Solapur University, Solapur

M.Sc. Part-II Electronics

Sem.-III	Sem.-IV
1) Digital Signal Processing	1) Microwave devices, Antennas and Measurements
2) Advanced Digital Design with VHDL	2) Networking and data communications
3) Elective – I	3) Elective – III
4) Elective – II	4) Elective- IV
5) Practical- Compulsory Laboratory.	5) Project (Two Course Weightage)
6) Practical- Elective Laboratory.	

Elective papers:

(ESI) Embedded System and Instrumentation

Sem.– III

1) Advanced Microcontroller based System Design
2) Medical Instrumentation.
3) Agro Instrumentation.

Sem.-IV

1) ARM Microcontroller and system design.
2) Virtual Instrumentations.
3) Industrial Controllers and automation

(CE) Communication Electronics

Sem.-III

1) Digital Communication
2) Cellular and mobile communication
3) Optical Fiber Communication

Sem.-IV

1) ARM Microcontroller and system design.
2) Wireless Sensor Network
3) Satellite Communication

VLSI Design

Sem.-III

1) VLSI Devices and Design Technology
2) Computer Aids for VLSI Design

Sem.-IV

1) PRO ASIC System Design
2) Mixed Signal SOC Design

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : IX (Compulsory)

Paper- IX Digital Signal Processing

Unit 1 : DSP System Concepts : (8)

Basic concepts of discrete time system, important sequence, Linear & time invariant system (Causality, Stability, Convolution, impulse response, shifting), Linear constant coefficients difference, FIR,IIR System.

Unit 2 : Discrete Fourier Transform : (10)

F.T., Inverse F.T., properties, sampling of continuous signal, Nyquist rate & aliasing problem, anti aliasing , recovery of analog signal, DFT, properties, convolution, FFT,DFT relation between DFT& Z transform, Fast convolution technique.

Unit 3 : Z-transform : (12)

Z-transform, properties, inverse Z -T, Poles & Zeros, discrete time signal, properties, Difference equation, representation of discrete system difference equations.

Unit 4: Design of digital filter : (14)

Realization of digital linear system, filter categories, system function of a digital filter, combination of filter section, implantation of digital filter using system function, Bilinear transformation IIR filter, direct cascade & parallel realization, FIR filter, FIR filter design using window method .

Reference Books:

1. Introduction to DSP – Proakis, Pearsons Edn.
2. Discrete Time Signal Processing – Oppenhiem & Schafer
3. D.S.P - Pallan Technova Publications
4. D.S.P. – Luedmon.

Solapur University, Solapur

Class : M. Sc.-II
Semester :III
Subject : Electronics
Paper : X (Compulsory)

Paper X- Advanced Digital Systems Design with VHDL

Unit-1 : Introduction to Hardware description Language. 10

a) **Introduction:** Introduction to Computer-aided design tools for digital systems. Introduction to EDA tool, IO pin configuration, design implementation, synthesis, behavioral. Programming the devices.

b) **Hardware Description Languages :** Concept of Hardware description Languages. Introduction to VHDL, data objects, classes and data types, Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration.

Unit-2 : VHDL Statements : 12

a) Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. Structural Modelling, component declaration, structural layout and generics.

b) Examples on digital circuit design

Unit-3 : Combinational Circuit Design: 8

VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions etc.

Unit-4 : Sequential Circuit Design: 6

Models and Simulation of Sequential Circuits Shift Registers, Counters etc

Unit -5 : Prototyping and case studies: 10

a) Design with CPLDs and FPGAs : Programmable logic devices : PLAs, PALs, CPLDs and FPGA. Design implementation using CPLDs and FPGAs

b) Examples on digital circuit design

Reference Books:

1. A VHDL Synthesis Primer J. Bhaskar BS Publications Hyderabad.
2. Digital System Design using VHDL: Charles. H.Roth ; PWS (1998)
3. Fundamental of digital Logic Design with VHDL – Stephan Brown and Zvonk Vranesic – 2nd ed TMH New Delhi.
4. VHDL-Analysis & Modelling of Digital Systems: Navabi Z; McGraw Hill.
5. VHDL by Douglas L. Perry, Mc Graw Hill Publications

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : XIII (Compulsory)

Paper XIII- Microwave Devices, Antennas and Measurements

Unit 1 Introduction (08)

Microwave spectrum, Microwave applications, Electric and magnetic fields, Field in Conductors and Insulators, Maxwell's Equations and Boundary Conditions, Wave propagation in perfect insulators, Wave polarization, Wave propagation in Imperfect Insulators and Conductors, Reflections at Conducting and Dielectric Boundaries

Unit 2 Microwave Transmission Lines (08)

Transmission-Line Equations, Solutions of Transmission-Line Equations, Reflection Coefficient, Transmission Coefficient, Standing Wave, Standing-Wave Ratio, Line Impedance, Line Admittance, Smith Chart, Single-Stub Matching, Double-Stub Matching, Microwave Coaxial Connectors

Unit 3 Microwave Tubes and Transferred Electron Devices (TEDs) (06)

Klystrons, Multicavity Klystron Amplifiers, Reflex Klystrons, Helix Traveling-Wave Tubes**,** Magnetron Oscillators, Gunn-Effect diodes – GaAs diode, RWH theory, LSA Diodes, InP Diodes

Unit 4 Microwave Waveguides and Components (10)

Rectangular waveguides, Rectangular-Cavity Resonator, Q Factor of a Cavity Resonator, Waveguide Tees, Magic Tees, Rat-Race Circuits, Corners, bends, twists, Directional Couplers, Circulators and Isolators, Terminations and Attenuators,

Unit 5 Microwave Antennas (08)

Slot and Microstrip Antennas, Horn Antennas, Reflector Antennas

Unit 6 Microwave Measurements (08)

Detection of Microwave power- Crystal rectifiers, Crystals as Low-level Detectors, Crystals as Converters, Crystal Holders, Microwave Power Measurements-Bridge Circuits, Thermistor parameters, Operation of Thermistor in a Bridge Circuit, Thermistor Mounts, Measurement of VSWR-Standing Wave Detector, Techniques in Standing-wave Detector Measurements

Reference Books:

1. Peter A. Rizzi, *Microwave Engineering: Passive Circuits.* New Delhi : PHI, 2001
2. Samuel Y. Liao, *Microwave Devices and Circuits*. New Delhi : PHI, 2001
3. Rajeswari Chatterjee, *Antenna Theory and Practice*, New Delhi : New Age International (P) Ltd. Publishers, 2000
4. Edward L. Ginzton, *Microwave Measurements*, New York : McGraw-Hill Book Company, Inc., 1957
5. Carol G. Montgomery, Ed., *Techniques of Microwave Measurement*, Vol.1. New York : Dover Publications, Inc., 1966

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : XIV (Compulsory)

Paper XIV- Networking and Data Communication

1. Introduction to Networking: **7**

Data communication. Networks- Topology & Categories of Network. Network Models- OSI & TCP/IP- Layered architecture, Functions of layers & Addressing.

2. Physical Layer **10**

Data transmission- Analog & Digital. Multiplexing & Spreading, Transmission media- Guided & Unguided. Transmission Impairment, Switching- Circuit switched, Datagram & Virtual switched. Structure of switch. Modem Standards, Digital Subscriber Line (DSL)

3. Data Link Layer: **10**

Data link control- Framing, Flow & Error control, Protocols (Simplest, Stop-and-Wait ARQ, HDLC, PPP). Wired LANs- Standard Ethernet, Bridge Ethernet, Switched Ethernet, Full-Duplex Ethernet. Wireless LANs- IEEE 802.11, Bluetooth. Connecting Devices- Hubs, Repeater, Bridges, Routers, Gateway. SONET, ATM

4. Principles of Internetworking **13**

IP Address- IPv4, IPv6.

Internet Protocols- IPv4, IPv6, Dual Stacking, Tunneling, Header Translation.

Address Mapping, Error reporting, Multicasting, Delivery, Forwarding, Routing. Connection oriented & Connectionless Network, UDP,TCP, Congestion Control, Quality of Service.

Domain Name System- Name space, Domain Name space, Distribution of Name Space, DNS in the Internet.

Remote Logging, Electronic Mail (SMTP), File Transfer, WWW, HTTP

5. Security : **5**

Cryptography, Network Security- Security Services, Message Confidentiality, Message Authentication, Digital Signature, Entity Authentication.

Security in the Internet- IPSecurity (IPSec), Firewalls

Reference Books

1. Data Communication & Networking by B.A. Forouzen, TMH.
2. Computer Networks by A.S. Tanunbaum, PHI.
3. Data & Computer Communications by W. Stalling PHI.

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective-ESI-01

ESI-01: Advanced Microcontroller Based System Design

Unit 1 Overview of PIC & AVR Microcontrollers: 10

Architecture of PIC 16F877A microcontroller, overview of memory organization, IO Ports, ADC, DAC, serial communication and Timers etc

Architecture of AVR ATmega 8L microcontroller, overview memory organization, IO Ports, ADC, DAC, serial communication and Timers etc.

Unit 2 System Design with PIC microcontroller : 13

Hardware : Block diagram of microcontroller based system. Sensors, Signal conditioner, Data Acquisition System, Minimum system with PIC 16F877A, Power supply, clock circuit, reset circuit, In-system- programming circuit, ADC initialization, LCD interfacing.

Software: Minimum software modules, Development and programming tools, ADC Reading, Sampling and averaging of data, BCD conversion , ASCII code conversion, LCD initialization and display of the parameter values.

Unit 3 System Design for Measurement and Control : 10

Designing of PIC 16F877A based system design (HW and SW) for measurement and control of temperature, humidity and speed. Open loop and feedback control, Proportional and PID modes.

Unit 4 Isolation Techniques: 6

Need of isolation, opto-couplers and its interfacing, Relays and actuators, couplers, Magnetic and Electrostatic Shielding and Grounding

Unit 5: Signal Transmission: 6

V to I and I to V Conversion, V to F and F to V Conversion, 4 to 20mA current loop

Reference Books:

1. Barnet
2. PIC Microcontroller and Embedded Systems using Assembly ad C for PIC 18 M. A. Mazidi , R. D. Mckinlay and D. Causey Pearson Education, NewDelhi (2009)
3. Barnet
4. Transducer Interfacing Handbook , D.H. Sheingold Analog Devices Technical Handbook Norwood, USA.
5. Datasheet of PIC 16F877 Microchip corporation
6. datasheet of AVR ATmega 8L Atmel corporation

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – ESI-02

ESI-02: Medical Instrumentation

Unit 1. Bioelectric signal : (6)

The origin of Biopotentials, measurement of Biopotentials, Electrical activity of excited cells, The concept of electrical impedance, impedance bridge circuits, determination of biological events by electrical impedance method.

Unit 2. Sensors and Electrodes: (10)

The Nernst equation. Potentiometric sensors, amperometric sensors, chemical biosensors, Blood-Gas sensors, pH, pO_2, etc sensors, Noninvasive Blood gas sensors, Blood-Glucose sensors. Electrical conductivity of electrode Jellies and Creams skin contact measurement, Silver-silver Chloride electrode Electrodes for ECG, EEG & EMG.

Unit 3. Cardio-vascular system and Measurement: (5)

The heart and cardio-vascular system, concept of blood pressure, blood flow and heart sound, Measurement of BP.

Unit 4. Fundamentals of Biomedical recording system : (8)

Basic recording systems, General architecture of recording system, preamplifiers, differential amplifiers, instrumentation amplifiers, Isolation amplifier, Sources of the noise.

Unit 5. Modern recording system : (9)

- **Electrocardiograph (ECG**): Basic principle, block diagram of ECG, ECG Leads, microcontroller based ECG
- **Electroencephalograph (EEG):** Basic principle, block diagram of EEG, Computerized analysis of EEG
- **Electromyograph (EMG):** Basic principle, block diagram of EMG

Unit 6. Modern Imaging systems (8)

Basis of Diagnostics radiology, features of Diagnostics x-ray, General architecture of x-ray Machine, voltage and frequency requirements, Basic principles and general architecture of modern imaging systems MRI, and Ultrasound.

Reference Books:

1. Handbook of Biomedical Instrumentation, -R.S. Khandpur, 2nd edition, TMH, New Delhi Reprint 2007
2. Introduction to Biomedical Equipment Technology- J.J.Carr & J.M. Brown, PHI 1993.
3. Medial Instrumentations: Application and design – J.G. Webster, 3rd Edition, John Wiley & Sons, 2004.
4. Biomedical Instrumentation and Measurements –Cromwell, Weibell & Pfeiffer, PHI 2nd Ed.

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – ESI-03

ESI-03: Agro Instrumentation

Unit 1. Fundamentals of Agricultural Instrumentation. (10)

Necessity of instrumentation for high tech Agriculture.
Definition of parameters involved in Agriculture: Environmental & Soil parameters Humidity, pH, light intensity, pest concentration, physiological effects, soil parameters, Soil moisture, conductivity..

Unit 2. Sensors for Agricultural Parameters (14)

Sensors for measurement of temperature, Humidity, pH, conductivity, soil, moisture, salinity, etc. CO_2, O_2 etc gas sensors. Study of SY-HS-220, IR based sensors, Figaro TGS 813.

Unit 4. Instrumentations to Control the Polyhouse Environment (12)

Development of Electronics system for Measurement and control of Humidity and Temperature of polyhouse. PC Based Instrumentation. Application of Wired Network for Greenhouse. Introduction to Wireless sensor and its application to polyhouse monitoring system.

Unit 5. Instrumentations to measure and control soil parameters (8)

Instrumentation for measurement of pH, Conductivity, salinity and nutrients of the Soil.

Reference books;

1. Instrumentation hand book : Process & Control- B. G. Liptak
2. Process control & Instrumentation technology C. D. Johnson
3. Instrumental methods of chemical Analysis –williard mertte & dean
4. Industrial Instrumentation & control- S. K. singh 2edn. TMH

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective-ESI-04

ESI-04: ARM Microcontroller and System Design

Unit I Fundamentals of ARM Microcontrollers: 10

Introduction to ARM microcontroller, ARM Core Philosophy, Bus Architecture, AMBA Bus, AHB, APB, Registers, Current program status register(CPSR), Saved program status register(SPSR), Stack pointer, Link register, Modes of processor , States of the processor, ISA, Pipelining register , Current program status register(CPSR), Saved program status register(SPSR), TDMI, Interrupts and Exceptions, Interrupt latencies. Nomenclature of ARM families.

Unit II Instruction Set of ARM Microcontrollers: 10

ARM instruction set architectures, Barrel shifter, Data Transfer Instructions, Arithmetic and Logical, multiply instruction, SWI, Thumb Instruction set, Jazzele Instructions, comparison of ARM, Thumb and Jazzele ISA.

Unit: III Architecture of LPC 2378 : 4

Block diagram of LPC2378, Pin Description, On-Chip memory, memory map, GPIO, clock and timing , power control modes,

Unit: IV On chip peripherals of LPC 2378 : 10

On chip peripherals , ADC, DAC, DMA controller, UART, Timer /Counter, Real time clock ,Watchdog timer, CAN and Ethernet, I2C mode, USB host/slave

Unit: V ARM LPC 2378 based embedded system development : 10

ARM based embedded system design, clock circuit, reset circuit, power supply, IDE SCARM, Examples in embedded C programming. Interfacing of LED, Relay, Optocouplers etc. Development of Embedded system for temperature, humidity, pH , displacement etc. measurements.

Reference Books:

1. ARM System Developers Guide- A. N. Sloss, D. Symes & C. Wright –Elsevier (2004)
2. ARM System on Chip Architecture- Steve, Furber Pearson Education
3. Product data sheet of LPC 2378.

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – ESI-05

ESI-05: Virtual Instrumentation

Unit 1. Fundamentals of Virtual Instrumentation. (10)

Historical perspectives, Basic concept of Virtual Instrumentation, Block diagram and architecture of Virtual Instrumentation, data- flow techniques, graphical programming in data flow, Comparison between Virtual instrumentation and Traditional Instrumentation, Advantages of Virtual Instrumentation. Development of VI using GUI.

Unit2. PC communication Ports (10)

Introduction to Centronics parallel ports, Serial COM1/COM2, RS232 standards, Current loop,RS232/RS485,GPIB, Bus Interface: USB, PCI. Networking for office & Industrial applications VISA and IVI .

Unit3. Add on Peripheral cards: (8)

Selection & applications , ADC, DAC, DIO, DMM, Waveform Generator.

Unit 4. LABVIEW based Virtual Instrumentation . (10)

Introduction to LABVIEW the virtual Instrumentation software, Virtual Instrumentation programming techniques, "G" Programming Language, VI and sub-VI loops, charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file IO

Unit 5. Case studies: (4)

Designing of Virtual Instrumentation using LABVIEW for

1. Data Acquisition Systems for Measurement of physical parameters
2. Temperature controlling
3. Biomedical Instrumentation.

Reference Books:

1) LABVIEW Graphical programming Gary Johnson, 2nd Edition, MGH, 1997.
2) LABVIEW for everyone –Lisa K wells and Jeffery Travis PHI 1997.
3) Basic concept of LABVIEW 4-Skoff-PHI 1998.
4) "PC Interfacing for Data Acquisition and process control-S. Gupta & Joseph John A-2nd Edn.1994

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – ESI-06

ESI-06: Industrial Controllers and Automation

Unit 1. Digital Control systems: (12)

Introduction to digital control systems, Architecture, Analysis and synthesis, Time Domain and frequency domain.

Discrete control Modeling : Definition and determination of Z Transform, Z- Transform theorems, Inverse Z-transforms. Transformation of problem into w ' domain

Continuous Time control systems: Simple second order system, co-relation with frequency and time domain, Poles and zeros,

Unit 2. Fundamentals of Programmable Logic Controllers : (8)

Architecture of programmable controllers, Standard PLC's, IO modules and their characteristics, Memory, processor, Serial Communication, Power supply, PLC Devices, Switches, Relays, Coils, standard Symbols.

Unit 3. Programming of Programmable Logic Controllers : . (10)

Concept of programming of the PLC, PLC's instructions, PLC programming, ladder diagram, programming for ON-OFF inputs and ON-OFF Outputs, Boolean algebra and PLC programming. Design of Ladder diagrams for process control description.

Unit 4. Components and functions of Programmable Logic Controllers : (8)

Components of the PLC, Registers, Timers, Counters, Arithmetic functions, Master Control relay, Sequencer functions.

Unit 5. Industrial Automation (4)

Concept of industrial automation, Centralized and Distributed control systems Centralized Control system(CCS): Basic Architecture, advantages & limitations Distributed Control System(DCS): Introduction, Basic architecture of DCS, display unit, DCS communication.

Unit 6. The SCADA: (5)

Introduction to SCADA, SCADA Architecture, types of SCADA system Monolithic SCADA Systems Distributed SCADA Systems Networked SCADA Systems, the RTU, SCADA Protocols (Modbus / Profibus),

Books:

1. Digital Control System – C. H. Houpis and G. B. Lamont TMH
2. Programmable logic controllers: Principles & applications- Webb & Reis (PHI)
3. Introduction to Programmable logic controllers- Garry Dunning, Thomson learning
4. Industrial Instrumentation & control 2nd ed. –S K Singh(TMH)

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – CE-01

CE-01: Digital Communication

Unit 1: Fundamentals of the Signal and Analysis (10)

The signal, Types of the signal, Elements of the Digital Communication Systems, Digitization of the signals, sampling and quantization, Shannon's Channel Capacity Theorem. Power & Energy of the sampling signals

Unit 2: Digital Communication Techniques- (12)

Digital Communication Design Requirements, PWM, PPM, PCM, delta modulation, adaptive delta modulation, ASK, FSK, PSK, QAM, Modems,

Unit 3: Baseband Transmission- (8)

Analog base band Transmission, Digital base band transmission. The receivers

Unit 4: Coding Techniques- (10)

Introduction to the Coding, Alpha - Numeric coding, Parity Check Coding, Hamming Code, Concept of Systematic Code, RZ, NRZ, Manchester code, AMI, Error Detection and Error Correction.

Unit 5: Advanced Digital Communication Systems- (8)

Satellite Communication, Telephone, Cellular Phones, Dual Tone Multi Frequency (DTMF) dialing, Integrated Services Digital Network (ISDN).

Recommended Books:

1. Analog and digital communication system - M. S. Roden 5th Edition, Shroff publishers
2. Modern digital and analog communication systems – B. P. Lathi. 3rd Edn. Oxford.
3. Digital Communication- J.S. Katre
4. Digital communication fundamentals and applications – scalar, Pabitra Kumar Ray. 2nd Edn.
5. Communication techniques for digital and analog signals – M. Kanefsky, John Wiley and Son.
6. Digital communication – S. K. Khedkar. Technova Publishing House First Edition.

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – CE-02

CE-02: Cellular and Mobile Communication

1. Cellular Radio System Design & Specifications of Analog System (8)

A basic cellular system, Performance criteria, Uniqueness of Mobile radio environment, Operation of cellular systems

Definitions of terms and functions of analog system, Specification of Mobile station & Land station, Different specification of the analog cellular system.

2. Cell Coverage & Antennas (12)

Cell coverage- Introduction, Point-to-point model, Foliage loss, Propagation- over flat open area, Near distance, Long distance, Mobile-to-mobile, Cell-site antenna height & signal coverage cells.

Antennas- Cell site antennas, Unique situation of cell-site antennas, Mobile antennas, Design of an Omnidirectional & Directional antenna system

Interference: A) Cochannel interference- Cochannel interference area, Real-time cochannel interference, reduction of cochannel interference B) Nonchannel interference- Adjacent channel interference, Near-end-far-end interference & avoidance of interference, Effect of cell site components

3. Frequency Management & Channel Assignment (10)

Frequency management- Frequency spectrum utilization, Set-up channels, Definition of channel assignment, Fixed channel assignment, Nonfixed channel assignment, Operating with additional spectrum, Traffic and channel assignment.

Handoffs & Dropped calls- Value of implementing handoffs, Initiating handoffs, Delaying a handoffs, Forced handoffs, Queuing of handoffs, Power difference handoffs, Mobile assisted handoffs & soft handoffs, Intersystem handoffs, Introduction to dropped call rate, Formula of dropped call rate.

4. Operational Techniques & Switching (8)

Adjusting the parameters of the system, Hole filler, Leaky feeder, Cell splitting, Microcells. Concept of switching, Analog & Digital switching equipment, Features for handling traffic, MTSO interconnection

5. Digital Cellular Communication (8)

Introduction to digital technology, ARQ techniques, Digital mobile telephony, GSM, Intelligent cell concept, Applications of intelligent micro-cell system

Reference Books:

1. Mobile Cellular Telecommunications Analog Digital System by W.C.Y. Lee, MGH 2nd Ed.
2. Mobile Communication Engineering Theroy & Applications by W.C.Y. Lee, MGH 2nd Ed.

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – CE-03

CE-03: Optical Fiber Communication

1. Fundamentals of Optical Fiber Communications (15)

Optical spectral Bands, fundamentals of data communication concepts, analog and digital signal, Major elements of optical fiber communication systems, Nature of light polarization of light, propagation mechanism. Construction and working principle of optical fiber**,** Types of optical fiber, Numerical aperture, Pulse spread due to material dispersion, loss mechanism, modes in steps and grade index fiber.

2. Optical Transmitters & Receivers (6)

Fundamentals of optical transmitter & receiver, Digital signal transmission, Error sources, Receiver configuration, Receiver performances, Receiver sensitivity, Analog receivers

3. Fundamentals of WDM (8)

Operational principles of WDM, Classification of WDM, WDM standards, Dense WDM, Applications of WDM based systems

4. Optical Amplifiers (9) Basics of optical amplifiers, Types of optical amplifiers, Semiconductors optical amplifiers, High impedance FET amplifiers, Preamplifiers Powers amplifiers, Architecture of EDFA , Power conversion, Efficiency & Gain

5. Optical Fiber Communication Measurements (6)

Performance measurement parameters, Measurement standards, Optical power measurements, Fiber characterization, Types of dispersion, Dispersion measurements, Attenuation measurements, Eye diagram tests, Optical Spectrum Analyzer, Optical Reflectometer

Reference Books:

1. Optical Fiber Communication by A. Selvarajan S Kar and T Srinivas, TMH, 2003.
2. Optical Fiber Communication by Gerd Keiser, Third Edition MGH , 2000.
3. Optical Fiber Communication by Gerd Keiser, Fourth Edition TMH , 2009.

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective-ESI-04

ESI-04: ARM Microcontroller and System Design

Unit I Fundamentals of ARM Microcontrollers: 10

Introduction to ARM microcontroller, ARM Core Philosophy, Bus Architecture, AMBA Bus, AHB, APB, Registers, Current program status register(CPSR), Saved program status register(SPSR), Stack pointer, Link register, Modes of processor , States of the processor, ISA, Pipelining register , Current program status register(CPSR), Saved program status register(SPSR), TDMI, Interrupts and Exceptions, Interrupt latencies. Nomenclature of ARM families.

Unit II Instruction Set of ARM Microcontrollers: 10

ARM instruction set architectures, Barrel shifter, Data Transfer Instructions, Arithmetic and Logical, multiply instruction, SWI, Thumb Instruction set, Jazzele Instructions, comparison of ARM, Thumb and Jazzele ISA.

Unit: III Architecture of LPC 2378 : 4

Block diagram of LPC2378, Pin Description, On-Chip memory, memory map, GPIO, clock and timing , power control modes,

Unit: IV On chip peripherals of LPC 2378 : 10

On chip peripherals , ADC, DAC, DMA controller, UART, Timer /Counter, Real time clock ,Watchdog timer, CAN and Ethernet, I2C mode, USB host/slave

Unit: V ARM LPC 2378 based embedded system development : 10

ARM based embedded system design, clock circuit, reset circuit, power supply, IDE SCARM, Examples in embedded C programming. Interfacing of LED, Relay, Optocouplers etc. Development of Embedded system for temperature, humidity, pH , displacement etc. measurements.

Reference Books:

1. ARM System Developers Guide- A. N. Sloss, D. Symes & C. Wright –Elsevier (2004)
2. ARM System on Chip Architecture- Steve, Furber Pearson Education
3. Product data sheet of LPC 2378.

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – CE-05

CE-05: WIRELESS SENSOR NETWORKS

Unit 1. Introduction to Sensor Networks (8)
Introduction to Sensor Networks, Sensor Network Management, A Taxonomy of Routing Techniques in Wireless Networks, Basics of wireless sensor networks (WSN), and various topics related to WSN, services, applications, sensor programming.

Unit 2. Sensor Network Architecture (8)
Sensor Network Architecture, Tiered Architectures in Sensor Networks, Power-Efficient topologies for Wireless Sensor Networks, Architecture and Modeling of Dynamic Wireless Sensor Networks

Unit 3. PROTOCOLS (10)
Overview of Communication Protocols for Sensor Networks, wireless networking protocols (IEEE 802.11, 802.15, 802.16, GPRS, CDMA, etc.), Communication Architecture and Programming Abstractions for Real-Time Embedded Sensor Networks.

Unit 4. Zigbee The RF models : (8)
Introduction to the RF Modules, ISM band, Specifications of WSN devices, Architecture of the Zigbee module, On-chip resources of the Zigbee Pro, Programming the Zigbee, Designing of WSN with Zigbee modules.

Unit 5.Application Dependent Shortest Path Routing (SPR) in Ad-Hoc Sensor Networks:
Introduction, Fundamental SPR, SPR for Mobile Wireless Networks, SPR for Ad-Hoc Sensor Networks **(8)**

Unit 6. Key management and WSN security issues (8)
Key management and WSN security issues - Energy management in Ad Hoc wireless networks: Need for energy management, classification of energy management, battery management schemes, transmission power management schemes, system power management schemes, Location discovery, privacy, integrity, authentication, secure localization, secure aggregation, attacks and defense mechanisms.

REFERENCE BOOKS:

1. Ad Hoc Wireless Networks: Architecture and Protocols, C. Siva Ram Murthy, B.S. Manoj, Pearson education
2. Handbook of Sensor Networks: Compact Wireless and Wired Sensing Systems, CRC PRESS Publication, Edited by Mohammad Ilyas and Imad Maugoub.
3. Wireless Sensor Networks Signal Processing and Communication Perspectives, WILEY Publications by Ananthram Swami, Qing Zhao, Yao-Win Hong, Lang Tong

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – EC-06

EC-06 :Satellite Communication

Unit 1 : Satellite Systems **9**

History of satellite communications, Orbital mechanics, Look angle determination, Orbital perturbations, Satellite subsystems – AOCS, TTC and M, power systems, communications subsystems, satellite antennas, Satellite frequency bands, satellite Multiple access formats

Unit 2 : Modulation, Encoding and Decoding **8**

Analog modulation, Digital Encoding, Spectral shaping, Digital decoding, Error correction Encoding, Block Waveform Encoding, Digital Throughput.

The Satellite Channel

Electromagnetic field propagation, Antennas, Atmospheric losses, receiver Noise, Carrier to Noise ratios, satellite link analysis, Frequency Reuse by dual polarization, Spot beams in satellite downlinks.

Unit 3 : The Satellite Transponder 9

The transponder model, the satellite front end, RF filtering of digital carriers, Satellite signal processing, Transponder Limiting, Non linear satellite amplifiers, Effect of non linear amplification on digital carriers.

Unit 4 : Satellite Ranging System **6**

Ranging system, Component Range Codes, Tone Ranging Systems

Unit 4 : Multiple access formats 12

FDMA - FDMA system, Nonlinear amplification with multiple FDMA Carriers, FDMA, FDMA Nonlinear analysis, FDMA characterization, AM/PM conversion with FDMA, Satellite switched FDMA.

TDMA -The TDMA system, preamble design, Satellite Effects on TDMA performance, Network synchronization, SS TDMA.

CDMA - Direct Sequence CDMA system, Performance of DS CDMA, satellite systems, Frequency Hopped CDMA, Antijam advantages of spectral spreading, Code Acquisition and Tracking

Reference Books

1. Robert M. Gagliardi, Satellite Communications, New Delhi : CBS Publishers and Distributors, 2000
2. Timothy Pratt, Charles W. Bostian, Jeremy E. Allnutt, Satellite Communications, Singapore : John Wiley and Sons Inc. 2003
3. Dennis Roddy, Satellite Communications. New York : McGraw-Hill, 2001

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Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – VLSI-01

VLSI-01: VLSI Design Technology and Devices

Unit:1. MOS Transistor Theory: 7

pMOS, nMOS enhancement transistors, Id-VDS relationship, Threshold voltage equation, MOS device design equations, Second-order effects, DC characteristics, Static load MOS inverters

Unit:2 Design of the CMOS 10

Basic CMOS technology, BiCMOS technology, CMOS process enhancements, Interconnect and circuit elements, Layout design rules, Latch up, pull up to pull down ratio, Switching characteristics, Transistor sizing, Power dissipation, Charge sharing, Design margining, Scaling of device dimensions

Unit:3 CMOS Circuit and Logic Design: 10

CMOS Logic Gate Design, Design of simple logic gates, Clocking strategies, I/O Structures, Transmission gate, layout designs for CMOS NAND, NOR gates, 2 input Multiplexer, Cell based design methodology , Standard cell, compiled cell, microcells, megacells, semi-custom design flow.

Unit:4 VLSI Devices : 10

Programmable Logic Devices, PLA, PAL, CPLD, and FPGA, Architecture of Programmable Logic Devices – PLA/PAL, SPLD, CPLD, FPGA and SOC, Concepts of Macro Cells, CLBs, PSMs, Interconnect lines, IOBs, ISP, IP Cores,General block diagrams of Altera FLEX, Xilinx Spartan III, Actel ProASIC 3.

Unit:5 Development Tools 7

Design of Inverter, AND gate, OR gate,……., by CMOS level design tools

Reference Books:

1. Basic VLSI Design Principles and Applications- D. Pucknell and K. Eshraghian, 3rd Edition, PHI
2. Principles of CMOS VLSI Design: A Systems Perspective - Neil H. E. Weste, Kamran Eshraghian Pearson Education , 8th Ed. 2002.
3. Digital Integrated Circuits A design perspective II Edn - Jan M. Rabaey, A Chandrakasan and B. Nikolic Pearson , 2007.
4. Fundamental of Digital Logic Design with VHDL, - S. Brown & Z. Vranesic II Ed. TMH, 2009.

Solapur University, Solapur

Class : M. Sc.-II
Semester : III
Subject : Electronics
Paper : Elective – VLSI-02

VLSI-02: Computer Aids for VLSI Design

Unit 1. Fundamentals of Computer aided design: 15

The Characteristics of Digital Electronic Design and Representation issues, Design abstraction , Hierarchy Views, Connectivity, Spatial Dimensionality, Design Environments, System Level, Algorithm Level, Component Level, Layout Level, Design flow, Design Flow: Schematic Entry, HDL, Synthesis, Verification, Implementation, Design Hand-off, Y- diagram, Simulation, Synthesis, Physical level, RTL level, Floor Planning, Placement and Routing,

Unit 2: Representation : 06

General Issues of Representation, Hierarchy Representation, View Representation, Connectivity Representation, Geometry Representation

Unit 3: Synthesis and Static Analysis Tools: 15

Introduction, Cell Contents Generation and Manipulation, Generators of ayout Out, the Cells, Cells and Their Environment, Silicon Compilers, Post layout Generators Static Analysis Tools: Node Extraction, Geometrical Design-Rule Checkers, Electrical-Rule Checkers, Verification, Dynamic Analysis Tools, Circuit-Level Simulators, Logic-Level Simulators, Functional- and Behavioral-Level, Simulation Issues, Event-Driven Simulation, Hardware and Simulation.

Unit 4:The Output of Design Aids and hardware issues: : 10

Circuit Boards, Integrated Circuits, Implementation Issues, Programmability, Imperative Programming, Declarative Programming, Graphics Display Graphics, Hardcopy Graphics, Input Devices, Human Engineering, Task and User Modeling, Information Display, Tools For Designing a Chip, Formats: Gerber Format, Caltech Intermediate Format, GDS II Format, Electronic Design Interchange Format, EBES Format

Reference Books:

1. Algorithms for VLSI Design Automation by Sabih H. Gerez, Wiley Publications
2. Computer Aids for VLSI Design, Second Edition, Steven M. Rubin
3. Principles of CMOS VLSI Design: A Systems Perspective - Neil H. E. Weste, Kamran Eshraghian Pearson Education , 8th Ed. 2002.
4. Modern VLSI Design Wayne Wolf, PHI, New Delhi 2009

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – VLSI-03 -Revised

VLSI-03: PRO ASIC System Design

Unit 1.Introduction to ASICs (12)

Types of ASIC, ASIC design flow, Logic Cells- Combinational, Sequential, Datapaths, I/O cells, Cell Compilers. Issues of ASIC Library Design- Transistor as a resistor, Parasitic and junction capacitance, Library Architecture.

Unit 2. Programmable ASICs Logic Cells (12)

The antifuse, Static RAM, EPROM and EEPROM Technologies.

a) ACTEL :- Logic modules 1, 2, 3. Shannons Expansion theorem, Mulplexure logic as function generator, timing module, speed grading.
b) Xilinx : Architecture of XC3000 & 4000 CLBs

Unit 3. Programmable ASICs IO Cells (10)

a) ACTEL :- IO Characteristics, single endded & differential IO, IO register specifications 1
b) Xilinx : Programmable IO block.

Unit 4. Programmable ASICs Interconnect (08)

a) ACTEL :- Routing resources, Elmores constant, RC delay in antifuse.
b) Xilinx : Architecture of Xilinx interconnect.

Unit 5. Programmable ASICs System design (08)

Design of subsystem for

a) Counter/Timer
b) Square wave generator
c) Analog to Digital Convertor
d) Core of 8051 microcontroller

REFERENCE Books

1. Application Specific Integrated Circuits, Michael Smith, Person Education Asia.
2. Actel ProASIC3 Datasheet
3. Digital system design and Principles Wakerly,PHI

Solapur University, Solapur

Class : M. Sc.-II
Semester : IV
Subject : Electronics
Paper : Elective – VLSI-04 -Revised

VLSI-04: Mixed Signal SoC Design

Unit-1 Mixed-signal embedded SoC architectures. (12)

Basic of CMOS and BiCMOS transistor, Op-Amp design.

Concept of mixed signal design. Design Issues of Mixed Signal VLSI, Mixed-signal SoC architectures. Microcontroller M8C core. Instruction set. RAM and flash memory system. I/Os. System buses. Interrupt subsystem. Interrupt Service Routine (ISR). Boot program, Static & Dynamic reconfiguration.

Unit-2 Programmable Digital subsystem. (10)

Performance improvement through architecture customization. Profiling. Performance profiling. PSoC programmable digital building blocks (timers, counters, CRC generator, PWM). Data communication in embedded systems. Serial communication using SPI and UART.

Unit-3. Continuous Time analog building blocks. (6)

Basics of continuous time analog circuits. Presentation of basic building blocks, i.e., ideal op amps, comparators, PGA, Instrumentation amplifier, integrators, etc.

Unit-4. Switched-capacitor analog building blocks. (6)

Basics of switched capacitor analog circuits. Presentation of basic building blocks, i.e., ideal op amps, comparators, gain, integrators, etc. Application of Switch-Capacitor circuits.

Unit-5. Delta-Sigma Analog to digital converters. (10)

Basics of Delta-Sigma converters (DS). Sampling. Quantization. Oversampling. Noise shaping. Performance of DS ADC. First-order DS ADC. Second-order DS ADC. Implementation using PSoC. Impact of circuit nonidealities on ADC performance.

Unit-6. Design of Mixed signal based system (6)

Design of mixed signal based system for

a) Temperature, Humidity and CO_2 measurement
b) Interfacing of PIR sensor
c) Touch sensing

Reference Books:

1. Introduction to Mixed signal, Embedded Design A. N. Doboli and E. H Currie Cypress semiconductor corporation (2007)
2. Designers Guide to the Cypress PSoC by Robert Ashby Elsevier
3. CMOS Circuit design, Layout and Simulation, R. J. Baker, WSE, Willey (2009)