

Embedded and Robotics

Total duration: 40 hours (Theory 18 Hours + Lab 17 Hours)

Chapter 01 – Basics of Digital System

What is Digital System?

Assigning States

Number Systems in digital electronics

Types of Digital Circuits

Clock: Building block of a sequential circuit

Logic Gates : Building block of a sequential circuit

Chapter 02 - Basic Electronic Components

Resistor

Capacitor

Breadborad

Intergrated Circuits (IC)

LED

7805 Voltage Regulator

Chapter 03 - Introduction to Embedded Systems

Introduction

Applications

Embedded System Types

Digital I/O ports

Examples

Chapter 04 - Introduction to Microcontrollers

What is Microcontroller?

Basic Architecture of Microcontroller

Digital Integrated Circuits (ICs)

Processor Type & Memory Structures

Compiler /IDE (Integrated Development Environment)

Programme

How to use Serial Programmer's Circuit (Hardware)

USB Programmer

Chapter 05 - Code Vision AVR (CV AVR)

Code vision AVR (CV AVR)

CHIP

PORT

Chapter 06 – Introduction to Atmega 16 Microcontroller

Atmega 16 Microcontroller Features

Pin Configuration

Digital Input Output port

Registers

Chapter 07 – I/O Ports

I/O Ports

DDRX (Data Direction Register)

PORTX (Data Read Register)

Chapter 08 – Communication

LCD

ADC

UART Communication

IC-MAX232

SPI Communication

Examples

Chapter 09 – Timers

CTC

Normal

Prescaler

Chapter 11 – Robotics

Introduction

Types of motor

Motor drivers

RF Transmitter

RF Receiver

Examples

VLSI, Verilog, VHDL and PCB Design

Total duration: 40 hours (Theory 20 Hours + Lab 20 Hours)

Module-1: Introduction to VLSI

Introduction

History of VLSI

VLSI Design Methodologies

System Specification and Architectural Design

Functional Design

Logic Design

Circuit Design

Fabrication

Packaging

Top-Down Design Methodology

System Level

Algorithmic(behavioral)level

RTL (Register transfer Level/Dataflow)

Gate Level

Transistor(also called Switch)Level

Technology Trends in VLSI

Challenges in VLSI technology

Module-2: CMOS Fabrication Process

The CMOS Technology

CMOS Inverter Design

Module-3: Digital Fundamentals

Boolean Algebra

Logic Gates

Models associated

Gate Level Simulation

Module-4: CMOS Circuit Characterization

Introduction

Characterization for Analog Design

Power Consumption

Static Dissipation

Dynamic Dissipation

Analog CMOS

Temperature Range

Resistance Estimation

Capacitance Estimation

Characteristics of MOS Capacitor

MOS Device Capacitance

Diffusion Capacitance

Routing Capacitance

Delay Calculation

Power Consumption

Dynamic Dissipation

Electronic Data Processing

Module-5: CMOS Logic Design

CMOS Logic gate Design

Combinational Logic

Representation

Combinational Logic Analysis

Basic Combinational Logic Circuits

AND-OR Logic

AND-OR Invert Logic

Exclusive-OR Logic

Exclusive-NOR Logic

Implementing Combinational Logic

Universal Gates

Combinational Logic using Universal Gates

NAND Logic

NOR Logic

Pulsed waveforms

Dynamic CMOS Logic

Static verses Dynamic Logic

Dynamic Logic

Sequential Logic

Shift Register-Serial Data to Parallel

Shift Register- Parallel Data to Serial

Data Latch

Binary up Counter

Binary up Counter with Reset(Modulo N)

Binary down Counter-counts Backwards

Module-6: Memories

Basics of Semiconductor Memories

Description

Memory Organization

One-Word-Wide

Wide

RAM,ROM,EEPROM AND FLASH Memories

Memory types

Module-7: Analog Design

Introduction

Analog Circuits

P-N Junction

Reverse Bias

NPN forward Biased Junction

NPN reverse Biased Junction

Alpha and beta relationship in a NPN transistor

Small signal Analysis of CMOS

MOSFET Amplifier Small-Signal Analysis

Single Stage Amplifier Design

Common Source Amplifier

Common Gate Amplifier

Common Drain Amplifier

Configurations Associated with Single-Stage BJT's

Common collector Amplifier Common Base

Amplifier

Operational Amplifier Design

Module-8: Schematic Simulation

Software Introduction

MOS Simulations

Models Associated

Gate Level Simulation

Switch Level Simulation

Simulating Large Circuits

Clarifying Circuit Simulators

Module-9: IC Layout

Introduction

Layout Rules

Passive Components Design

Process Technologies

Layout Versus Schematic(LVS)

LVS Check

Parasitic Exaction

Module-10: VHDL

What is VHDL?

Basic Terminology and Coding Style

Language Elements

Different Types of Modelling and Test bench

Module-11: PCB Design

PCB Layout

Introduction to softwrae

Difference between IC and PCB