## UEI301DIGITAL ELECTRONICS

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| 3 | 1 | 2 | 4.5 |

**Introduction:** Difference between analog and digital systems, Advantages and Disadvantages of digital system.

**Number Systems:** Introduction, Number systems: Decimal, Binary, Octal, Hexadecimal; Conversions; Representation of Signed Numbers, Sign magnitude, 1's complement, 2's complement, r's complement; Binary Arithmetic – addition, subtraction, multiplication and division, Binary codes: Weighted and non-weighted codes, Sequential codes, Self-complementing codes, Excess-3 code, Gray code, Error-detecting codes, Error-correcting codes, Hamming code, Alphanumeric codes.

**Minimization Techniques:** Introduction, Boolean Algebra: Laws and Theorems, Demorgan's Theorem, Simplification of Boolean functions by Boolean algebra, K–map method and Quine–McClusky method in SOP and POS forms, Advantages and disadvantages of different minimization techniques.

**Combinational Circuits**: Introduction, Logic Gates: Basic gates, Universal gates, Derivation of other gates from universal gates, Half adder, Full adder, Parallel Binary adder, Serial adder, BCD adder, Half and full subtractor, Binary multiplier, Dividers, ALU, Code converters, Magnitude comparators, Parity Generators/checkers, Encoders, Priority encoder, Decoders, Multiplexers, Multiplexer as function generator, Demultiplexer.

**Sequential Circuits**: Introduction, Flip-flops: Types, Their conversions and applications, Registers: Serial/Parallel in/out, Bi–directional, Universal shift register, Counters: Synchronous, Asynchronous, Decade, Binary, Modulo-n, Shift register counters; Design of Synchronous sequential circuits.

**Memories:** Introduction and classification of ROM, ROM organization, Static and Dynamic RAM, DRAM Refreshing, Representative circuits for cells using BJT and FET's, Timing diagrams of memories, Memory expansion using IC's, Flash memory, CCD, Magnetic Memories.

**Logic circuits**: Introduction, Specification terminology: Fan out, Unit load, Current and voltage parameters; TTL, ECL, MOS, CMOS logic families and their comparison, Tristate Logic, Interfacing of TTL and CMOS logic families.

**Converters:** Digital to Analog conversion, R–2R ladder DAC, Weighted Resistor DAC, Analog–to–Digital (A/D or ADC) conversion, Flash type, Counter type ADC, Dual-slope ADC, Successive approximation type ADC.

**Laboratory Work:**
To consider various important codes and the logic for converting from one to another, 74146, 7476, 7483, 7485, 7490, 7492, 7495, 74121, 74123, 74126, 74151, 74163, 74180, 74181, 74190, 74192, 74195, 74196, Shift register and binary counting using JK flip flop, asynchronous/synchronous up/down counters, Variable modulus counters, Usage of IC tester, Computer simulation using EDA tools.

**COURSE LEARNING OUTCOME (CLO):**The student will be able to

1. Understand number systems, codes and conversions
2. Apply minimization techniques
3. Design combinational and sequential circuits
4. Understand various types of memories
5. Understand the concept of logic circuits and converters

***Text Books:***

1. *Floyd, T.L. and Jain, R. P., Digital Fundamentals, Pearson Education (2008).*
2. *Tocci, R. and Widmer, N., Digital Systems: Principles and Applications, Pearson Education (2007).*

***Reference Book:***

3. *Mano, M. M. and Ciletti, M., Digital Design, Pearson Education (2008).*
4. *Kumar, A., Fundamentals of Digital Circuits, Prentice Hall (2007).*

**Evaluation Scheme:**

| Sr. No. | Evaluation Elements | Weightage (%) |
|---|---|---|
| 1 | MST | 25 |
| 2 | EST | 35 |
| 3 | Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations) | 40 |