LOGIC DESIGN

Paper Code **ECS-305**

Course Credits 4

Lectures/ Week 3

Tutorials/ Week 1

Course description

UNIT- I SWITCHING ALGEBRA AND COMBINATIONAL LOGIC

Development of Boolean Algebra, truth functions, AND OR and NOT operators, laws of algebra, reducing Boolean expressions, universal building blocks, Karnaugh mapping, minterms, maxterms, solving digital problems using sum of the products and product of sums reduction hybrid functions, incompletely specified functions (don't care combinations).

UNIT-II SEQUENTIAL CIRCUITS (FLIP-FLOP AND RIPPLE COUNTERS)

Introduction to asynchronous systems, flip-flop: RS, T, D, JK, master slave JK, Ripple counters-shortened modulus, up and down counter designs, few application of ripple counter.

UNIT-III SEQUENTIAL CIRCUITS (PARALLEL COUNTERS AND ASYNCHRONOUS CIRCUITS)

Parallel counters, type T counter design, up and down counters, non-sequential counting (skipping states), type D counter design, shift registers, ring counters, type JK counter design, controlling the counter to count through more than one set of states.

UNIT-IV LOGIC FAMILIES

Diode transistor logic (DTL), Transistor-Transistor logic (TTL) as derived from DTL, typical TTL NAND gate, function of the input transistor, volt-ampere characteristics, fan-in and

fan-out calculations, output stage: totem-pole and modified totem-pole, introduction to Emitter Coupled Logic (ECL), Integrated Injection Logic (IIL), and MOSFET, Comparison of various logic families.

UNIT-V ADDERS, SUBTRACTORS, ADC AND DAC

Binary half adder, full adder design, parallel adder, BCD adder, addition of more than two numbers, subtractor, fast adder (look-ahead carry), parity checker/generator, multiplexer/ demultiplexer, some applications, Digital to analog converter - weighted register, R-2R ladder network, Analog to digital converter, successive approximation type, dual slope type.

Pre-requisite Fundamentals of Abstract Algebra

Course/Paper:

Text Book: Herbert Taub and Donald Schilling, "Digital Integrated Electronics" Tata MC Graw Hill. 1988

Reference Books:

1. Willam H. Gothman, "Digital electronics –An Introduction to Theory and Practice", 2nd Edition PHI. 1992
2. Thomas L Floyd, "Digital Fundamentals" Pearson Education, 2011
3. Morris Mano, "Digital Circuits and Logic Design", PHI. 1987

Course Outcome:

CO1. A thorough understanding of basic building blocks of Digital Circuits and Boolean Algebra and ability to design simple combinational circuits by using K-Maps.

CO2. A thorough understanding of basic storage units and their need in sequential circuits, and the ability to design ripple counters and the appreciation of their limitations.

CO3. The ability to design synchronous counters using type -T, Type-D and Type-JK design philosophies and the appreciation of how they overcome the limitations of ripple counter.

CO4. A thorough understanding of circuits like Adders, Subtractors, Parity Checkers/Generators , Multiplexers/De-Multiplexers, A/D and D/A converters etc. and a co-relation with the design insights already gained in CO1 and CO2.

CO5. A thorough understanding of the implementation of basic building blocks in DTL,TTL,MOS,CMOS,ECL and I^2L Logic Families and a qualitative comparison of their performance.
