

## Digital Circuits and Systems

1.1 Course Number: ECE221

1.2 Contact Hours 3-1-2 Credits: 13

1.3 Semester-offered: 2<sup>nd</sup> Year-Even

1.4 Prerequisite: Solid State Electronic Devices; Network Analysis & Synthesis

1.5 Syllabus Committee Member: Dr. Umakant Dhar Dwivedi, Dr. Shivanshu Shrivastava, Dr. Ravi Shaw, Dr. Sajal Agarwal, and Dr. Abhishek Kumar Singh.

2. **Objective:** To understand number representation and conversion between different representation in digital electronic circuits. To analyze logic processes and implement logical operations using combinational logic circuits. To understand characteristics of memory and their classification. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines. To verify the theoretical concepts through laboratory and simulation experiments.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Wave shaping circuits	Wave generating circuits: Multi-vibrators and Schmitt Trigger, Frequency division and synchronizing techniques. Sweep generating circuits: Errors in sweep waveforms, Miller Integrator, Bootstrap techniques.	7
2	Digital Logic families	Bipolar and MOS Integrated circuits: Characteristics, limitations and applications. Analysis of digital logic families: TTL, MOS, CMOS Inverters; interfacing between logic families; various logic functions and their implementation.	8
3	Synthesis of Combinational functions using standard Logic gates.	MSI modulo Circuits. Binary, BCD, Excess 3, Gray codes. Error detection and correction codes. Flip Flops and Memory devices: RAM – Static and Dynamic, ROM, PROM, EPROM, EEPROM.	10
4	Counters and Shift registers	Binary, BCD and programmable modulo counters, Shift register, counters. Bistable circuits - R-S, J-K, D and PLA; Design of synchronous sequential circuits.	8
5	Sequential circuit design	System design using SSI and MSI building blocks. Finite State Machine	7
		<b>Total</b>	<b>40</b>

#### 4. **Readings**

##### 4.1 Textbook:

1. Digital Logic and Computer Design, M. Morris Mano, PHI
2. Pulse, Digital and switching Waveforms, Jacob Millman and Herbert Taub, TMH
3. Gate to Microprocessor by S. K. Bose
4. Digital Design by Roth

##### 4.2 Reference Book:

1. Digital Circuits and Logic Design, S. C. Lee, PHI

5. **Outcome of the Course:** After successful completion of the course student will be able to develop a digital logic and apply it to solve real life problems. Analyze, design and implement combinational logic circuits. Classify different semiconductor memories. Analyze, design and implement sequential logic circuits.