C. Syllabus Detailing and Learning objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
Module 1	**CH 1** Number Systems and Codes (Hours-08)	Introduction to Number System and conversions: Binary, Octal, Decimal and Hexadecimal number Systems, Binary arithmetic: addition, subtraction (1"s and 2"s complement), multiplication and division. Octal and Hexadecimal arithmetic: Addition and Subtraction (7"s and 8"s complement method for octal) and (15"s and 16"s complement method for Hexadecimal). Codes: Gray Code, BCD Code, Excess-3 code, ASCII Code. Error Detection and Correction: Hamming codes.	**Purpose:** To make students understand the fundamental concepts of number system. To convert from one number format to another and to find the specified code for a given number.	1. List the different number systems. **(R)** 2. Define a particular number. **(U)** 3. Convert from one number format to another. **(R)** 4. Derive a particular code for a given number. **(U)**
			Scope: 1. Academic Aspects– Understanding different number systems and coding techniques. **2. Technology Aspect**– No technology can be involved in this case. **3. Application Aspect-** Number system concept can be used in the design of logic circuits.	
			Students Evaluation – 1. Theory questions to be asked on error detection and correction codes; numerical questions to be asked on number conversions and coding techniques. 2. Lab experiments for comparison of different coding techniques.To realize binary to gray code and gray code to binary converter.	

			3. Corresponding viva questions can be asked for different number system formats and coding techniques.	
Module 2	**CH 2** Boolean Algebra and Logic gates (Hours-08)	Theorems and Properties of Boolean Algebra, Boolean functions, Boolean function reduction using Boolean laws, Canonical forms, Standard SOP and POS form. Basic Digital gates: NOT , AND , OR , NAND , NOR , EXOR , EX-NOR, positive and negative logic, K-map method 2 variable, 3 variable, 4 variable, Don"t care condition, Quine-McClusky Method, NAND-NOR Realization.	**Purpose:** This chapter gives details about the theorems and properties of Boolean algebra and the function of different logic gates. **Scope: 1. Academic Aspects**–Understanding the concepts of Boolean algebra-theorems, properties, laws. Understanding the operation of basic logic gates. **2. Technology Aspect**–Simulation tools can be used to check the operation of logic gates. **3. Application Aspect –** Embedded systems using logic gates. **Students Evaluation:** 1. Theory Questions to be asked on boolean algebra theorems, laws and logic gates; derivative questions can be asked on reduction techniques 2. Lab experiments are done tostudy and verify the truth table of various logic gates using ICs and realize Boolean expressions using gates. 3. Corresponding viva questions can be asked on theorems and laws of Boolean algebra, logic gates.	1. State the theorems and properties of Boolean algebra. **(R)** 2. Describe the operation of different logic gates. **(R)** 3. Explain the different reduction techniques to simplify a boolean expression. **(U)** 4. Derive a simplified Boolean expression using reduction techniques. **(U)**
Module 3	**CH 3** Combinational Logic Design (Hours-08)	Introduction, Half and Full Adder, Half subtractor Full Subtractor, Four Bit Ripple adder, look ahead carry adder, 4 bit adder subtractor, one digit BCD Adder, Multiplexer, Multiplexer tree, Demultiplexer, Demultiplexer tree,	**Purpose:** To make students understand the concepts of adders, subtractors, multiplexer, encoders, decoders and comparator. **Scope: 1. Academic Aspects**–Understanding the operation of adders, subtractors, multiplexer, encoders, decoders and	1. Describe the operation of adders, subtractors, multiplexer,encoders, decoders and comparator. **(R)** 2. Classify the different adder and subtractor circuits. **(A)** 3. Relate the

		Encoders Priority encoder, Decoders, One bit, Two bit , 4-bit Magnitude Comparator, ALU IC 74181.	comparator. **2. Technology Aspect**–Simulation tools can be used to check the output of ofadders, subtractors, multiplexer, encoders, decoders and comparator. **3. Application Aspect –** Design of ALUs **Students Evaluation:** 1. Theory Questions to be asked on adders, subtractors, multiplexer, encoders, decoders and comparator. 2. Lab experiments are done to realize arithmetic circuits i) Half adder ii) Full adder iii) Half subtractor iv) Full subtractor v) 2 bit magnitude comparator; to study multiplexer IC and realization of full adder using multiplexer IC 3. Corresponding viva questions can be asked on adders, subtractors, multiplexer, encoders, decoders and comparator.	operation of adders, subtractors, multiplexer, encoders, decoders and comparator in the functioning of computer's ALU. **(A)** 4. Use the logic of adders and subtraction to solve binary arithmetic problems. **(A).** 5. Design simple logic circuits using combinational logic. **(C)**
Module 4	**CH 4** Sequential Logic Design (Hours-15)	Introduction: SR latch, Concepts of Flip Flops: SR, D, J-K, T, Truth Tables and Excitation Tables of all types, Race around condition, Master Slave J-K Flip Flops, Timing Diagram, Flip-flop conversion, State machines, state diagrams, State table, concept of Moore and Mealy machine. Counters: Design of Asynchronous and Synchronous Counters, Modulus of the Counters, UP-DOWN counter, Shift Registers: SISO, SIPO, PIPO, PISO Bidirectional Shift Register, Universal	**Purpose:** This chapter gives details about the operation of flip-flops, counters, registers and state machines. **Scope: 1. Academic Aspects**–Understanding the operation of flip-flops counters and registers with truth tables. **2. Technology Aspect**–Simulation tools can be used to check the output of flip-flops counters and registers. **3. Application Aspect –** Design of embedded systems. **Students Evaluation:** 1. Theory Questions to be asked on flip-flops, counters and registers. 2. Lab experiments on study of flip-flops using IC's; to realize	1. Describe the operation of flip-flops, counters and registers. **(R)** 2. Compare the different flip-flops using truth tables. **(U)** 3 Design simple logic circuits using sequential logic. **(C)**

		Shift Register, Ring and twisted ring/Johnson Counter, sequence generator.	asynchronous 3 bit up counter, shift registers using flip flops 3. Corresponding viva questions can be asked onconcepts of flip-flops, counters and registers.	
Module 5	**CH 5**Introduction to VHDL (Hours-06)	Introduction: Fundamental building blocks Library, Entity, Architecture, Modeling Styles, Concurrent and sequential statements, simple design examples for combinational circuits and sequential circuits.	**Purpose:** This chapter gives an introduction about VHDL, a hardware description language used in electronic design automation. **Scope: 1. Academic Aspects**–Understanding the architecture, modeling styles of VHDL. **2. Technology Aspect**–VHDL to perform electronic design automation. **3. Application Aspect –** Design of automation systems **Students Evaluation:** 1. Theory Questions to be asked on architecture, library, modeling styles of VHDL. 2. Lab experiments are done to realize basic gates using VHDL. 3. Corresponding viva questions can be asked onarchitecture, library, modeling styles of VHDL.	1. List the different libraries in VHDL. **(R)** 2. Outline the architecture of VHDL. **(R)** 3. Describe the modeling styles and statements of VHDL. **(R)** 4. Use appropriate modeling styles of VHDL for a particular design. **(A)** 5. Design simple combinational circuits and sequential circuits using VHDL. **(C)**
Module 6	**CH 6** Digital Logic Families (Hours-03)	Introduction: Terminologies like Propagation Delay, Power Consumption, Fan in and Fan out, current and voltage parameters, noise margin, with respect to TTL and CMOS Logic and their comparison.	**Purpose:** To make students understand the terminologies of digital logic families. **Scope: 1. Academic Aspects**–Understanding the terminologies of digital logic families with respect to TTL and CMOS logic. **2. Technology Aspect**–Simulation tool can be used to understand the digital logic terminologies. **3. Application Aspect –** Digital logic concepts can be applied to design embedded and automation systems.	1. List the different digital logic terminologies. **(R)** 2. Describe the different digital logic terminologies with respect to TTL and CMOS Logic. **(R)**. 3. Deduce the parameters in a given circuit. **(AN)**

			Students Evaluation: 1. Theory Questions to be asked on terminologies of digital logic families. 2. Study experiment can be performed on different digital logic terminologies. 3. Corresponding viva questions can be asked onterminologies of digital logic families with respect to TTL and CMOS logic.	