

Indian Institute of Information Technology Vadodara

Syllabus and Course Evaluation Index-Autumn-2024-25

Digital Logic Design (EC-201)- L-T-P-C: 3-0-0-3

Prerequisites: Fundamentals of Computer, Boolean Algebra, VHDL, Logic Gates

Objectives: The main objective of this course is to introduce the concept of digital logic circuits and binary systems. To design and implement the combinational and sequential logic circuits which are the prime ingredient to make ALU. To provide the basic understanding of design and implementation of the digital circuits using VHDL.

Course Outcomes:

The students will be able to understand the fundamentals of digital logic design. The students will be able to understand the combinational logic circuits. The students will be able to understand the sequential logic circuits. The students will be able to understand the design and implementation of digital circuits using VHDL.

Syllabus:

NUMBER SYSTEMS: Representations, signed, 1's complement, 2's complement, saturation and overflow in fixed point arithmetic. **BOOLEAN ALGEBRA:** Axioms and theorems, DeMorgan's law, universal gate, duality, expression manipulation using axioms and theorems. **COMBINATIONAL**

LOGIC: Introduction to switching algebra, canonical forms, two-level simplification, boolean cube, logic minimization using K-map method, QuineMcCluskey tabular method, minimization for product-of-sum form, minimization for sum-of-product form, multiplexers, demultiplexers, decoders, encoders, hazard free synthesis, Arithmetic circuits, adders, half adder, full adder, BCD adder, ripple carry adder, carry-lookahead adder, combinational multiplier.

SEQUENTIAL LOGIC: Simple circuits with feedback, basic latches, clocks, R-S latch, master-slave latch, J- K flip flop, T flip-flop, D flip-flop, storage registers, shift register, ripple counter, synchronous counters, Finite State Machine (Moore/Mealy Machines), FSM with single/multiple inputs and single/multiple outputs, RAM, ROM, EPROM.

HARDWARE DESCRIPTION LANGUAGE: Programming and simulation, structural

specification, behavioral specification, dataflow modelling, testbench, testing using test vectors, testing using waveforms, design of basic blocks to build larger circuits, case studies, adder, ALU, counters, shift registers, register bank, FSM design example etc.

Text Books:

- 1) Digital Design, Morris Mano, Prentice Hall, 2002.
- 2) Digital Fundamentals, 10 th Ed, Floyd T L, Prentice Hall, 2009.

Reference Books:

- 1) Digital Circuits and Design, S Salivahanan, Vikas Publication House Pvt. Ltd.
- 2) A VHDL Primer, 3rd Edition, J. Bhaskar, Pearson.

Evaluation Index: (100 marks, weightage 100%)

- Mid-Examinations: 30 % (Pen and paper)
- End-Semester-Examination: 45% (Pen and paper)
- Assignment/Quize/Test: 15-20%
- Attendance: 5-10%

Dr. Kamal Kishor Jha

Course Instructor: Digital Logic Design