

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	BTech Electronics and Instrumentation Engineering
Semester:	V
Course Code:	
Course Title:	Digital Design for Instrumentation
Course Type:	Departmental Elective-I
Year of Introduction:	2025-26

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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. understand architecture and working of different types of programmable logic devices **(BL2)**
2. apply register transfer level design principles **(BL3)**
3. design and implement basic combinational and sequential circuits **(BL6)**
4. implement applications related to instrumentation with programmable logic devices. **(BL6)**

Unit	Contents	Teaching Hours (Total 45)
Unit-I	Introduction to Design Concepts Introduction to digital design, significance of digital design over analog design, digital hardware, design process, design of digital hardware, difference between FPGA and microcontroller-based designs	01
Unit-II	Programmable Logic Devices Difference between ASIC design and FPGA design, Field Programmable Logic Arrays (FPGA), applications of CPLDs and FPGAs	02
Unit-III	Introduction to Verilog Module, ports, hierarchical design, identifiers, data types, operators, behavioural modelling, dataflow modelling, structural modelling, mixed modelling	06
Unit-IV	Combinational Circuit Building Blocks Code converter, parity generator and checker, comparator, multiplexers, decoders, half and full adder, half and full subtractor, encoders, ripple carry adder, signed number adder and subtractor, BCD adder, multiplier, divider, carry lookahead adder.	12
Unit-V	Sequential Circuits Flip flops (RS,D,JK,T), counter, register, BCD counter, universal shift register, basic design steps of sequential circuits, state machine concept, design of finite state machines (FSM), Moore design, Mealy design.	13
Unit-VI	RTL design Basic RTL concepts, RTL components, Verilog for RTL design, RTL design flow, synthesis, verification, Time and performance considerations.	04