Annexure 2

DIGITAL ELECTRONICS AND LOGIC DESIGN

Course Code: ECE 306 **Credit Units: 03**
Total Hours: 30

Course Objective:
This course is an introduction to the basic principles of digital electronics. At the end of this course, the student will be able to quantitatively identify the fundamentals of computers, including number systems, logic gates, logic and arithmetic subsystems, and integrated circuits.

Course Contents:

Module I: Fundamentals of Digital Systems: (7 Hours)
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, Octal hexadecimal number, binary arithmetic, one's and two's complements, Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Q-M method of function realization.

Module II: Combinational Digital Circuits: (5 Hours)
Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices.

Module III: Sequential circuits and systems: (8 Hours)
A 1-bit memory, the circuit properties of bi-stable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

Module IV: A/D and D/A Converters Logic families: (5 Hours)
A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter IC's, sample and hold circuit, analog to digital converters: parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, specifications of A/D converter.
Logic families: Characteristics of digital IC's, digital logic Families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic, ECL, RTL, DTL

Module V: Semiconductor memories and Programmable logic devices: (5 Hours)
Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic

Course Outcomes:

- At the end of this course, students will demonstrate the ability to
- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

A: Attendance, CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination

Text & References:

- R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
- M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
- A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
- Thomas L. Floyd: Digital Fundamentals, Pearson Education.
- Malvino and Leech: Digital Principles & Applications, Tata Mc-Graw Hill