# B.Sc. ELECTRONICS
## IV SEMESTER

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| Programme Name | B.Sc. in Electronics | |
| Semester | Fourth Semester | |
| Course Title | DIGITAL ELECTRONICS | |
| Course Code | ELE CT-4 | No. of Credits:04 |
| Teaching Hours | 64 | Duration of Exam: 3 hours |
| Formative Assessment Marks | 20 | Summative Assessment Marks: 80 |

**Course Objectives:**

The students are able to understand and gain the knowledge on

- The number systems and code conversions.
- Basics of logic gates, Boolean equators, Simplifications of Boolean expressions using K-maps.
- Design and working of Arithmetic and Logical operations using gates.
- Design and working of various Registers, Counters and their applications.

**Course Outcome:**

After studying the syllabus, the students are able to understand the principles and working of logic gates, design and construct the flip-flops using gates, design and construct the Arithmetic Logic circuits, Registers, Counters and their applications.

## ELE CT-4: DIGITAL ELECTRONICS

**UNIT I: Number system and codes:** **16 Hrs**

Introduction to signed and unsigned numbers: Decimal, binary, octal and hexa decimal number systems- their inter conversion. BCD(8421) numbers, Gray, Excess-3, arithmetic operations in binary, hexadecimal addition, BCD addition and Execess-3 addition. 1's and 2's compliment subtraction.

**UNIT II: Logic gates and Boolean algebra:** **16 Hrs**

Positive and negative logic, basic logic gates-AND, OR and NOT gates (logic symbols and truth tables). Construction of AND, OR using diodes and NOT gate using transistor. NAND, NOR, X-OR and X-NOR gates (logic symbols and truth tables). NAND and NOR as universal gates. Boolean algebra-laws and theorems, De-Morgan's theorems, simplification of logic expressions using Boolean algebra, SOP and POS expressions, Karnaugh maps(K-Map): K Map techniques to solve 3 variable and 4 variable expressions.

**UNIT III: Combinational and Sequential logic circuits:** **16 Hrs**

**Arithmetic logic circuits:** Half adder, full adder, 4-bit parallel binary adder, 2-bit digital comparator. Decoders: 1 of 4 and 1 of 16 line decoders. Encoders: Decimal to BCD encoder. Priority encoder using IC 74147.

**Sequential Logic Circuits:** Flip-Flops: Basic RS latch (using NOR gates), clocked RS flip-flop (using NAND gates), D flip-flop, edge triggered D flip-flop, preset and clear functions, JK flip-flop, T-flip-flop, Master-slave JK flip-flop.

**UNIT IV: Registers and counters:** **16 Hrs**

**Registers:** 4-bit serial-in-serial-out, serial-in-parallel-out, parallel-in-serial-out and parallel-in-parallel-out resisters.

**Counters:** 3-bit asynchronous ripple counter, 3-bit synchronous parallel counter, 4-bit synchronous up-down counter. Synchronous modified counter, mod-6 counter, Decade counter- mod-10 counter.

**Digital IC terminology:** TTL logic family, standard TTL series characteristics, TTL open collector outputs, CMOS series and characteristics.

**Text books for Study**


1. Digital fundamental, Floyd, CBS Publications( UNIT-I)
2. Digital Principles and applications: Malvino and Leach-TMH 3rd editions.
3. Digital systems-Principles and applications, Ronald J Tocci, P-III, 9th edition, Pearson education (Unit II- VI).


**Books for Reference:**


1. Modern digital electronics, R.P. Jain, TMH Publication, 2nd Edition.
2. Digital Logic and Computer Design: M. Morris Mano-PHI, New Edition.
3. Digital Computer Electronics; Malvino-III Ediction, TMH, NewDelhi.
4. Digital Computer Fundamentals; Thomas C Bartee-IV Edition, TMH.
5. Experiments in Digital Principles: Malvino & Leach-V Edition TMH.

## ELE CP-4: DIGITAL ELECTRONICS LAB
**(Minimum 12 experiments to be performed)**

1. Construction of basic gates AND,OR using diodes and NOT gate using transistors
2. Verification of truth tables of AND, OR, NOT gates using IC's
3. Verification of truth tables of NAND, NOR, X-OR and X-NOR gates using IC's
4. IC 74LS00-realisation of AND, OR, NOT and X-OR gates.
5. IC 74LS02-realisation of AND, OR, NOT and X-NOR gates.
6. Verification of De-Morgan's theorems.
7. Construction of half-adder and full-adder using IC 74 LS86 and IC74 LS32
8. Binary to grey code and vice-versa using IC 74LS86.
9. BCD to seven segment conversion using IC 74LS47.
10. Digital comparator using IC 7485.
11. Construction of JK flip-flop using logic gates and its truth table verification.
12. Conversion of JK flip-flop into D and T flip-flop and its truth table verification.
13. Construction of clocked RS, D and T flip-flop using IC's.
14. Study of 4-bit binary ripple counter using IC 74LS76 (or equivalent).
15. 4-bit parallel binary adder using IC 74LS83.
16. Characteristics of TTL gates.
17. Study of working of 3 to 8 decoder using IC 74LS138.
18. Study of working of priority encoder using IC 74LS147.


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