EC-210 Logic and Sequential Circuit Design - Course Contents

a. **Credits** : 3+1

b. **Textbooks**

1. Digital Logic and Computer Design by M. Morris Mano, Prentice – Hall of India, New Delhi – 110001, Latest Issue, ISBN 81-203-0417-9

2. Logic and Computer Design Fundamentals by M. Morris Mano and Charles R. Kime, Prentice – Hall, New Jersey, 07458, 2000, ISBN 0-13-012468-0

c. **References**

1. Digital Design. M. Morris Mano, 3rd Edition, Prentice Hall, 2001. ISBN: 0130621218
2. Digital Fundamentals by Thomas L. Floyd, 6th Edition, Prentice Hall International, 1997

d. **Objectives/Goals:** At the end of the course, students will be able to:

1. Comprehend different number systems including the binary system and Boolean algebraic principles
2. Apply Boolean algebra to switching logic design and simplification.
3. Analyze a given digital system and decompose it into logical blocks involving both combinational and sequential circuit elements.
4. Synthesize a given system starting with problem requirements, identifying and designing the building blocks, and then integrating blocks designed earlier
5. Validate the system functionality and evaluate the relative merits of different designs.

e. **Course Outcomes:** Successful achievement of the course objectives will contribute to the following outcomes of the computer engineering program related to equipping the students with:

1. An ability to apply knowledge of Boolean Algebra to Digital Circuit minimization
2. An ability to design digital systems from component (gate) level to meet desired needs

3. An ability to identify, formulate, and solve engineering problems related to digital system design using project-based learning approach
4. An ability to communicate effectively
5. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (Veriwell simulation tool)

f. **Topics :**

1. **Digital Computers and Binary Systems:** Digital Computers and Information, Binary Numbers, Number Systems and their Conversions, Arithmetic Operations, Decimal Codes, Alphanumeric Codes, Complements, and Binary Codes
2. **Boolean Algebra and Logic Gates:** Binary Logic and Gates, Boolean Algebra and Functions, Canonical and Standard Forms, Logic Operations, Digital Logic Gates, and IC Digital Families
3. **Simplification of Boolean Functions:** K-Map Method and Simplification using Different Variables Map, Simplification of Product of Sums, Implementation with NAND and NOR Gates, Don't Care Conditions, The Tabulation Method, Determination of Prime-Implicants, and Selection of Prime-Implicants
4. **Combinational Logic Design:** Design Procedure, Adders, Subtractors, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-OR, and Equivalence Functions
5. **Combinational Logic with MSI and LSI:** Decimal Adder, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Binary Adders, Binary Subtraction, Binary Adder-Subtractors, Binary Multipliers and HDL Representation – VHDL/Verilog
6. **Sequential Logic/Circuits:** Latches, Flip-Flops, Triggering of Flip-Flops, Clocked Sequential Circuits and their Analysis, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Designing with D & JK Flip-Flops, HDL/Verilog Representation for a Sequential Circuits – VHDL/Verilog
7. **ROM, PLAs and Counters:** ROM and PLA architecture, Designing using ROMs and PLAs, Binary Counters