II Year B.Tech. EEE II-Semester **L T P C**
Course Code: PC114BK **3 - - 3**

DIGITAL ELECTRONICS
(Common to EEE, CSE, IT)

Prerequisites:-Nil-

Course Objectives:
1. To understand common forms of number representation in digital electronic circuits and convert between different representations.
2. To design combinational logic circuits.
3. To design sequential logic circuits.
4. To understand logic families and data converters

UNIT 1: (~8 Lecture Hours)
Number Systems: Review of number systems, Complements of Numbers, Codes - Binary Codes, Binary Coded Decimal Code and its Properties.
Boolean Algebra and Switching Functions: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Universal Gates, Multilevel NAND/ NOR realizations.

UNIT 2: (~10 Lecture Hours)
Minimization of Combinational Circuits: Introduction, The minimization of switching function using theorem, The Karnaugh Map Method-Up to Six Variable Maps, Don't Care Map Entries, Tabular Method.
Design of Combinational Logic: Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Carry Look Ahead Adder, Comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code Converters, Decoders for Display Drivers, PLD's: PROM, PLA, PAL, Realization of circuits using PLD's

UNIT 3: (~8 Lecture Hours)
Sequential Machines Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, Latches: SR, JK, Race Around Condition in JK, Flip Flops: JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

UNIT 4: (~8 Lecture Hours)

Registers and Counters: Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Asynchronous and Synchronous Counters, mod-n Counters.

UNIT 5: (~10 Lecture Hours)

Logic Families: Introduction, Characteristics of Digital ICs, Transistor Transistor Logic, Emitter Coupled Logic, MOS Logic, CMOS Logic, Interfacing ECL and TTL, Interfacing CMOS and TTL, Interfacing CMOS and ECL.

A/D and D/A Converters: Digital to Analog convertors: Weighted resistor/convertor, R-2R Ladder D/A converter, specifications for D/Aconverters, examples of D/Aconverter ICs, sample and hold circuit, Analog to Digital convertors: Quantization and encoding, parallel comparator, A/D converter, successive approximation A/D converter, Counting A/D comparator, A/D converter, Successive approximation A/D converter, Counting A/D converter, dual slope A/D Converter, A/D Converter using voltage to frequency and voltage to time conversion, Specifications of A/D Converters, Example of A/D Convertor ICs.

Text Books :

1. Morris Mano, Digital Design, 5th Edition, Pearson.
2. R.P. Jain, Modern Digital Electronics, 4th Edition, Tata McGraw Hill.
3. ZviKohavi&Niraj K.Jha, Switching and Finite Automata Theory, 3rd Edition, Cambridge.

References:

1. W.H. Gothmann, Digital Electronics- An introduction to theory and practice, 2nd Edition, PHI.
2. AAnand Kumar, Switching Theory and Logic Design, 3rd Edition, PHI.

Online Resources:

1. https://courses.cs.washington.edu/courses/cse370/08wi/pdfs/lectures/04-Logic%20gates.pdf
2. http://www.cs.utoronto.ca/~sengels/csc258/lectures/Gates_1up.pdf
3. http://www.site.uottawa.ca/~petriu/Digital-Logic.pdf
4. https://www.slideshare.net/wewemahir/adc-dac-54832376
5. www.cse.cuhk.edu.hk/~khwong/www2/ceng4480/ceng4480_A3.pp
6. http://www.electronics-tutorial.net/digital-logic-families/

7. http://digitalbyte.weebly.com/logic-families.html
8. https://www.tutorialspoint.com/digital_circuits/digital_circuits_shift_registers.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Recall fundamental concepts and techniques involved in the design of digital circuits.
2. Comprehend the concepts to design basic combinational and sequential circuits.
3. Demonstrate building of various designs using basic digital blocks.
4. Verify the digital designs for required functionality.
5. Interface ICs from different logic families.
6. Analyse the design and performance of different Data Converters.