



B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING

B.Tech III Semester(2023-24)

MEASUREMENT PROJECTS USING ARDUINO

Course Objective:

Students will design, implement, and analyze various sensor-based systems to measure physical quantities such as temperature, humidity, light, sound, motion, and more.

Course Outcomes:

After completion of this course, the candidate will be able to :

1. Understand the principles behind various types of sensors and measurement techniques.
2. Design and implement Arduino-based measurement systems for a variety of environmental parameters.

UNIT I

Introduction to Arduino and Sensors

Introduction to the Arduino platform, Basic Arduino programming concepts, Setting up the Arduino IDE and hardware, Basic electronics components and tools

Understanding Sensors and Measurement Principles

Types of sensors: analog vs digital, Principles of measurement: accuracy, precision, sensitivity, Sensor calibration techniques, Overview of common sensors used with Arduino (temperature, humidity, light, sound, etc.)

UNIT II

Temperature and Humidity Measurement

Working with temperature sensors (e.g., LM35, DHT11, DHT22), Reading analog and digital signals, Writing code to read and display temperature values, Implementing a temperature logging system, Understanding the concept of humidity, Using DHT11/DHT22 for measuring humidity, Integrating temperature and humidity data in a single project, Displaying readings on an LCD or serial monitor

UNIT III

Light and Sound Measurement

Introduction to light sensors (e.g., LDR, TCS3200, BH1750), Understanding light intensity and its units (lux), Implementing a light-level meter with Arduino, Displaying results and triggering actions based on light intensity, Using microphones or sound sensors, Measuring sound levels (decibels) with Arduino, Displaying sound measurements in real-time, Analyzing the correlation between light and sound data (if applicable)

UNIT IV

Motion and Distance Measurement

Introduction to PIR (Passive Infrared) motion sensors, Detecting motion and triggering events, Using ultrasonic sensors (e.g., HC-SR04) for distance measurement, Implementing a motion-based alarm system, Understanding ultrasonic waves and how they work, Programming an

ultrasonic sensor with Arduino, Measuring and displaying the distance of objects, Integrating distance measurement with other sensor data

Texts/ References:

1. Simon Monk (2016). Programming Arduino: Getting Started with Sketches, 2nd Edition. McGraw-Hill Education.
2. Jörn Düson (2016), Arduino: A Technical Reference, 1st Edition: O'Reilly Media.



B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING

B.Tech IV Semester(2023-24) DTSP

1. Discrete time Fourier series
 - Introduction
 - Evaluation of DTFS coefficient
 - Magnitude and Phase spectrum of Discrete time periodic signals
 - Systems with periodic inputs

2. Discrete-Time Fourier Transform
 - Introduction
 - Fourier Transform Representation of Aperiodic Discrete time signals
 - Fourier transform of periodic signals
 - Energy and power spectral density
 - Some important Results

3. Z-Transforms
 - Introduction
 - Z-plane(poles and zeros)
 - Inverse Z-transform
 - Analysis and Characterization of LTI systems
 - Some applications of z-transform in signal processing

4. Filter concepts
 - Introduction
 - Ideal and Practical filters
 - Minimum phase, Maximum phase and Non-minimum phase systems
 - Averaging filters
 - Comb filters

5. Sampling and Quantization
 - Introduction
 - Sampling of Discrete time signals
 - Uniform Quantizers
 - Quantization error and Quantization noise
 - SQNR for sinusoidal signals
 - Non uniform Quantizers



**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)**

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Accredited by NBA & NAAC with 'A' Grade)



B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING

B.Tech V Semester(2023-24)

VLSI DIGITAL: THINK, DESIGN&SIMULATE

Course Objective:

VLSI Digital Design covers the complete digital design and explains the concepts of combinational, sequential and FSM designs and coding for synthesis and simulation. It comprehends the concepts of hardware description language and basic concepts like data types and operators. Then it explains the advanced concepts like assignments, procedural blocks, synthesis coding style and test bench coding, in detail with various examples. Doing the labs will make you a hands-on RTL programmer.

Course Outcomes:

Upon successful completion of the course, the student is able to

1. To understand the digital fundamentals and approach any kind of real time digital designs.
2. Appreciate the constructs and conventions of the Verilog HDL programming.
3. Develop digital circuits using gate level, data flow and behavioural modelling.
4. Perform functional verification of above designs using Test Benches.

UNIT-I: Introduction to VLSI Digital

Introduction to VLSI chip design procedure, The steps in VLSI Design Flow and the types of design. The theoretical design of basic gates and combinational circuits, introduction to multiplexers. Mux-based design of logical gates and combinational circuits.

UNIT-II: Introduction to Verilog HDL Programming

Introduction to Verilog HDL Programming, Data types, operators and conditional operators, The concepts of Data Flow modeling.

UNIT-III: Introduction to ModelSim software

Introduction to ModelSim software and hands-on experience in digital design using Verilog programming, design of basic gates and mux-based circuits using Verilog.

UNIT-IV: Design of Combinational circuits

Design of mux-based circuits, decoders and encoders the design of comparator and adder circuits using Verilog. concepts of structural modeling, The application of VLSI Design in the biomedical sector.



B.TECH – ELECTRONICS & COMMUNICATION ENGINEERING

B.Tech VI Semester(2023-24) FPGA Based System Design

Course Objective:

This course covers the advanced design and analysis of digital circuits with HDL. The primary goal is to provide in depth understanding of system design. The course enables students to apply their knowledge for the design of advanced digital hardware systems with help of FPGA tools.

1. Understand Digital system design using HDL.
2. Know FPGA architecture, interconnect and technologies.

Course Outcomes:

After completion of this course, the candidate will be able to :

1. Design and optimize complex combinational and sequential digital circuits
2. Model Combinational and sequential digital circuits by Verilog HDL
3. Design and model digital circuits with Verilog HDL at behavioural, structural, and RTL Levels
4. Develop test benches to simulate combinational and sequential circuits.

UNIT I: Verilog HDL Coding Style: Lexical Conventions - Ports and Modules – Operators - Gate Level Modeling - System Tasks & Compiler Directives - Test Bench - Data Flow Modeling - Behavioral level Modeling -Tasks & Functions.

UNIT II: Overview of FPGA Architectures and Technologies: FPGA Architectural options, coarse vs fine grained, vendor specific issues (emphasis on Xilinx FPGA), Antifuse, SRAM and EPROM based FPGAs, FPGA logic cells, interconnection network and I/O Pad.

UNIT III : Verilog Modelling of Combinational and Sequential Circuits: Behavioral, Data Flow and Structural Realization – Adders – Multipliers- Comparators - Flip Flops - Realization of Shift Register - Realization of a Counter- Synchronous and Asynchronous FIFO –Single port and Dual port RAM – Pseudo Random LFSR – Cyclic Redundancy Check.

UNIT IV Synchronous Sequential Circuit: State diagram-state table –state assignment-choice of flipflops – Timing diagram –One hot encoding Mealy and Moore state machines – Design of serial adder using Mealy and Moore state machines - State minimization – Sequence detection- Design examples: Sequence detector, Serial adder, Vending machine using One Hot Controller.

References:

1. M.J.S. Smith, “Application Specific Integrated Circuits”, Pearson, 2000.
2. Peter Ashenden, “Digital Design using VHDL”, Elsevier, 2007.
3. Peter Ashenden, “Digital Design using Verilog”, Elsevier, 2007.
4. W. Wolf, “FPGA based system design”, Pearson, 2004