnaugh's map methods | |
| 3.6 | Realisation of simplified logic expressions using gates | |
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| **4** | **COMBINATIONAL CIRCUITS** | |
| 4.1 | Define a Combinational Circuit and explain with examples | |
| 4.2 | Arithmetic Circuits (Binary) | |
| | a) Realise function,Logical expression, gate Level logic circuit , truth table & applications of half-adder, half-subtractor, full-adder & full-subtractor | |
| | b)Explain Serial & Parallel adders: concept, comparison & applications. | |
| | c) Working of 2 & 4 bit parallel adders with logic circuit . | |
| | d) Construct 2 bit Magnitude Comparator: logic expression, truth table,gate level circuit . | |
| 4.3 | Discuss Encoders: definition, relevance, gate level circuit of decimal to BCD Encoders, Truth table, Definition of Priority Encoder. | |
| 4.4 | Discuss Decoders: definition, relevance, gate level circuit of BCD to Decimal Decoders, BCD to Seven Segment Decoder with truth tables. | |
| 4.5 | Explain the working of Binary-Decimal: Encoder & Decoder | |
| 4.6 | Discuss Multiplexers: definition, relevance, gate level circuit and Truth Tables of 2:1, 4:1, 8:1.Multiplexers. | |
| 4.7 | Realisation of high order multiplexers using simple multiplexers | |
| 4.8 | Discuss Demultiplexers: Definition, relevance, gate level circuit and truth tables of 1:2, 1:4 ,1:8 Demultiplexers . | |
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| **5** | **SEQUENTIAL LOGIC CIRCUITS** | |
| 5.1 | **Flip-Flops** | |
| 5.1.1 | Define Sequential Circuit: Explain with examples | |
| 5.1.2 | Compare Combinational and Sequential Logic Circuits | |
| 5.1.3 | Clock-definition, characteristics, types of triggering & waveform. | |
| 5.1.4 | Define Flip-flop | |

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| 5.1.5 | Study RS, clocked RS, D, T, JK FF -Race around condition, MS-JK flip-flops with gatelevel circuit using NAND gates only, logic circuit and truth table. | |
| 5.1.6 | Applications of flip-flops. | |
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| **5.2** | **SHIFT REGISTERS** | |
| 5.2.1 | Introduction to Registers. | |
| 5.2.2 | Explain the working of various types of shift registers - SISO,SIPO,PISO,PIPO with truth table using flip flop | |
| 5.2.3 | Working of 4 Bit Ring and Johnson Counters with timing diagram and Truth table. | |
| 5.2.4 | Applications of shift registers | |
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| **5.3** | **COUNTERS** | |
| 5.3.1 | Define Synchronous and Asynchronous Counters - Their Comparison. | |
| 5.3.2 | Explain the modulus of a counter | |
| 5.3.3 | Design of different Modulo counters using decoding gates. | |
| 5.3.4 | Explain the working of 4 bit ripple counter with truth table and timing diagram | |
| 5.3.5 | Define the propagation delay in ripple counter | |
| 5.3.6 | Explain the Four Bit Synchronous counter with truth table and timing diagram | |
| 5.3.7 | List out applications of counters | |
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| **6** | **LOGIC FAMILIES** | |
| 6.1 | Introduction, list of various logic families & standard notations | |
| 6.2 | Explain propagation delay, fan-out, fan-in, power dissipiation,Noise Margin, Noise Immunity & speed with reference to logic families. | |
| 6.3 | List and Compare the Features of Standard TTL, CMOS & ECL-Concept of Saturated and Non Saturated Logic. | |
| 6.4 | Describe the Interfacing between TTL & CMOS | |
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| **Text Books** | | |
| 1 | Digital Principles & Applications - Floyd | |
| 2 | Digital Electronics I - By K Shashidhar, Sapna Publications | |
| 3 | Digital Electronics Devices Principles & Applications -A.K. Maini (Willey Eastern Publications) | |
| | | |
| 4 | Digital Electronics - By A. P. Godse | |
| **REFERENCES** | | |
| 1 | Digital Principles & Applications - Mavino and Leach | |
| 2 | Digital Computer Fundamentals- Thomos C Bartee | |
| 3 | Digital Electronics and Integrated Circuits- R P Jain & M M S Anand | |
| 4 | Digital Systems- Tocci | |
| 5 | Digital Principles- Morris Mano | |