

Semester II

MES 2C1 - DSP AND APPLICATIONS

MES 2C2 – MICROCONTROLLERS AND EMBEDDED SYSTEM

MES 2C3 – ROBOTICS AND MECHATRONICS

MES 2C4 - VLSI DESIGN AND ANALYSIS

MES 2P5 – MICROCONTROLLER AND SIGNAL PROCESSING LAB

MES 2C1 - DIGITAL SIGNAL PROCESSING AND APPLICATIONS

MODULE 1

Introduction to signals, Classification of signals, Discrete time systems, Digital signal Processor systems, Advantages and limitations of Digital signal Processing systems, Operation of signals

Book : 1

MODULE 2

Z transform definition, properties, inverse Z transform – Partial fraction, convolution method, Solution different equations using one sided Z transform.

Book: 1

MODULE 3

Image processing, Image representation, Stages of Image processing, Application of Image processing, Colour Image. RGB, YUV, Image Enhancement, DCT, DST, Image compression standard – JPEG, JPEG 2000, Image processing software – an overview.

Book : 3,4

MODULE 4

Video coding, motion estimation, Search for Motion Vectors, video coding standards, MPEG 1 standards, H.261 standards, H.264 standards

Book : 5

Reference

1. Ramesh Babu, Digital Signal Processing, Fourth edition, Scitech Publications (India), Chennai
2. Nagoorkani, Digital Signal Processing, MC Graw – Hill Edition
3. K.Sayood, Introduction to Data Compression, Harcourt India Pvt. Ltd. & Morgan Kautmann Publishers, 1996
4. S.Jayaraman, , Digital Image Processing, Tata MC Graw – Hill Edition
5. Z.Li and M.S Drew, “Fundamentals of Multimedia”. Pearson Education (Asia) Pte. Ltd
6. Mark Nelson, Data Compression book, B.P.B Publishers, Newdelhi, 1998.
7. Jan Vozer, Video compression for Multimedia, Newyork, 1995
8. Digital Signal Processing – Principles, algorithms and application – John C, Proakis - PHI.

MES 2C2 MICROCONTROLLERS AND EMBEDDED SYSTEM

MODULE 1

Introduction to Embedded systems – Microcontroller and Embedded Processor – Introduction to 8051 – Architecture, Hardware – Oscillator & clock program C – Data pointer – registers – Memory Organisations – Program Memory – Data Memory – Input/Output Ports – External Memory – Counter – Timer – Serial Data – Input Output Interrupts

Book : 1

MODULE 2

8051 Assembly language programming – Structure of assembly language – Assembling & running an 8051, Addressing Mode – Accessing memory using various addressing modes – Instruction set – Arithmetic Operation & programs – Logical Operation and Programs – Jump & Call instructions and Programs – I/O port programs – Single bit call instructions & Programs – Timer and counter & programs.

Book : 1

MODULE 3

UART – Serial Protocols: 12 C bus, TWI, SPI, CAV bus – Wireless protocols: IrDA – RS -232 – Input Capturing and Output Compare – Pulse Width Modulation – Wave Generation – Watch Dog Timers –JTAG

Book : 4,5

MODULE 4

AVR Microcontroller – AVR Family – AVR RISC Microcontroller Architecture (AT Mega -32) – ALU & Registers – Memory Access & Instruction Execution – Program & Data Addressing Modes – AVR Instruction Set – Serial Communication: UART, SPI, 12C, TWI – Timers –PWM – Watch Dog Timers – Interrupts

Book : 5,6

MODULE 5

Overview of PIC Microcontrollers – PIC Architecture and assembly language programming – Comparison of 8051, PIC & AVR Microcontrollers - Introduction to MPLAB simulator - AVR Simulator : AVR Studio – Programming the AVRs - Introduction to AVR C- Programming

Book : 2,5,6

Reference

1. Muhamed Ali Mazidi, Rolin D Mickinkay, The 8051 Microcontroller and Embedded systems, Second edition, Persons Education.Inc
2. Martin Bater, PIC Microcontroller, an Introduction to microelectronics, 3rd Edition
3. Frank Vahid and Tony Givargis, Wiley Embedded system design : A unified hardware/ software Introduction
4. Dhananjay V. Gadre, programming and Customizing the AVR Microcontroller, McGraw Hill
5. Muhamed Ali Mazidi, Sarmad Naimi, Sepehr Naimi, The AVR Microcontroller Embedded systems, Prentice Hall

MES 2C3 ROBOTICS AND MECHATRONICS

MODULE 1

Introduction: Definitions. Robot classification – Cartesian, Cylindrical, Spherical Work envelop, repeatability, Precision, Accuracy, types of joints, Prismatic, Revolute, Ball and Socket, Degree of Freedom, Joint Variables

Book : 1

MODULE 2

Sensors and actuators : Sensors, Position Sensors – Potentiometric, Velocity and Speed measurements, Proximity Sensors, Touch and slip sensors, Force and torque sensors, Actuators – Hydraulic and Pneumatic, DC motor and Stepper motors

Book : 2,3

MODULE 3

Robot Programming : tech In, tech Through, High level Languages – robot talk, Comparison of Teaching and Programming methods, Software and speed up. Industrial applications: Loading and Unloading, Die casting, Spot and Arc welding, Assembly applications, Selection of Robots

Book : 5,2,6

MODULE 4

Introduction to mechatronics – systems – control systems – history – structure of robotics and mechatronics projects-systems-measurement systems control systems-microprocessor-based controllers – response of systems- themechatronics approach

Book : 8

REFERENCE

1. Schilling, Robert J. "Fundamentals of Robotics" PHI, 1996
2. Klafter, richardd, "robotic engineering" PHI, 1996
3. Fu, Gonzalez, Lee "Robotics: Control, Sensing, vision and intelligence" Mcgraw hill
4. Moshe Shoham, " a text book of robotics – basic concept", koganpage, London - 1982
5. Groover, Weiss, Nagel and Ordey "Industrial robotics technology, programming & applications" Mcgraw hill
6. R.K.Mittal, I j nagrath " robotics and control", Mcgraw hill
7. Devdas shetty, Richard a.kolk, mechatronics system design-pws publishing company, 1997
8. Bardley, d.dawson, n.c. burd and a.j. loader. Mechatronics : electronics in products and processes, chapman and hall. London, 1991
9. Bolton, Mechatronics : Electronic Control systems in Mechanical and Electrical Engineering, 2nd Edition, Addison Wesley Longman Ltd. 1999.
10. Devdas shetty, Richard A.Kolk, Mechatronics System Design-PWS publishing company, 1997
11. Brian Morris, Automated Manufacturing Systems – Actuators, Controls, Sensors and Robotics, Me Graw Hill International Edition, 1995.

MES 2C4 VLSI DESIGN AND ANALYSIS

Module 1. Introduction to MOS Technology

Basic MOS Transistors--Enhancement Mode Transistor action—Depletion Mode Transistor Action—nMOS Fabrication--Silicon Wafer Preparation—Summary of an nMOS process— Basic CMOS Technology—The p-well Process—The n-well Process—The Twin-Tub Process—SOI Process—BiCMOS Technology-- Moor's Law

Module 2. Basic Electrical Properties of MOS and CMOS Circuits

nMOS and pMOS Enhancement Mode Transistors--V-I Characteristics of MOS Transistors—MOS Device Equations—Basic DC Equations--Threshold Voltage—Body Effect—The Pass Transistor— The nMOS Inverter—Pull-Up to Pull-Down Ratio—The CMOS Inverter—DC Characteristics— Switching Characteristics of CMOS Inverter

Module 3. MOS Circuit Design Process

Why Design Rules—MOS Layers—Stick Diagrams—nMOS Design Styles—CMOS Design Styles—Design Rules and Layout—Scaling of MOS Circuits—Scaling Models and Scaling Factors—Scaling Factors for Device Parameters—Limitations of Scaling

Module 4. Subsystem Design and Layout

Architectural Issues—Switch Logic:-Pass Transistors and Transmission Gates—Gate Logic:- The Inverter, Two-input nMOS and CMOS Nand & Nor Gates—Examples of Structured Design(Combinational Logic):-Parity Generator, Multiplexers, General Logic Function Block Programmable Logic Array—Clocked Sequential Circuits:-Two-phase clocking, Charge Storage, Dynamic Register Element, Dynamic Shift Register—Design of 4*4 Barrel Shifter

Module 5. Ultra-fast VLSI Technology and Introduction to VHDL

Ultra-fast Systems—Submicron CMOS Technology—GaAs VLSI Technology—Technology Development—Comparison between Si and GaAs Technology About VHDL—History— Capabilities—Hardware Abstraction—Basic Terminology—Entity Declaration—Architecture Body—VHDL vs. Verilog—XILINX

Text Books

1. Basic VLSI Design- -Douglas A.Pucknell-Third Edition-PHI Publication(**Module- 1,2,3,4,5**)
2. Principles of VLSI Design-Neil H.E.Weste&Kamran-Second Edition-Pearson Education(**Module-1,2**)
- 3.A VHDL Primer-J.Bhasker-Third Edition-Pearson Education(**Module-5**)

Reference Books

- 1.VLSI Design-Albert Raj&T.Latha-PHI Publication
- 2.Integrated Circuit-K.R.Botkar-Khanna Publishers
- 3.Modern VLSI Design-Wayne Woolf—Third Edition—PHI Publication
4. Introduction to VLSI Design – Carver Mead & Conway – BS Publications

MES 2P5 MICROCONTROLLER AND SIGNAL PROCESSING LAB

Part I : Microcontroller Lab

Part 1 : Basic AVR Programming using Assembly and C in AVR Studio

Addition, Subtraction, Multiplication, ascending Order, Descending Order, Code Conversion, Memory Swapping, etc.

Part 2 : Interfacing Experiments (Using AVR KIT)

1. LED Interfacing and Delay Programming
2. Speed Control of DC Motor
3. PC Key Board and LCD Interfacing
4. Wave form Generator Using PWM
5. DS 1307 RTC Interfacing
6. Temperature Display Using DS 18B20
7. Interfacing of GSM Module SIM 300

Part II : Signal Processing Lab

1. Familiarisation of Mat lab
2. Matrix addition
3. Generation of Simple signals
4. Plot pole zero plot
5. Plot impulse response of a system analytically and using Matlab
6. Generation of AM signals

Tool : MATLAB, OCTAVE

Reference: Ramesh Babu , Digital Signal Processing

Note : Do any 10 experiments from above list