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|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| <b>Course Title</b>                              | <b>Digital Logic Design</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |            |
| <b>Course Code</b>                               | <b>CC-110</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |            |
| <b>Credit Hours</b>                              | 2 (2,0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |            |
| <b>Category</b>                                  | Computing core                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |            |
| <b>Prerequisite</b>                              | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |            |
| <b>Co-Requisite</b>                              | None                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |            |
| <b>Follow-up</b>                                 | CC-210 Computer Organization & Assembly Language                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |            |
| <b>Course Introduction</b>                       | The course introduces the concept of digital logic, gates and the digital circuits. Further, it focuses on the design and analysis combinational and sequential circuits. It also serves to familiarize the student with the logic design of basic computer hardware components.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |            |
| <b>Course Learning Outcomes (CLOs)</b>           | At the end of the course, the students will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>BT</b>       | <b>PLO</b> |
|                                                  | CLO1: Acquire the basic knowledge of logic gates and digital logic circuits                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | C1 (Acquire)    | 1          |
|                                                  | CLO2: Understand the working of the fundamental digital circuits used in digital systems and computers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | C2 (Understand) | 1,2        |
|                                                  | CLO3: Designing a digital circuit for implementing a given scenario.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | C3 (Apply)      | 3,4        |
| <b>Syllabus</b>                                  | <b>Topics:</b> Introduction to Digital Systems, Number Systems, Introduction to Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Logic Gates, NAND and NOR Implementation, Representation of Function in Sum of Minterms or Product of Maxterms, Simplification of Boolean function using Karnaugh Map, Don't care Conditions, The Tabulation Method, Introduction to Combinational Logic, Design of Adders, Design of Subtractors, Code Convertors, Analysis Procedure of Combinational Circuits, Binary Parallel Adders, Decimal Adders, Magnitude Comparator, Decoders and its applications, Multiplexers, Demultiplexers, Encoders, ROM, Programmable Logic Array (PLA), Introduction to Sequential Circuits, Basic Flip Flop, Clocked RS Flip Flop, Clocked D Flip Flop, Clocked JK Flip Flop, Clocked T Flip Flop, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip Flop Excitation tables, Design Procedure, Design of Counters, Design with State Equations, Introduction to Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, Memory Unit, Random Access Memory. Introduction Programmable Logic Devices (CPLD, FPGA), Lab Assignments using tools such as Verilog HDL/VHDL, MultiSim. |                 |            |
| <b>Suggested Instructional/ Reading Material</b> | 1. M. Morris Mano, Digital Logic and Computer Design, 1 <sup>st</sup> Edition, Pearson, 1979, ISBN: 0132145103.<br>2. Thomas L. Floyd, Digital Fundamentals, 10th Edition, Prentice Hall, 2008, ISBN: 0132359235.<br>3. Fundamental of Digital Logic with Verilog Design, Stephen Brown, 2/e                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |            |