Nirma University
School of Technology, Institute of Technology
B. Tech (Instrumentation and Control Engineering)

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Course Code	**2ICDE57**
Course Title	**Digital Design for Instrumentation**

Course Learning Outcome:

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

- describe architecture and working of different types of programmable logic devices
- develop Verilog code for different types of combinational and sequential circuits
- implement applications related to instrumentation on programmable logic devices

Syllabus

Teaching Hours

UNIT 1: Introduction to Design Concepts — **01**

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

UNIT 2: Programmable Logic Devices — **04**

Difference between ASIC design and FPGA design, Field Programmable Logic Arrays(FPGA), Applications of CPLDs and FPGAs, Introduction to Verilog language for HDL programming

UNIT 3: Combinational Circuit Building Blocks — **04**

Multiplexers, decoders, encoders, code converters, arithmetic comparison circuits, Verilog for combinational circuits

UNIT 4: Flip-flops, Registers, Counters — **04**

Basic latch and flip flop structures, design with JK flip-flop, registers, counters, reset synchronization, BCD counter, registers and counters in Verilog code, Using Verilog sequential statements for registers and counters

UNIT 5: Sequential Circuits — **09**

Basic design steps of sequential circuits, State machine concept, design of finite state machines, Moore design, Mealy design concepts designing of counters, registers using Finite state machine

UNIT 6: Applications related to Instrumentation **08**

Analog to digital converter interface, digital to analog interface, data acquisition, control algorithms, memory implementation, pulse width modulation generation, stepper motor speed control.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

Laboratory Work:

Laboratory work will consist of minimum 10 experiments based on the above syllabus.

References:

1. Stephen Brown, Zvonko Vranesic, Fundamentals of digital logic design with VHDL, TATA McGraw-Hill Publication.
2. Charles H Roth, Fundamental of logic design, Jaico Publishing House.
3. Volnei A Pedroni, Circuit Design with VHDL, MIT press.
4. Douglas L. Perry,VHDL: Programming by Example, Tata McGraw-Hill Publication.
5. Kevin Skahill, VHDL for Programmable Logic, Pearson Education.
6. J.Bhaskar, VHDL Primer, PHI Publication.