

Class: **ECE A**

Title of the Project: **FPGA-Based Digital Speedometer for Precise Vehicle Speed Measurement and Alert**

Batch Member Details:

Roll Number	Name
CB.EN.U4ECE23002	Aathithya Pranav
CB.EN.U4ECE23004	Adarsh B
CB.EN.U4ECE23010	Battula Uday Venu Gopal
CB.EN.U4ECE23016	Ezhilkirthik M

### **Abstract:**

The proposed FPGA-based digital speedometer ensures precise vehicle speed measurement. A Hall effect sensor detects wheel rotation via magnetic field changes, generating square wave pulses proportional to speed. A Xilinx FPGA board processes these pulses using Verilog HDL with structural, behavioral, and dataflow modeling for real-time computation. Vivado synthesizes the design, optimizing FPGA resources, while ModelSim validates functionality. Speed is shown on a seven-segment display, with an LED alerting drivers above 80 km/h. The system prioritizes low power, scalability, and reliable performance, enhancing road safety and showcasing proficiency in HDL modeling, simulation, and synthesis.

### **Objectives of the Work:**

- Develop an FPGA-based digital speedometer for accurate vehicle speed monitoring.
- Employ a Hall effect sensor to detect magnetic field changes for precise wheel speed measurement.
- Implement Verilog HDL for efficient design, simulation, and synthesis.
- Display real-time speed on a seven-segment display and trigger a red LED for speeds exceeding 80 km/h.
- Optimize power consumption and FPGA resource usage for efficient, scalable performance.
- Ensure adaptability to diverse vehicle types, enhancing road safety and regulatory compliance.

### **Tools Used:**

- Xilinx Vivado Design Suite
- Modelsim Quartus Prime 20.1
- FPGA Board

### **Deliverables :**

- Functional FPGA-Based Digital Speedometer Prototype: A fully operational system interfaced with a Hall effect sensor for real-time vehicle speed monitoring.
- Verilog HDL Codebase: Complete code implementing structural, behavioral, and dataflow modeling for speed detection, processing, and display logic.
- RTL Schematics: Diagrams generated via Vivado illustrating the system's architecture, including sensor interfacing and display modules.

- ModelSim Simulation Results: Waveforms validating system performance for speeds below and above 80 km/h, ensuring accurate functionality.
- Hardware Demonstration: Real-time speed display on a seven-segment display with LED alerts for speeds exceeding 80km/h.
- Comprehensive Documentation: Report detailing design methodology, simulation results, and performance comparison with existing speedometer systems.

Signature of Batch Members with date:

Aathithya Pranav -

Adarsh B -

Battula Uday Venu Gopal -

Ezhilkirthik M -