Uka Tarsadia University

B.Tech.

Semester II

DIGITAL LOGIC AND COMPUTER DESIGN

EC3002

EFFECTIVE FROM July-2021

Syllabus version: 1.00

Subject Code	Subject Title	Teaching Scheme			
		Hours		Credits	
		Theory	Practical	Theory	Practical
EC3002	Digital Logic and Computer Design	3	2	3	1

Subject Code	Subject Title	Theory Examination Marks		Practical Examination Marks	Total Marks
		Internal	External	CIE	
EC3002	Digital Logic and Computer Design	40	60	50	150

Objectives of the Course:

- To provide comprehensive knowledge of fundamentals of Binary number systems, Boolean algebra and Digital systems.
- To explain the operation and design of Combinational, Sequential and Arithmetic logic circuits.
- To design hardware systems for real world problems.

Course Outcomes:

Upon completion of the course, the student shall be able to

CO1: Understand digital number systems and codes.

CO2: Design Boolean algebra and Solve Switching function minimization.

CO3: Design and analyze the combinational circuits.

CO4: Design sequential circuits using Flip-Flop and conversion of Flip-Flop.

CO5: Understand the concept of Registers, Counters and Memory unit.

CO6: Study and apply design of Processor Logic Design.

Sr. No.	Topics	Hours
	Unit – I	
1	**Introduction to Digital Logic, Number systems and Codes:** Digital and Analog system, Logic levels and Pulse waveforms, Elements of digital logic, Functions of Digital logic, decimal number system, Binary number system, Representation of signed numbers and binary arithmetic, Octal number system, Hexadecimal number system, Classification of binary codes, 8421 BCD Code, Excess Three Code, Gray Code(Reflective Code)	6
	Unit – II	
2	**Boolean Algebra and Switching Functions:** Logic gates, The universal gates, The Exclusive- OR gate, Properties of Exclusive–OR, The Exclusive–NOR gate, Boolean algebra, Logic operation, Axioms and Laws of boolean algebra, duality, Reducing boolean expression, Functionally complete sets of operation, Boolean function and their representation, Expansion of a boolean expression in SOP from to the standard SOP form, Expansion of a boolean expression in POS from to the	9

	standard POS form, computation of total gate inputs, Determining of output level form the diagram, Converting AND/OR/Invert logic to NAND/NOR logic. Minimization of switching function using K-map two variable K-map, Three variable K-map, Four variable K-map, don't care combination, Tabulation method.	
Unit – III		
3	**Combinational Logic Design:** Introduction, Design procedure, Adders, Subtractors, Binary parallel adder, 4-bit parallel subtractor, Binary adder–subtractor, The look ahead carry adder, BCD adder, Code converters, Parity bit generators/checkers, Comparators, Encoders, Decoders, multiplexers, Demultiplexers, ROM, PLA and PAL.	8
Unit – IV		
4	**Sequential Circuits :** Flip-flops, Classification of sequential circuit, Level mode and pulse mode asynchronous sequential circuit, Latches and flip-flops, asynchronous inputs, Flip flop operating inputs, Flip flop operating characteristics, Clock skew and time race, Master slave flip- flops, flip-flop excitation tables, Conversion of flip –flops.	6
Unit – V		
5	**Registers, Counters and Memory Unit:** Introduction, Registers, Shift registers, Design of ripple counters, Design of synchronous counters, Shift register counters, The finite state model, Memory elements.	9
Unit – VI		
6	**Processor Logic Design**: Processor organization, Design of arithmetic circuit, Design of logic circuit, Design of arithmetic logic unit, Status register, Design of shifter, Processor unit and design of accumulator.	7

Sr. No.	Digital Logic and Computer Design (Practical)	Hours
1	To study of all logic gates. To study of de-morgans theorems.	2
2	To study of boolean algebra. To study of "NOR" logic gate as universal gate.	2
3	To study of half adder and full adder. To study of half and full subtractor.	2
4	To study of 4 bits binary to gray code converter. To study of 4 bits bcd to excess-3 code converter.	2
5	To study 4 bits even / odd parity checker / generator. To study of 4 bits full adder by IC 7483.	2
6	To study of 8 bit analog to digital converter by ADC0804.	2

	To study of 8 bit digital to analog converter by DAC0800.	
7	To study of 4 bits binary comparator by IC 7485 with verify the truth table. To study of 8 lines to 3 lines encoder by IC 74 148.	2
8	To study of 4 lines to 16 lines decoder using IC74154. To study of BCD To decimal (4 to 10 lines) decoder using IC74145.	2
9	To study of decimal to BCD(10 line to 4 line) encoder. To study of BCD to 7-segment decoder / driver.	2
10	To study of 16 : 1 multiplexer using IC 4067. To study 1 : 16 de-multiplexer by IC 4067.	2
11	To study of various flip flops by IC.	2
12	To study of 4 bits universal shift register by IC. To study 4 bit arithmetic logic unit using IC 74181.	2
13	To study decade counter by IC 74 90. To study 4 bits binary counter by IC 74 93.	2
14	To study 4 bit synchronous up/down counter by IC.	2
15	To study 4 bits twisted ring (johnson) counter.	2

Text book:

- Anand Kumar , "Switching theory and logic design", PHI Learning Pvt. Ltd

Reference books:

- Mano Morris , "Digital Logic and Computer Design", 4th edition, Pearson Education
- Jacob Millman and Christos Halkias , "Integrated Electronics", Tata McGraw-Hill Publication.
- Floyed Thomas L. and Jain R. P. , "Digital Fundamentals" - 8th Edition, Pearson Education

Course Objectives and Course outcomes mapping:

- To provide comprehensive knowledge of fundamentals of Binary number systems, Boolean algebra and Digital systems: CO1,CO2
- To explain the operation and design of Combinational, Sequential and Arithmetic logic circuits:CO2,CO3,CO4,CO5
- To design hardware systems for real world problems:CO6

Course Units and Course Outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
1	Introduction to Digital Logic, Number systems and Codes	✓					
2	Boolean Algebra and Switching Functions		✓				
3	Combinational Logic Design			✓			
4	Sequential Circuits				✓		
5	Registers, Counters and Memory					✓	

	Unit						
6	Processor Logic Design						✓

Programme Outcomes:

PO 1:	Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.
PO 2:	Problem analysis: An ability to identify, formulates, and solves engineering problems.
PO 3:	Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.
PO 4:	Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.
PO 5:	Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.
PO 6:	The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.
PO 7:	Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.
PO 8:	Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.
PO 9:	Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10:	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.
PO 11:	Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12:	Life-long learning: A recognition of the need for, and an ability to engage in life-long learning.

Programme Outcomes and Course Outcomes mapping:

Programme Outcomes	Course Outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1	✓	✓	✓	✓	✓	✓
PO2		✓	✓	✓	✓	✓
PO3		✓	✓	✓	✓	✓
PO4		✓	✓	✓	✓	✓
PO5						
PO6						

PO7						
PO8						
PO9						
PO10						
PO11						
PO12						