

EC-3002 DIGITAL CIRCUITS & SYSTEM

Course Objective

To learn the basic methods for the design of digital circuits and provide the fundamental Concepts used in the design of digital systems.

To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions

To introduce the methods for simplifying Boolean expressions

To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits To introduce the concept of memories and programmable logic devices.

To illustrate the concept of synchronous and asynchronous sequential circuits

Course contents:

Review of Logic gates and binary operations- AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive- NOR Implementations of Logic Functions using gates, NAND-NOR implementations – Multi level gate implementations- Multi output gate implementations. Introduction to number systems and binary operations.

Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality, Boolean function, Canonical and standard forms, Minimization of Boolean functions, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS), Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method of minimization.

Combinational logic circuits: Half adder – Full Adder – Half subtractor - Full subtractor- Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder- Serial. Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/De-multiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

Sequential logic circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave, Characteristic table and equation- Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor.

Registers and Counters: Asynchronous Ripple or serial counter. Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit. Implementation - Modulo-n counter, Registers – shift registers - Universal shift registers. Shift register counters – Ring counter – Shift counters - Sequence generators.

Logic Families: Introduction to different logic families and their characteristics ,RTL,DTL,TTL, ECL, IIL,TTL inverter – circuit description and operation, CMOS inverter – circuit description and operation, other TTL and CMOS gates,

Memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization Static RAM, Dynamic RAM, Programmable Logic Array (PLA) - Programmable Array Logic (PAL)

Course outcome

Students who are successful in this class will demonstrate at least the abilities:

- 1.To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates.
- 2.To design various combinational and sequential circuits.

TEXT BOOKS

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. Donald P. Leach and Albert Paul Malvino, Digital Principles and Applications, 6th Edition, TMH, 2003.
3. [nptelvideos dot in/2012/12/digital-circuits-and-systems.html](http://nptelvideos.in/2012/12/digital-circuits-and-systems.html)

REFERENCES

1. Anil K. Maini, Digital electronics Principles and Integrated circuits Wiley India Pvt. Ltd.
2. Anandkumar- fundamental of digital circuit. 3rd edition. PHI
3. John. F. Wakerly, Digital Design, Principles and Practices, Pearson Prentice Hall
4. John. M. Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
5. Comer: Digital Logic & State Machine Design, Oxford Publication.
6. Donald D. Givone, Digital Principles and Design, TMH, 2003.
7. Ghosal- Digital electronics, cengage learning.

Graphical Programming using Lab

1. To verify the truth table of all basic logic gates and to implement all gate using universal gate.
2. Design of 4 bit Adders (CLA, CSA, CMA, Parallel adders)
3. Design of Binary Subtractors
4. Design of Encoder (8X3), Encoder(3X8)
5. Design of Multiplexer (8X1), and De-multiplexer (1X8)
6. Design of code converters & Comparator
7. Design of FF (SR, D, T, JK, and Master Slave with delays)
8. Design of registers using latches and flip-flops