

Course name (English)	Digital Design		
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Course ID:	40212	No of units:	3	Program:	BSc
Prerequisites:			-	Co-requisites:	-
Prepared by:	Alireza Ejlali				

Outline

- Topic 1: Coding and Number representation: Numbers, Number-Base, r 's Complement, $r-1$'s Complement, Subtraction with complements, Signed numbers, Carry and Overflow (Modular Arithmetic), BCD Numbers**
- Topic 2: Boolean Algebra: Basic Definitions, Axiomatic Definition of Boolean Algebra, Switching Algebra, Basic Theorems and Properties, Boolean Functions, Logic Operations, Logic Gates, Logic-Circuit Diagram, Minterms and Maxterms, Canonical and standard forms, Propagation Delay, Critical Path**
- Topic 3: Simplification: Karnaugh Map, Don't Care Conditions, Two-Level implementations, Quine-McCluskey Method, Race, Hazard and Glitch**
- Topic 4: Combinational Logic and components: Combinational Circuits, Decoder, Multiplexer, Simplifications methods for MUX and DEC, Encoder, Priority Encoder, Demultiplexer, Half Adder, Full Adder, Ripple Carry Adders, CLA Adder, Comparator**
- Topic 5: Multi-Valued Logic: 3-Value and 4-Value Logics, Tri-state Gates, Tri-state buffers, Open Collector Gates, Wired logic**
- Topic 6: Synchronous Sequential Logic: Sequential Circuits, Latch, Race Problem, Level-Sensitive Flip-Flop, Edge-Sensitive Flip-Flop, Master-Slave Flip-Flop, Asynchronous inputs (reset and preset), Hold time and Setup time**
- Topic 7: Finite State Machines: Mathematical Model, State Diagram and State Table, Excitation Table, Design Procedure, Mealy and Moore FSMs**
- Topic 8: Sequential Components: Registers, Shift Registers, Universal Registers, Counters, Johnson Counter, Ripple Counter**
- Topic 9: Simple PLDs: Programmable Logic Devices, ROM, Programmable Logic Arrays (PLA), PAL.**

References

- 1) Digital Design, Third Edition, by M. Morris Mano., Prentice Hall, 2001.
- 2) Digital Design, Fourth Edition, by M. Morris Mano., Prentice Hall, 2006.
- 3) Digital Logic Circuit Analysis and Design, by Victor P. Nelson, H. Troy Nagle, Bill D. Carroll, David Irwin, Prentice Hall, 1995.
- 4) The Art of Digital Design: An Introduction to Top-Down Design, by Franklin P. Prosser, David E. Winkel, Prentice Hall, 1987.