DSE (Electronics) Sem IV
(For Physics and Electronics as core subjects)

Credit: 04 (Theory-02, Practical-02)

ADVANCED DIGITAL ELECTRONICS (DSE)

Course Title	Credits	Credit distribution of the course			Eligibility Criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical		
Advanced Digital Electronics (DSE)	4	2	0	2	Class XII Pass with Science	Basic Electronics

LEARNING OBJECTIVES

This paper aims to cover the overall topics in Digital Electronics and is offered as elective papers in this curriculum. In this course, students will be able to understand the working principle of CRO, Analog and Digital circuits, 555 timer, Counters, Programmable Logic Devices. In addition, students will get an Introduction to basic principle of MOS transistor and basic CMOS Inverter

LEARNING OUTCOMES

At the end of this course, students will be able to achieve the following learning outcomes.

- To understand the internal structure of CRO and its usage to measure the Voltage, Current, Frequency, and Phase Difference.
- Knowledge of Active and Passive components and scale of integration.
- To understand the use and applications of the 555 timer.
- Knowledge about various types of 4-bit counters.
- D/A and A/D conversion.
- Variety of memories, Programmable Logic Devices and Digital Logic families

THEORY COMPONENT

Unit 1

Introduction to CRO: Block Diagram of CRO. Electron Gun, Deflection System and Time Base. Deflection Sensitivity. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference. **(3 Lectures)**

Analog & Digital Circuits

Integrated Circuits (Qualitative Treatment only) :- Active and Passive components. Discrete

Circuit Component. Wafer. Chip. Advantages and Drawbacks of ICs. Scale of integration : SSI, MSI, LSI and VLSI (Basic Idea and Definitions Only). Classification of ICs. Fabrication of Components on Monolithic ICs. Difference between Analog and Digital Circuits , Examples of Linear and Digital ICs. **(5 Lectures)**

Unit 2

Timers:IC 555: block diagram and applications: Astable multivibrator and Monostable multivibrator. **(3 Lectures)**

Counters(4 bits): Asynchronous counter, Synchronous Counter, Ring Counters, Decade Counter. **(3 Lectures)**

D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, Accuracy and Resolution**,** A-D conversion characteristics, sampling techniques, successive approximation ADC. **(4 Lectures)**

Unit 3

Memories: ROM, PROM, EPROM, EEPROM, Bipolar RAM, static and dynamic RAM, Memory Expansion (Word size and Word Capacity). **(4 Lectures)**

Programmable Logic Devices: Combinational circuit Implementation using PROM, PLA and PAL. **(2 Lectures)**

Introduction to basic principle of MOS transistor and basic CMOS Inverter. **(2 lectures)**

Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, TTL and CMOS families and their comparison. **(4 Lectures)**

References:
Essential Readings:

1. Digital Principles and Applications, A.P.Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
2. Digital Fundamentals, 3rd Edition by Thomas L. Floyd (Universal Book Stall, India, 1998).
3. Digital Design by M. Morris Mano, 5th edition, Pearson.
4. Digital Electronics by R.P. Jain.
5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.

PRACTICAL COMPONENT

(15 Weeks with 4 hours of laboratory session per week)

Do any 6 of the following experiments.

1. To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.
2. To design an astable multivibrator of given specifications using 555 Timer.
3. To design a monostable multivibrator of given specifications using 555 Timer and to measure the Pulse-Width of its output.
4. Design an asynchronous Up/Down counter using D Flip Flop.
5. Design an asynchronous Up/Down counter using JK Flip Flop.
6. Design a synchronous Up/Down counter using D Flip Flop.
7. Design a synchronous Up/Down counter using JK Flip Flop.
8. Design and study of R-2R DAC.
9. Design and study of ADC.

Additional Readings:

1. Digital design by M. Morris Mano, 5th edition, Pearson.

2. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.

3. Digital Electronics G K Kharate ,2010, Oxford University Press.

4. Digital Computer Electronics, A. P. Malvino, J.A. Brown, 3rd Edition, 2018, Tata McGraw Hill Education.