

BHARATHIAR UNIVERSITY, COIMBATORE 641 046

M.PHIL / P.HD (FT / PT) - ELECTRONICS

PART I SYLLABUS

(WITH EFFECT FROM 2008-09 ONWARDS)

- PAPER III -
1. Sensors, Thin Films and their Applications
 2. PC, Microcontroller and their Applications
 3. Advanced Electronic Communication System
 4. Embedded Systems
 5. VLSI Design
 6. MEMS and their Applications
 7. Digital Signal Processing
 8. RTOS and Vx Works

M.PHIL / PH.D (FT / P T) - ELECTRONICS
PART I – SYLLABUS
(Effective from the academic year 2008-2009 & onwards)

PAPER III – 1. SENSORS, THIN FILMS AND THEIR APPLICATIONS

UNIT I :

Introduction to Thin Films - Thin Film Growth Process - Structural Consequences of the Growth Process - Solubility Relaxation - Thermal Evaporation: General Consideration - Evaporation Methods : Resistive Heating - Flash Evaporation - Arc Evaporation - Laser Evaporation - Exploding Wire Technique- RF Heating - Electro Bombardment Heating.

UNIT II:

Cathode Sputtering - The Process - Glow Discharge Sputtering - Sputtering Variants - RF Sputtering - Ion Beam Sputtering - Chemical Methods - Electro Deposition - Electrolytic Deposition - Electron Lens Deposition - Anodic Oxidation Deposition - Chemical Vapor Deposition - Vacuum Deposition - Apparatus - Substrate Deposition Technology - Substrate Materials - Substrate Cleaning.

UNIT III :

Introduction to Thin Film Components - Electrical Behavior of Metal Films – Dielectric Behavior of Insulator Film - Thin Film Resistors - Thin Film Capacitors - Thin Film diodes and Transistors.

introduction to Opto Electronic Thin Film Devices- Photo Conductive Detector- photo Emissive Detector - Photo Voltaic Devices - Solar Cells - General Analysis - Thin Film Solar Cells - information Storage Devices.

UNIT IV :

Introduction to Transducers - Selecting Transducers - Classification of - Transducers - Analog and Digital Transducers - Characteristic Features - Electrical Transducers : Resistive Transducers, Capacitive Transducers, Inductive Transducers - Thermo couple - Piezo Electric Transducers - PH Transducers - Sound Transducers - Nuclear Transducers - Digital Transducers - Optical Encoders.

UNIT V :

Types of Detectors - Primary and Secondary Detectors - Mechanical detectors : Mechanical Springs - Pressure Sensitive Detectors - Temperature Detectors - Thermister Hydro pneumatic detectors - Opto Electronic Sensors : Photo Voltaic cell, Photo Conductive cell, Photo Transistor , Semiconductor Photo Diode - Characteristics and its applications - Rotary Variable Differentiable Transformer (RVDT) - Linear Variable Differentiable Transformer (LVDT) - Hall Effect Principles and its Operation.

REFERENCE BOOKS :

1. Kasturi Lal Chopra and Inderjeet Kaur - *Thin Film Device Applications* – Unit III
2. K.L.Chopra - *Thin Film Phenomena* - McGraw Hill - New York. - Unit III .
3. Umesh Sinha - *Electrical, Electronic Measurements and Instruments* - Satya Pragasam, New Delhi - 6th Edition - Unit IV, Unit V
4. A.K.Sawhney - *A Course in Electrical, Electronic Measurements and Instrumentation* - Dhanpat Rai & Co. - Unit V

PAPER III – 2. PC, MICROCONTROLLER AND THEIR APPLICATIONS

UNIT I : INTEL MICROCONTROLLER

Intel 8051 Microcontroller: Introduction - Memory Organization - logical Separation of Program memory and Data memory - Program Memory - Data Memory - Instruction Set - CPU Timing- Interrupt Structure.

UNIT II: MICROCONTROLLER

PIC 16F84 Microcontroller: Introduction - Architecture - Pin Out Diagram - Memory Organization ALU – Status Registrar – Option Register - INTCON Registrar - Program Counter - Watch Dog Timer - Sleep Ports Interrupt - Timer - Instruction Set.

UNIT III : PC HARDWARE

Special Features of 286, 386, 486, Pentium Series Processor - Motherboard types and Classification - Memory Mapping - I/O Address - RAM Types - I/O Cards Basic Concept of" FDD and HDD – I\O Slot – Com Port - LPT Port – Interrupt– BIOS – TSR Programs.

UNIT IV: INTERFACING CONCEPT

Input Output Interfacing – Practical Interface Considerations – Logical level – Serial drive Capacities – Driving heavy loads – Driving AC loads – Serial Format – Asynchronous Synchronous Serial Data Communication – MODEM – Parallel\Serial Interface.

UNIT V: INTERFACING DEVICES

Interfacing Keyboard - Interfacing Alphanumeric Display - Interfacing ADC – Interfacing DAC - -interfacing LCD Module - Interfacing Stepper Motor - Temperature Monitoring - Design of 8255 card for PC - optical Motor Shaft Encoder

REFERANCE

BOOKS: UNIT I:

1. Intel Manual Embedded Microcontroller
2. Ayala K.J. - *The 8051 Microcontroller Architecture Programming & Applications* 3rd Edition - Pen ram International.

UNIT II:

1. PIC 16F84 Data Sheet
2. PIC Micro Mid Range MCU Family Reference Manual.

UNIT III:

1. Stephan J.Bigelow - *Trouble Shooting, Maintaining &Repairing PC's* - Tata McGraw Hill, 2nd Edition
2. B. Govindarajalu - *IBM PC and Clones Hardware Troubleshooting and Maintenance* --Tata McGraw Hill.
3. Peter Norton - *Inside IBM PC and PS/2* - 4the edition , Prentice Hall of India.

UNIT IV:

1. Ronald J. Tocci, Leots P.Laskowski – *Microprocessor and Microcomputer Hardware and Software* - Prentice Hall of India.

UNIT V :

1. Douhgles V.Hall - *-Microporcessor and Interfacing Programming and Hardware* - Tata McGraw Hill
2. Ramesh S.Goankar - *Microprocessor and interfacing. Programming and Application with 8085/80804* - 3rd Edition - Wiley- Eastern Limited

PAPER III - 3. ADVANCED ELECTRONIC COMMUNICATION SYSTEM

UNIT I : COMMUNICATION SYSTEM

Model of communication system Elements of Digital communication systems - Information source, Source encoder / decoder - communication channel modulator - demodulator - channel encoder / decoder - other functional blocks - Analysis of communication system - Design of Communication System.

UNIT II : DIGITAL- CARRIER MODULATION SCHEMES IN COMMUNICATION

Binary Phase Shift Keying - Differential Phase Shift Keying - Differentially encoded PSK - Quadrature Phase Shift Keying - Base Band Signal Receiver - Probability of Error - Optimum filter - White noise - Matched Filter - Coherent reception correlation - Phase shift keying - Frequency Shift Keying - Non coherent detection FSK - Differential PSK.

UNIT III: MULTIPLE ACCESS SATELLITE COMMUNICATION SYSTEM

System engineering consideration — Frequency Division Multiple Access (FDMA) — Time Division Multiple Access (TDMA) - Code Division Multiple Access (CDMA) - Estimation of Channel requirements — Comparison of Multiple Access Techniques - Transponder Space Graft Antennas.

UNIT IV: FIBRE OPTIC COMMUNICATION

Communication fibre model - transmitter for Fibre Optic Communication - LED Digital Transmitter - LED Analog Transmitter – Laser Transmitter - Analog and Digital Transmitter Design - Fibre Optic Receiver - High Performance Receiver - Design Procedure - Repeaters - Fibre based MODEM.

UNIT V : CELLULAR AND MOBILE COMMUNICATION

Practical cellular mobile systems - Mobile Radio Services - Communications Medium - Multi path fading - Delay spread coherence band width paths loss -- Frequency reuse and mobile concepts.

TEXT BOOKS :

1. Sam K. Shanmugam - *Digital and Analog communication System* - John Wiley Publications.
2. Martin S. Roderr - *Analog and Digital Communication System* - PHI, 1994
3. Subir Kumar Sarkar - *Optical Fibre And Fibre Optic Communication Systems* - S.Chand & Co, New Delhi.
4. Feher - *Wireless Digital Communications* - McGraw Hill Publications.

REFERENCE BOOKS :

1. B.P.Lathi - *Modern Communication Systems* - Tata McGraw Hill India.
2. Tri.T.Ha - *Digital Satellite Communication* - McGraw Hill, 1990.
3. D.C.Agarwall - *Satellite Communication* - Khanna Publications, 1995.
4. Stwest D.Personic - *Fibre Optic Technology & Applications*- Khanna Publications.
5. W.C.Y.Lee - *Mobile Cellular Communication Systems* - McGraw Hill Publications.

PAPER III : 4. EMBEDDED SYSTEMS

UNIT I : INTRODUCTION TO EMBEDDED SYSTEMS

Introduction — Features — Microprocessors — ALU — Von Neumann and Harvard Architecture -CISC and RISC - Instruction Pipelining. Micro controller: Characteristics and features, Controller overview and Architecture - PIC 16F84 - Philips 80C552 - Motorola 68HC05/08, Examples of Embedded Systems: Telegraph and Bar Code Scanner.

UNIT II: PIC MICROCONTROLLER

PIC Microcontrollers: CPU Architecture and Instruction Set- External Interrupts –Timers - I/O Port Expansion - Analog to Digital Converter - UART - I^A2 C Bus for peripheral Chip Accessories - Special Features.

UNIT III : MC6SHCXX - MOTOROLA MICROCONTROLLER

MC68HC05: Architecture - Registers - Addressing Modes - MC68HC08: Introduction Memory Map Registers - Addressing modes -MC HC II : Introduction - Expanded Modes -Registers - Addressing Modes - Erasing and Programming. - MC68HCII: EEPROM,. MC68HC12: Architecture - Expanded Mode Registers and Addressing Modes.

UNIT IV : SOFTWARE ARCHITECTURE AND RTOS

Software Architecture: Round Robin - Round Robin with interrupts - Function queue Scheduling Architecture - -RTOS : Architecture - Tasks and Task States - Tasks and Data -Semaphores and Shared Data - Message Queues - Mail Boxes and Pipes - Timer Functions -Events - -Memory Management - Interrupt Routines.

UNIT V : SOFTWARE DEVELOPMENT TOOLS AND DEBUGGING TECHNIQUES

Development Tools : Cross Compiler- Cross Assemblers - Linker Locator- PROM Programmers ROM Emulator- In Circuit Emulators- Debugging Techniques : Software Technique on Development - Host - Simulators - The Assert Macro- Laboratory Tools.

TEXT BOOKS / REFERENCES ;

1. Tim Wilmshurst - *An Introduction to Design of Small Scale Embedded Systems* -Palgrave Publications.
2. John.B.Peatman - *Design with PIC Microcontrollers* - Pearson Education.
3. Jonathan. W.Valvano — *Embedded Microcomputer Systems, Real time interfacing* - Brooks / Cole, 2000.
4. David E.Simon -*An Embedded Software Primer* - Pearson Education. 1999.

PAPER III – 5. VLSI DESIGN

UNIT I : HARDWARE DESCRIPTION LANGUAGE

Introduction to VHDL - Design units, Entity Declaration, Architecture body, Configuration, Declaration, Package Declaration, Package, Body - Basic Language Elements - modeling Styles - Behavioral Modeling - Dataflow Modeling - Structural modeling - Subprograms - Functions - Procedures – Packages.

UNIT II: DIGITAL SYSTEM DESIGN

Introduction to logic circuits - Combinational Logic Design procedure - Physical Design and VHDL, representation of Decoders, Encoders, Multiplexer, Demultiplexer, adder, Subtractor, Multipliers - Sequential logic design procedure - State Diagram and State table - Physical Design and VHDL, representation of flip-Flops, Shift Register, counters - Programmable Logic Technologies - ROM - programmable Logic Arrays - Programmable Array Logic Devices - Programmable logic Devices: Altera, Max7400, GPLD's, Xilinx XC 4000 Structure.

UNIT III: CMOS TECHNOLOGY

The CMOS IC Design process - Fabrication - The Well : Substrate , Laying out the N-well - Resistance calculation , The N-well / Substrate Diode - The RC Relay through an N-Well - The Metal layers, Bonding Pad, Design and Layout - Crosstalk and Ground Bounce.

UNIT IV : INTRODUCTION TO ASIC DESIGN

Full custom ASICs - Standard cell Based ASICs - Gate Array Based ASICs - channelless Gate Arrays - Structured Gate Arrays - programmable Logic Devices (PLD) - Field Programmable Gate Arrays (FPGA)

Design Flow - Schematic Entry - Hierarchical Design - The Cell Library - Names - Schematic Icons and Symbols - Nets - Schematic Entry For ASICs and PCBs - connections - Vectored Instances and Buses - Edit-in-place - Attributes - Net List Screener - Schematic - Entry tools - Back Annotations.

UNIT V : ASICs CONSTRUCTIONS, FLOOR PLANNING, PLACEMENTS, ROUTING

Physical Design - CAD Tools - System Partitioning Methods - Floor planning - Measurement of Delay in Floor planning - Floor planning Tools - Channel Definitions - I/O And Power planning - Clock Planning - Placements, Terms and Definitions - Measurement - Global Routing - Measurement of Interconnect Delay - Methods Routing Between Blocks - Time Driven Methods- Back annotations.

REFERENCE BOOKS:

UNIT I : J.Bhaskar_A *VHDL Premier* - **Third** Edition, Pearson Education Asia

UNIT II: M.Morris Mano & Charles R.Kime - *Logic circuit Design Layout and Design* - Pearson Education Asia

UNIT III: Jacob Baker, Harry w.Li. David E.Boyce - *CMOS- circuit Design, Layout and Simulation* - Prentice Hall of India

UNIT IV : M.J.S.Smith - *Application - specific Integrated Circuits* - Pearson Education Asia

UNIT V : M.J.S.Smith -- *Application - specific Integrated Circuits* - Pearson Education Asia

PAPER III – 6. MEMS AND THEIR APPLICATIONS

UNIT I : OVERVIEW OF MEMS & MICRO SYSTEMS

MEMS & Micro systems - Typical MEMS & Micro system Products - Evaluation of Micro Fabrication - Microsystems and Microelectronics - The Multi disciplinary nature of Micro System design and Manufacture - Micro Systems and Miniaturization - Applications of Micro systems in Automotive Industry — Applications of Microsystems in other Industries.

UNIT II : WORKING PRINCIPLES OF MICRO SYSTEMS

Micro sensors - -Micro actuation : Actuation using Thermal forces - Actuation Using Shape Memory Alloys - Actuation using Piezoelectric Crystals - Actuation using Electrostatic Forces - MEMS with Micro Actuators - Micro Accelerometers - Micro Fluidics.

UNIT III : MATERIALS FOR MEMS AND MICROSYSTEMS

Introduction - Substrates and Wafers - Active Substrate Materials - Silicon as a Substrate Material — Silicon Compounds — Silicon Piezoresistors - Gallium Arsenide - Quartz Piezoelectric Crystals - Polymers - Packaging Materials.

UNIT IV : MICROSYSTEMS FABRICATION PROCESSES

Introduction — Photolithography - Ion Implantation — Diffusion - Oxidation — Chemical Vapour Deposition — Physical Vapour Deposition — Sputtering — Deposition by Epitaxy — Etching - Summary of Micro fabrication.

OVERVIEW OF MICROMANUFACTURING:

Introduction - Bulk Manufacturing - Surface Manufacturing - The LIGA Process - Summary of Micro manufacturing.

UNIT V : MICROSYSTEMS DESIGN

Introduction - Design considerations - Process Design - Photolithography - Thin Film Fabrications - Geometry Shaping - Mechanical Design - Mechanical Design using Finite Element method - Design of a Silicon Die for Microprocessor Sensor- Design of Micro fluidic Network systems — Design case — Computer Aided Design.

MICROSYSTEM PACKAGING

Micro System Packaging (Types) - Essential Packaging Technologies (Types).

REFERENCE BOOKS:

Tai Ran Hsu - *MEMS & Micro systems Design and Manufacture* – Data McGraw Hill.

PAPER III – 7. DIGITAL SIGNAL PROCESSING

UNIT I : CLASSIFICATION OF SIGNALS AND SYSTEMS

classifications of Signals: Trigonometric Fourier Series - complex or Exponential form of Fourier Series — Parseval's identity for Fourier Series — Fourier Spectrum of a periodic function - Fourier Transform - Properties of a Fourier Transform - Fourier, transform of Some important Signals - Fourier Transform of Power and Energy Signals.

Applications of Laplace Transform to System Analysis – Definition – Region of Convergence – Laplace Transform of Some important Functions – Initial and Final Value Theorem – Convolution Integral – Table of Laplace Transform – Partial Fraction Expansion – Network Transform Function – S-Plane Poles and Zeroes – Laplace Transform of Periodic Function – Application of Laplace Transformation in analyzing Network.

UNIT II : Z - TRANSFORM

The Z – Transform - Properties – Rational Z Transform – Inclusion of the Z Transform – The one sided Z-Transform.

Linear Time Invariant Systems : Introduction – Properties of DSP Systems – Differential Equation and its Relationship with system Functions – Impulse Response and Frequency Response.

UNIT III: DISCRETE FOURIER TRANSFORM

Frequency Domain Sampling - Properties of DFT - Linear Filter Method Based of The DFT - Fast Fourier Transform Algorithm (FFT): Efficient Computation of DFT - structure and Design of FIR System - Structure and Design of IIR Systems Realization of Digital Linear System.

UNIT IV : DIGITAL SIGNAL PROCESSING

Sampling - Sampling Rate conversion - Signal Flow Graphs - Filter Structure – Polyphase Decomposition - Digital Filter Design - Application of Digital Signal processing -Application to Image processing - Introduction to wavelets.

UNIT V : DIGITAL SIGNAL PROCESSOR

Introduction to Programmable DSP - Architecture of TMS320C5X - TMS320C5X -Assembly Language Instructions - Instruction Pipelining in C5X - Application programming in C5X - Architecture and Application of TMS320C3X Processor - Recent Trends in DSP System Design.

REFERENCE BOOKS:

1. John G.Proakis , Dimitris. c.Manolios - *Digital signal Processing Principles, Algorithms and Applications* - Tata McGraw Hill Publication – 3rd Edition.
2. S.Salivahanan A Vallavaraj, G.Gnanapriya - *Digital signal Processing* - Tata McGraw Hill – 4th print.
3. B.Venkatramani, M.Bhaskar - *Digital signal Processors, Architecture, Programming and Applications* - Tata McGraw Hill Publications.

PAPER III – 8. RTOS AND Vx WORKS

UNIT I : REAL TIME OS - OVERVIEW

Introduction to O Operating System - Functions of Operating System - Types of Operating Systems – Memory Management - Static and Dynamic Partitions using MFT and MVT algorithms - Swapping , Paging, Segmentation , paged segmentations.

UNIT II : FILE MANAGEMENT SYSTEM OF OS

File systems - File structure - Disk Structure - File Allocation - Contiguous and non-contiguous allocation - Free Space Management – Disk Scheduling, Algorithms Process Management Process – Threads – Tasks – PCB – TCB – Process, Status, Short Term – Medium Term – Long Term – Schedulers – CPU Scheduling – Algorithms – Introductions to Intel Process Communication using shared memory – pipes – message queues – Semaphore – Signals interrupt – Sockets – introduction to RTOS – Real time Systems – Hard Real Time Systems – Soft Real Time Systems – Micro Kernel and Monolithic Kernel architecture – Features of RTOS, Overview of some RTOS like VxWorks, QNX, RT Linux, Windows CE, Symbian Psos.

TINIT III : Vx WORKS MEMORY MANAGEMENT

Introduction to VxWorks and Tornado, Features of IDE - Host Target Architecture -Project Management - Thread Scheduling Algorithm - Inter task Communication using Shaed Memory – Pipes - Message Queues - Semaphores - Mutual Exclusion.

UNIT IV : FILE FORMATS OF Vx WORKS.

Hardware and Software interrupt handling - RAM Disk - File systems - Using DOS file Systems on RAM disks – I/O systems - Memory Management - WDT - Message logging - Overview of networking on VxWorks - Managing host table - Managing IP.

UNIT V : SOCKET PROGRAMMING

Address - Sockets - Accessing remote files using FTP, TFTP, RSH and NSF - Configuring VxWorks as FTP server and FTP client - TFTP server and client - NFS server and NFS client - NFS Client: Rlogin - Using Crosswind for Debugging - Using Wind View as a Runtime Analyzer - Using Browser and Winds, Using Integrated Simulator - Building VxWorks image- - Creating a Boot image - Download and Booting VxWorks on the Target system.

REFERENCE BOOKS:

1. LIU - *Real Time Systems* - Pearson Education
2. Lante - *Real Time System Design and Analysis* - PHI
3. VxWorks — www.tornato.com.
