

## SWITCHING THEORY AND LOGIC DESIGN

(Common to ECE, EEE, CSE, IT)

**Course Code: 13EC1105**

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### Course Educational Objectives:

- ❖ To familiarize students with different number systems, digital logic, simplification and minimization of Boolean functions.
- ❖ To design combinational & sequential digital circuits and state machines.
- ❖ To introduce programmable logic devices.

### Course Outcomes:

Students can design optimized logic circuits through combinational and sequential logic.

#### UNIT-I

(10 Lectures)

##### NUMBER SYSTEMS & CODES:

Introduction to number systems, Complement representation of negative numbers, binary arithmetic, binary codes, Error detecting & correcting codes.

#### UNIT-II

(15 Lectures)

##### BOOLEAN ALGEBRA AND SWITCHING FUNCTION

Fundamental postulates of Boolean algebra, Basic theorems and properties, switching functions, Simplification of Boolean equations, Digital logic gates, properties of XOR gates, universal gates - NAND/NOR realizations. K-map method, Prime implicants, don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, simplification rules.

#### UNIT-III

(13 Lectures)

##### COMBINATIONAL LOGIC DESIGN:

Adders, Subtractor, Multiplexer, De-Multiplexer, MUX Realization of

switching functions, Encoder, Decoder, Parity bit generator, Code-converters, Basic PLD's-ROM, PROM, PLA, PAL Realizations.

## UNIT-IV

(13 Lectures)

### SEQUENTIAL CIRCUITS:

Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Latches and Flip-flops-Triggering and excitation tables, registers, shift registers, Steps in synchronous sequential circuit design, synchronous counters, ripple counters, Design of modulo-N Ring & Shift counters, Serial binary adder, sequence detector.

## UNIT-V

(9 Lectures)

### FINITE STATE MACHINES:

Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified sequential machines, Partition techniques, incompletely specified sequential machines using merger table.

### ALGORITHMIC STATE MACHINES:

Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

### TEXT BOOKS:

1. Morris Mano, "*Digital Design*" PHI, 3<sup>rd</sup> Edition, 2006.
2. Anand Kumar, "*Switching Theory and Logic Design*" PHI, 2008

### REFERENCES:

1. Zvi Kohavi, "*Switching & Finite Automata theory*" TMH, 2<sup>nd</sup> Edition,
2. R.P.Jain. "*Modern Digital Electronics*", 4th ed., TMH, 2009.
3. John M. Yarbrough, "*Digital Logic Applications and Design*" Thomson Publications, 2006.
4. Charles H. Roth, "*Fundamentals of Logic Design*" Thomson Publications, 5<sup>th</sup> Edition, 2004.

