

Prerequisites: EC 100: Basic Electronics

Design Concepts: Digital Hardware, Design Process, Hardware, Logic Circuit Design, Theory and Practice; Introduction To Logic Circuits: Variables and Functions, Inversion, Truth Tables, Logic Gates and Networks, Boolean Algebra, Synthesis using AND, OR AND NOT Gates, Design Examples, Introduction to Cad Tools, Introduction to VHDL.; Implementation Technology: Transistor Switches, NMOS Logic Gates, CMOS Logic Gates, Negative Logic System, Standard Chips, Programmable Logic Devices, Custom Chips, Standard Cells and Gate Arrays Practical Aspects, Transmission Gates, Implementation details for FPGAs.; Optimized Implementation of Logic Functions: Karnaugh Map, Strategy for Minimization, Minimization of Product-of-Sums Forms, Incompletely Specified Functions, Multiple-Output Circuits, NAND and NOR Logic Networks, Multi-Level Synthesis, Analysis of Multi-Level Circuits, CAD Tools. ; Number Representation And Arithmetic Circuits: Positional Number Representation, Addition of Unsigned Numbers, Signed Numbers, Fast Adders, Design of Arithmetic Circuits Using Cad Tools. ; Combinational Circuit Building Blocks: Multiplexers, Decoders, Encoders, Code Converters, Arithmetic Comparison Circuits, VHDL for Combinational Circuits. ; Flip-Flops, Registers And Counters, A Simple Processor: Basic Latch, Gated SR Latch, Gated D Latch. Master-Slave and Edge-Triggered D Flip-Flops, T Flip-Flop, JK Flip-Flop, Registers, Counters, Reset Synchronization, Other Types of Counters, Using Storage Elements with Cad Tools, Using Registers and Counters With Cad Tools, Design Examples. ; Synchronous Sequential Circuits: Basic Design Steps, State Assignment Problem, Meanly State Model, Design of Finite State Machines using CAD Tools, Serial Adder Example, State Minimization, Design of a Counter using the Sequential Circuit Approach, FSM as an Arbiter Circuit, Analysis of Synchronous Sequential Circuits.

Essential Reading:

1. S. Brown and Z. Vranesis, *Fundamental of Digital Logic with VHDL design* Tata Mc GRAW-Hill, 2003

Supplementary Reading:

1. F. Vahid: *Digital Design*: Wiley Student Edition, 2006
2. J. F. Wakerly, *Digital Design Principles and Practices*, Fourth Edition, Prentice-Hall, 2005.
3. R. L. Tokheim, *Digital electronics, Principles and applications*, 6th Edition, Tata McGraw Hill Edition, 2003