Session: 2023-24	
Part A - Introduction	
Subject	ELECTRONICS
Semester	THIRD
Name of the Course	Combinational & Sequential Circuits
Course Code	B23-ELE-301
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-3 MCC-4
Level of the course	100-199
Pre-requisite for the course (if any)	Basic Knowledge of Electronics in B.Sc. Ist Year
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: 1. Understand the Design principle of basic combinational circuit 2. Understand the design and working of different advanced combinational circuits 3. Learn the basic concepts and working of sequential circuits 4. Learn the working and design principle of asynchronous and synchronous counters 5. Use of Combinational and sequential circuits using digital trainer kits

Credits	Theory	Practical	Total
	3	1	4
Contact Hours	45	30	75

Max. Marks: 100(70 Theory + 30 Practical) Internal Assessment Marks: 20 Theory + 10 Practical End Term Exam Marks: 50 Theory + 20 Practical	Exam Time: 3 Hours each for Theory & Practical

Part B- Contents of the Course

Instructions for Paper- Setter
1. Nine questions will be set in all. All questions will carry equal marks.
2. Question No. 1, which will be short answer type covering the entire syllabus, will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each Unit I to IV. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	**Combinational Circuit-I:** Design principle of combinational circuit: Half adder, full adder, half subtractor, full subtractor, Railway track switching system, common light switching for a group of flats, Parity Generator.	10
II	**Combinational Circuits-II**: Multiplexers, Demultiplexer, Decoder, Encoder, Parity bit generator and checker, Code Converter: BCD to Seven Segment, Binary to Gray, Gray to Binary, Binary to Excess-3, Excess-3 to Binary, Application of combinational circuit: adder circuit using Multiplexers, Boolean expression implementation using Multiplexer, Boolean expression implementation using Demultiplexer	12
III	**Sequential Circuits**: Basic Sequential circuit, Asynchronous and Synchronous circuits, RS FF and JK Flip Flop, Race Around Condition, Master Slave JK flip flop, T and D Flip Flop, Excitation Table, Conversion of Flip Flop, State Diagram.	12
IV	**Counters:** Asynchronous Binary Counters, Asynchronous Mod-N Counter, Synchronous counter: Design principle of Modulo- N Counters, UP-Down counters, Decade Counter, BCD Counter.	10
V*	**Note:** A candidate is required to perform minimum 6 experiments out of the list provided during course of study in this semester. 1. Study of different types of digital IC's: functions, pin diagram, block diagram of 7400, 7402, 7404, 7408, 7432, 7474, 7476, 7490, 74153, 74155 2. Design a half adder using IC 7400. 3. Design a full adder using two half adders. 4. Study of parity generator/checker. 5. To study a 4:1 Multiplexer. 6. To study a 1:4 De- Multiplexer. 7. To study and design a Code Converter. 8. To verify the functionality of J-K, D and T Flip-Flops using 7476 and 7474 ICs. 9. To design a Ripple Binary Counter. 10. To study and design a MOD-N Counter (Synch/Asynch).	30

Suggested Evaluation Methods	
Internal Assessment: ➢ **Theory 20 Marks** • Class Participation: **5 Marks** • Seminar/presentation/assignment/quiz/class test etc.: **5 Marks** • Mid-Term Exam: **10 Marks** ➢ **Practicum 10 Marks** • Class Participation: • Seminar/Demonstration/Viva-voce/Lab records etc.: **10 Marks** • Mid-Term Exam:	**End Term Examination:** 50 Marks 20 Marks

Part C-Learning Resources

Recommended Books/e-resources/LMS:
1. Digital Electronics & Micro computers - R. K. Gaur (4th edition)
2. Modern Digital Electronics - R.P. Jain (4th edition)
3. Digital Principles and Applications by Leach Donald, Malvino AP (6th Edition)
4. Digital fundamentals by R.P. Jain & Floyd.