BCSG 0153: DIGITAL LOGIC DESIGN

Objective: This course enables the students:

- To learn the fundamental concepts of digital logic design.
- To study methods of logic expression simplification.
- To understand the procedure for the analysis of combinational and sequential logic circuits.
- To understand terms used in the designing of a memory and programmable logic devices.

Credits: 03 **L–T–P: 3–0-0**

Module No.	Contents	Teaching Hours
I	Introduction to digital systems, number system conversion, signed number representation, floating-point number representation, weighted (8421), non-weighted binary codes (excess-3 and gray code), error detection/correction code, and Hamming code. Basic and universal logic gates, realization of Boolean expressions using logic diagram, minterms, maxterms, SoP and PoS forms, simplification of Boolean function using two variables, three variables, and four variables K-Map, conversion from SoP to PoS and vice-versa. **Design and analysis of combinational circuits:** half adder, half subtractor, full adder, full subtractor, 4-bit parallel binary adder-subtractor, binary multiplier, magnitude comparator, multiplexer, implementation of a Boolean function using a multiplexer, implementation of higher-order multiplexers using lower order multiplexers, demultiplexer.	20
II	Encoder, priority encoder, decoder, implementation of Boolean functions using a decoder. Introduction to sequential circuits, SR latch, SR flip-flop, JK flip-flop, D flip-flop, T flip-flop, PS-NS table, excitation table, characteristic equation of flip-flops. Analysis of clocked sequential circuits, Mealy and Moore state machines, state table, and state diagram. Shift register, SISO, SIPO, PISO, PIPO, and universal shift register. Binary counter, ripple MOD-N (up/down) and MOD<N binary counter, synchronous binary counter, ring counter, Johnson's counter. Introduction to memory, RAM, ROM, and implementation of Boolean functions using ROM. Programmable logic: PAL architecture, PLA architecture, System on Chip (SoC) design.	20

Text Book:

- 1. S. Salivahanan& S. Asivazhagan, "Digital Circuit & Design", IInd Edition.
- 2. M. Morris Mano and M. D. Ciletti, "Digital Design" 4th Edition, Pearson Education.

Reference Books:

- John F Wakerly, Digital Design, Fourth Edition, Pearson/PHI,2006
- John M Yarbrough, Digital Logic Applications and Design, Thomas Learning,2002
- Charles H Roth, Fundamentals of Logic Design, Thomson Learning , 2003
- Donald P Leach and Albert Paul Malvino, Digital Principals and Applications, 6th
- Edition, TMH,2003.
- William H Gothmann, Digital Electronocs, 2nd Edition, PHI, 1982

Course Outcomes (CO): Upon completion of this course students will be able to:

- CO1: Understand number system conversion, signed numbers, and floating-point number representation.
- CO2: Understand 8421 weighted, non-weighted binary codes including excess-3 and gray code, and Hamming code.
- CO3: Understand basic and universal logic gates, SoP and PoS forms, and simplification of Boolean functions using K-Map.

- CO4: Construct combinational circuits including adder, subtractor, adder-subtractor, multiplier, comparator, encoder, decoder, multiplexer, and demultiplexer.
- CO5: Construct sequential circuits which include flip-flop, shift register, ripple counter, synchronous counters, Johnson counter, ring counter.
- CO6: Analyse clocked sequential circuits using state table and state diagram.
- CO7: Understand memory, programmable logic device including PAL and PLA, and SoC design.