SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
VISHNUPURI, NANDED
PROPOSED STRUCTURE OF SYLLABUS AND SCHEME OF EXAMINATION FOR ME (ELECTRONICS) FIRST YEAR
SEMESTER – I

Sr. No.	SUBJECT	TEACHING SCHEME			EXAMINATION SCHEME				
		TH	PR	TOTAL	PAPER	TW	TEST	ORAL	TOTAL
01	Advanced Digital Signal Processing	4	-	4	100	-	25	-	125
02	Multi-carrier Communication	4	-	4	100	-	25	-	125
03	Optical Communication and Networks	4	-	4	100	-	25	-	125
04	Elective-I	4	-	4	100	-	25	-	125
05	Elective-II	4	-	4	100	-	25	-	125
06	LAB-I	-	2	2	-	25	-	-	25
07	LAB-II	-	2	2	-	25	-	-	25
08	Seminar-I	-	2	2	-	50	-	-	50
09	Comprehensive Viva-I	-	-	-	-	-	-	75	75
TOTAL MARKS									**800**

ELECTIVE – I	ELECTIVE – II
1. Microwave Devices and Circuits	1. Advanced Computer Architecture
2. Information Theory and Coding	2. Micro-electronics Circuit Design
3. Modern Digital System Design	3. Artificial Neural Networks and applications

SEMESTER - II

Sr. No.	SUBJECT	TEACHING SCHEME			EXAMINATION SCHEME				
		TH	PR	TOTAL	PAPER	TW	TEST	ORAL	TOTAL
01	Embedded System Design	4	-	4	100	-	25	-	125
02	Wireless Communication	4	-	4	100	-	25	-	125
03	Digital Image Processing	4	-	4	100	-	25	-	125
04	Elective-III	4	-	4	100	-	25	-	125
05	Elective-IV	4	-	4	100	-	25	-	125
06	LAB-III	-	2	2	-	25	-	-	25
07	LAB-IV	-	2	2	-	25	-	-	25
08	Seminar-II	-	2	2	-	50	-	-	50
09	Comprehensive Viva-II	-	-	-	-	-	-	75	75
TOTAL MARKS									**800**

ELECTIVE – III	ELECTIVE – IV
1. Modern Antenna Design	1. Modern Instrumentation System
2. Advanced VLSI Design	2. Pattern Recognition
3. Advanced Computer Networks	3. Adaptive Signal Processing

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PROPOSED STRUCTURE OF SYLLABUS AND SCHEME OF EXAMINATION FOR ME (ELECTRONICS) SECOND YEAR

SEMESTER-III/

Sr. No.	SUBJECT	EXAMINATION SCHEME			
		PAPER	TW	ORAL / PRESENTATION	TOTAL
01	Dissertation Part-I	-	100	100	200

SEMESTER-IV

Sr. No.	SUBJECT	EXAMINATION SCHEME			
		PAPER	TW	ORAL/ PRESENTATION	TOTAL
01	Dissertation Part-II	-	100	200	300

Dissertation shall consist of Research work done by the candidate in the areas related to Electronics Engineering.

Advanced Digital Signal Processing

Unit I

Discrete Time Signals and Systems:

Discrete Time Signals, The Sampling Process, Discrete-Time Systems, Correlation of discrete time signals, Discrete time Fourier transform, Symmetry Properties of Fourier Transform, Fourier Transform Theorems.

Unit II

Digital Filter Design Techniques:

Design of IIR filters using Bilinear Transformation and Impulse invariant Method, FIR Filter Design Based on Windows and Freuency Sampling Technique, Optimal FIR Filters, Fourier series, Design of Computationally Efficient FIR Digital Filters.

Unit III

Multirate Digital Signal Processing:

Multirate Structures for Sampling Rate Conversion, Multistage Design of Decimator and Interpolator, Filter Design and Implementation of Sampling Rate Conversion, Polyphase Filter Structures, Time variant Filter**,** The Polyphase Decomposition, Arbitrary-rate and Sampling Rate Converter.

Unit IV

Wavelet Transform:

Introduction to Wavelets, Wavelets and Wavelet Expansion Systems, Discrete Wavelet Transform, Multiresolution Formulation of Wavelet Systems, Haar Wavelet Representation, Wavelet Functions, Parseval's Theorem.

Unit V

Applications of Digital Signal Processing:

Spectral Analysis of Sinusoidal, Nonstationary and Random Signals, Signal Compression, Oversampling A/D Converter, Oversampling D/A Converter.

REFERENCES:

1. Oppenheim, Schafer, and Buck, Discrete-time signal processing, Pearson Education LPE
2. S. K. Mitra, Digital signal processing: A computational approach, TMH
3. Johny Johnson, Introduction to digital signal processing, PHI.
4. P. P. Vaidyanathan, Multirate filters and Filter banks, PH International, Englewood Cliffs
5. Rabiner and Schafer, Multirate signal Processing, PH International, Englewood Cliffs
6. C. S. Burrus, Ramose and A. Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.
7. Roman Kuc, Digital Signal Processin
8. Gonzaleaz and Woods, Digital Image Processing

Multi-Carrier Communication

Unit I

Introduction to digital communication:

Introduction to digital communication, high rate wireless application, wireless channel fundamentals, digital communication system fundamentals, Multi-Carrier system fundamentals, comparison with single carrier communication system.

Unit II

System Architecture

Basics of OFDM, FFT implementation, power spectrum, efficiency Impairments of wireless channels to OFDM, signals Performance optimization, clipping in multi-carrier system, channel partitioning, optimization through coding.

Unit III

Performance, Channel Estimation and Equalization

Synchronization, channel estimation & equalization: Timing & frequency offset, synchronization and system architecture, timing and frame synchronization frequency offset estimation. Channel Estimation and equalization Coherent detection, noncoherent detection, performance, channel estimation for MIMO-OFDM.

Unit IV

Channel coding

Need for coding block, coding in OFDM convolution encoding, concatenated coding, coding in OFDM.

Unit V

PAPR Reduction Techniques

Peak power reduction techniques PAPR properties of OFDM signals, PAPR reduction with and without signal distortion PAPR reduction for multi-carrier CDMA.

Unit VI

Applications of multi-carrier communication

Coding in OFDM, wireless LAN, digital audio & video broadcasting OFDM based multiple access techniques, mitigation of clipping effects.

REFERENCES:

1.Bahai, Saltzberg, Ergen : Multi-carriers Digital communications, Springer

2.Rappaport, T.S, Wireless communication, Prentice Hall

3.Heiskala, J., Terry J., OFDM wireless LANs: A Theoretical and practical guide. Samps Publishing 2002

4.Haykinls, Communication system, John Wiley & Sons.

5. Oppenheim, A.V., Schafer R.W., Discrete – Time signal processing New Jerssey : Prentice Hall Inc.

6.Bingham, J.A.C., ADSL, VDSL and multi-carrier modulation New York Wiley.

7.OFDM orthogonal frequency Division Multiplexing. Nova Engineering

Optical Communication and Networks

Unit I
Fundamentals of Optical Communication:
The basic optical communication system, communication components, modulation methods, transmitters- receivers, repeaters.

Unit II
Optical Amplifiers:
Basic concepts, semiconductor Laser amplifier, Raman Amplifier, erbium-Doped Fiber Amplifier.

Unit III
Multichannel Systems:
Wavelength division multiplexing, time division multiplexing, channel multiplexing, subcarrier multiplexing

Unit IV
Optical Networks:
Basic networks, FDDI networks, SONET/SDH, storage area networks, broadcast networks, next generation networks.

Unit V
Optical Fiber Measurements:
Fiber attenuation measurement, fiber dispersion measurement, fiber Refractive index profile measurement, Optical Time Domain Reflectometry (OTDR)

REFERENCES:
1.John M. Senior, Optical Fiber Communications Principles and Practice, PHI 1992
2.Gerg Keiser, Optical Fiber Communications Systems.2nd Edition PHI of India 1995
3.G.P.Agarwal, Fiber Optic Communications Systems,3rd Edition, Wiley, 2002
4.John Gowar, Optical communications Systems, 2nd Edition PHI of India 1992
5.Matthew N. O. Sadiku, Optical and Wire-less Communications, CRC Press

Microwave Devices and Circuits

Unit I

Microwave Devices:

Microwave transistor, Microwave tunnel diode, Schottky diode, MESFET, principle of operation, equivalent circuit, cut-off frequency, power frequency limitations, MOS structures, MOSFET: mechanism modes of operation, trans-conductance, maximum operating frequency and microwave applications, HEMT: structure, operation, trans-conductance and cut-off frequency, microwave application, charge coupled devices(CCD), transferred electronic devices: Gunn diode, LSA diode, modes of operations, microwave generations and Avalanche effect devices: read diode, carrier current and external current, IMPATT diodes.

Unit II

Microwave Linear Beam Tubes:

Velocity modulation process, bunching process, output power and beam loading, reflex klystron: power output and efficiency, traveling wave tubes and magnetron.

Unit III

Microwave Components and Circuits:

Waveguide impedence matching elements, waveguide tees, series tee, shunt tee, hybrid tee, directional couplers, applications: waveguide attenuators, waveguide phase shifter, microwave detector, terminations, microwave filters, microwave wavemeters.

MEMS technology based on microwave components like switches, filters, phase shifters and delay lines.

Unit IV

Matching Network and Microwave circuit analysis:

Reactive matching network using lumped elements, quarter wavelength transformer, lumped planar component like capacitor, inductor; the transmission line section as a basic component, transfer function of a transmission line section, T and PI representation transmission line section, analysis of two ports and multipoint network by using Z, Y and S-parameter analysis of microwave circuits, conversion of Z, Y transmission parameters and S parameter.

Unit V

Microwave Amplifier:

Design using s-parameter, stability criteria, constant power & gain circles. parametric amplifiers, oscillators & mixers: Gunn oscillators, IMPATT diodes, TRAPATT diodes, BARITT diodes, transited oscillators, oscillator circuit, mixers, mixers noise figure, mixed analysis, introduction to monolithic microwave integrated circuits, hybrid integrated circuits, microwave measurements, dielectric constant of low loss & high loss material.

REFERENCES:

1. Field Theory of Guided Waves by R.E.Collin

2.Microwave Devices and Circuits, 3rd Edition, Samuel Y. Liao, Prentice-Hall of India

3. Theory of Guided Electromagnetic waves by R.A. Waldron

4. Rizzi, Microwave Engineering (Passive Circuits)

Information Theory and Coding

Unit – I

Introduction to Information Theory and Coding:

Probability, random variables, probability distribution and probability densities, functions of random variables, statistical averages of random variables, some useful probability distributions.

Unit – II

Fundamental Limits on Performance:

Mathematical models for information sources, a logarithmic measure of information, average mutual information and entropy, information measures for continuous random variables, coding for discrete sources, coding for discrete memory less sources, Lempel-Ziv algorithm.

Unit – III

Source Coding:

Coding for analog sources-optimum quantization, scalar quantization, vector quantization, coding techniques for analog sources, temporal waveform coding, PCM, DPCM, adaptive PCM and DPCM, DM, spectral waveform coding, model based source coding.

Unit – IV

Channel Models and Channel Capacity:

Error Control Coding: Linear block codes, generator matrix and parity check matrix, some specific linear block codes, cyclic codes, transfer function of a convolution code, optimum decoding of convolution codes-Viterbi algorithm, BCH codes.

Unit – V

Coded Modulation Technique:

BPSK, QPSK, 8PSK, QAM and Trellis coded modulation techniques.

Unit – VI

Error Correcting Codes:

Gal'ois fields, vector spaces and matrices – Concatenated block codes - Punctured convolution codes – Non-binary dual-K codes and concatenated codes – Trellis coded modulation - Binary cyclic codes – Multiple error correcting codes – Majority logic decoding – Convolution codes - Burst error correcting codes – Two dimensional codes – ARQ – Performance of codes, Advances in Information theory and coding.

REFERENCES:

1. Ranjan Bose, Information Theory, Coding and Cryptography, TMH.
2. G. A. Jones and J.M. Jones, Information Theory and Coding, Springer.
3. J. G. Proakis, Digital Communication, Fourth Edition, McGraw Hill
4. Simon Haykin, Digital Communication, John Wiley and Sons.
5. J. G. Proakis and M. Salehi, Communication Systems, 2nd Ed.
6. B. Sklar, Digital communications Fundamentals and applications, Pearson Education

Modern Digital System Design

Unit-I

Review of logic design fundamentals: Combinational logic, logic simplification, Quine McClusky minimization, Hazards in combinational networks.

Unit-II

Sequential machines: Concept of memory, design of clocked flip flops, practical clocking aspects concerning flip flops, clock skew, traditional approaches in sequential machine analysis and design, Reduction of state tables and state assignments.

Unit-III

Asynchronous FSM: Designing, cycles and races, hazards-static, dynamic and essential Hazards. Computer Arithmetic: Design of fixed point, floating point arithmetic Units, MAC and SOP, CORDIC architectures.

Unit-IV

Design using VHDL: Entities and architectures, Data objects, types, design description, libraries, synthesis basics, mapping statements to Gates, model optimization, verification, test benches, Architectural synthesis, optimization, data path synthesis, logic level synthesis and optimization Cell library binding

Unit-V

Hardware testing and design for testability (DFT), FPGA: Fundamental concepts, technologies, origin, alternative FPGA architectures, Configuration, Comparison with ASICs, Reconfigurable computing, Field Programmable node arrays, signal integrity and deep sub micron delay effects.

Unit-VI

Fault Modeling:

Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults. Test generation: Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm.

REFERENCES:

1. William I Fleatcher, An Engineering approach to digital design, PHI
2. Giovanni De Micheli, Synthesis and optimization of digital circuit (McGraw Hill)
3. Charles H Roth, Jr., Fundamentals of Logic Design, Jaico Book
4. Charles H Roth, Jr., Digital System Design using VHDL, Brooks/Cole Thomson learning
5. Kevin Skahill, VHDL for programmable Logic, Addison Wesley
6. Clive Max Maxfield, The Design Worriors Guide to FPGA Devices, tools and flows, Elsevier
7. J.P. Hayes, Computer Architecture and Organization, Mc Graw Hill.

Artificial Neural Networks and Applications

Unit I

Brain Style Computing: Origins and Issues**,** Biological neural networks, Neuron Abstraction, Neuron Signal Functions, Mathematical Preliminaries, Artificial Neurons, Neural Networks and Architectures Pattern analysis tasks: Classification, Clustering, mathematical models of neurons, Structures of neural networks, Learning principles.

Unit II

Feed Forward Neural Networks:

Pattern classification using perceptron, Multilayer feed forward neural networks (MLFFNNs), Pattern classification and regression using MLFFNNs, Error back propagation learning, Fast learning methods: Conjugate gradient method.

Unit III

Associative Memories:

Basic concept, linear Associator, Basic concept of Recurrent Associative Memory performance analysis of recurrent Associative memory, Bidirectional , Associative Memory of spatio- temporal patterns, neural networks, Pattern storage and retrieval, Hopfield model, recurrent neural networks

Unit IV

Radial basis function networks and fuzzy Arithmetic:

Bayesian neural networks, Regularization theory, RBF networks for function approximation, RBF networks for pattern classification, Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Uncertainty based Information: Information & Uncertainty, Non specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. Introduction of Neuro-Fuzzy Systems, Architecture of Neuro Fuzzy Networks . Application of fuzzy Logic: Medicine, Economics etc.

Unit V

Self-organizing maps: Pattern clustering, Topological mapping, Kohonen's self-organizing map Introduction to cellular neural network, fuzzy neural networks, Pulsed neuron models recent trends in Neural Networks.

Unit VI

Applications of neural networks: Neural networks in image processing –compression, pattern recognition rate coded restricted Boltzmann machine for face recognition –application neocognitron for integrated chip image processing –optical neural networks in image recognition, Advances neural networks and its application:

REFERENCES:

1. Jacek Zurada, Introduction to Artificial Neural Networks, Jaico Publishing House, 1997.
2. Satish Kumar, Neural Networks, A Classroom Approach, Tata McGraw-Hill, 2003
3. S. Haykin, Neural Networks, A Comprehensive Foundation, Prentice Hall, 1998.
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
5. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999.
6. L.O. Chua and T. Roska, Cellular Neural Networks and Visual Computing Foundation and Applications, Cambridge Press, 2002.
7. Haykin S., "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
8. Fuzzy Sets & Fuzzy Logic, G.J. Klir & B. Yuan, PHI, 1995.

Embedded System Design

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Embedded Systems Design

Introduction: Embedded systems overview, Design Challenges, Processor Technology, IC Technology, Design Technology, Trade-offs,

Unit II

Custom Single Processors

Custom Single purpose processors, RT level Custom Single purpose processor design, Optimization, General Purpose processors: pipelining, superscalar and VLIW architectures, Programmers view: Instruction set, program and data memory space, I/O, interrupts, operating system, Development environment: design flow and tools, testing and debugging, Application specific instruction set processors (ASIPs), microcontrollers, digital signal processors, less-general AIP environments, selecting microprocessors, general purpose processor design

ARM Processors, Architecture of ARM7TDMI processor, Programming model, Registers, operating modes, Instruction set, Addressing modes, memory interface

Unit III

Standard Single Purpose Processors: Peripherals

Introduction, timers, counters and watch-dog timers, UART, Pulse width modulators, controlling a DC motor using PWM, LCD controllers, Keypad controllers, stepper motor controllers, ADCs, Real time clocks, Memory: memory write ability and storage permanence, common memory types, composing memory, memory hierarchy and cache, advanced RAM.

Unit IV

Interfacing

Introduction, Communication basics, Basic protocol concepts, ISA bus protocol: memory access, Arbitration, Priority arbiter, Daisy chain Arbitration, Network oriented Arbitration methods, multilevel bus architectures, Advanced communication principles, Parallel and serial communication, wireless communication, Layering, error detection and correction, serial protocols, parallel protocols, wireless protocols: IrDA, Bluetooth, IEEE802.11

Digital camera example: Introduction to simple digital camera, requirement specification, design

Unit V

IC Technology

Full custom, Semi Custom, Gate array semi custom IC technology, Standard cell semi custom IC technology, PLDs Design Technology: Automation, synthesis, verification: H/W and S/W co-simulation, IP Cores, design process models.

Unit VI

Real Time Operating Systems

Introduction, process scheduling, examples of RTOS.Microprocessor and microcontroller based system design, typical design examples, system design and simulation using simulation software such as Proteus VSM.

References:

1.Frank Vahid and Tony Givargis, “Embedded system design: A Unified Hardware/Software Introduction”, John-Wiley and Sons, 2002
2.Raj Kamal,“Embedded System”, McGraw-Hill Publications Second Edition
3.Jonathan W. Valvano, “Embedded Microcomputer System: Real Time Interfacing”,Thomson Learning
4.Han-Way Huang, “Embedded System Design using 8051”, Cengage Learning

Wireless Communication

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Wireless Transmission

Frequencies for radio transmission, Signals, Signal propagation, Multiplexing, Modulation techniques: modulation schemes such as ASK, FSK, PSK, DPSK, BPSK, QPSK, Advanced frequency shift keying, Advanced phase shift keying, Gaussian minimum shift keying., Spread spectrum such as DSSS, FHSS, and Cellular systems.

Unit II

Medium Access Control

Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, and Comparison of S/T/F/CDMA. Introduction to wireless communication stems: Examples of Wireless communication systems, Paging systems, Cordless telephone systems, and Cellular telephone systems.

Unit III

Cellular Telephony

Frequency reuse principle, Transmitting, Receiving, Handoff, Roaming, First, Second, and third wireless generation systems. The Cellular concepts –System design fundamentals: Channel assignment strategies, Interference and system capacity, SIR calculations, Trunking and grade of service, and improving coverage & capacity in cellular systems,

Unit IV

Telecommunication Systems

GSM, DECT and Tetra. Wireless LAN: Infra red vs. radio transmission, Infrastructure and ad-hoc network, IEEE 802.11-System architecture protocol architecture HIPERLAN, Bluetooth-User scenarios, Architecture, and IEEE 802.15.

Unit V

Mobile Network Layer

Mobile IP, Mobile ad-hoc networks: Routing, Destination sequence distance, Dynamic source routing, alternative metrics and overview ad-hoc routing protocols.

Unit VI

Wireless Application Protocol

Architecture, WDP, WTLS, WTP, WSP, WAE, WML, WML Scripts, WTA, WAP 2.0 architecture, and I-mode.

References:

1.Rappoport, Wireless Communications (Principles and Practices), Prentice Hall.

2.Jochen Schiller, Mobile Communications, Pearson Education, 2004.

3.William Stallings, Wireless Communication and Networks, Pearson Education, 2003.

4.Fourozan, Data communications and Networking, third edition, Tata McGraw-Hill-2004. Fourozan, TCP/IP Suite.

Digital Image Processing

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Introduction

Digital image representation, fundamental steps in digital image processing, components of digital processing systems, image sensing and acquisition, sampling and quantization, basic relationship between pixel and image geometry.

Unit II

Image Transforms

Intensity transformation functions, histogram processing, spatial filtering, introduction to Fourier transform, DFT, properties of 2D DFT, FFT, other separable image transform, DCT, DST, Walsh, Harr transforms.

Unit III

Image Restoration and Reconstruction

Noise models, spatial filtering, noise reduction by frequency domain filtering, Inverse filtering, Wiener filtering, constrained least square filtering.

Unit IV

Image Compression

Fundamentals, image compression models, lossy compression, lossless compression image compression methods.

Unit V

Image Segmentation

Fundamentals of segmentation, Point, line and edge detection, thresholding, detection, region based segmentation, segmentation using morphological watersheds, the use of motion in segmentation, color image processing.

References:

1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", AWL.
2. A.K. Jain, "Fundamental of Digital Image Processing", PHI.
3. W. K. Pratt., John.Wiley "Digital Image Processing"(3rd Edition.)
4. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing using Matlab", AWL
5. Digital Image Processing & Computer vision : An introduction to theory & Implementation" by Robert Jschalkoff – John wiley & Sons Inc.
6. Digital Image Processing, K. R. Castleman, PHI
7. Digital Image Processing & Analysis, B. Chanda and D.Mujumdar, PHI, New Delhi, 2000.

Modern Antenna Design

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Basics Concepts of Radiation

Radiation from surface current and current line current distribution, Basic antenna parameters, Radiation mechanism-Current distribution of Antennas, Impedance concept-Balanced to Unbalanced transformer.

Unit II

Radiation from Apertures

Field equivalence principle, Rectangular and circular apertures, Uniform distribution on an infinite ground plane, Aperture fields of Horn antenna-Babinets principle, Geometrical theory of diffraction, Reflector antennas, Design considerations - Slot antennas.

Unit III

Synthesis of Array Antennas

Types of linear arrays, current distribution in linear arrays, Phased arrays, Optimization of Array Patterns, Continuous aperture sources, Antenna synthesis techniques.

Unit IV

Micro Strip Antennas

Radiation mechanisms, Feeding structure, Rectangular patch, Circular patch, Ring antenna. Input impedance of patch antenna, Micro strip dipole, Micro strip arrays.

Unit V

EMI S/EMC/Antenna Measurements

Log periodic, Bi-conical, Log spiral ridge Guide, Multi turn loop, Traveling Wave antenna, Antenna measurement and instrumentation, Amplitude and Phase measurement, Gain, Directivity, Impedance and Polarization Measurement, Antenna range; Design and Evaluation.

Unit VI

Smart Antenna Systems

Generalized array signal processing; Beam forming concepts-DOB, TRB & SSBF, Switched beam antennas, spatial diversity, and fully adaptive antennas for enhanced coverage, range extension & improvement in frequency refuse, interference nulling for LOS & Multipath systems, SDMA concepts and Smart antennas implementation issues.

References:

1. Antennas- Kraus, John Wiley and Sons;
2. Antenna Theory Analysis and Design- Balanis, John Wiley and Sons
3. Antenna Theory- Collin and Zucker, Mc Graw Hill, 35
4. Smart Antennas for Wireless Communication: IS-95 and Third Generation CDMS applications- Liberti, Rappaport, PHI .
5. Third-Generation Systems and Intelligent Wireless Networking: Smart Antennas and Adaptive Modulation- Blogh & Hanzo, Willey-IEEE Press;

Advanced VLSI Design

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Review of MOS Transistor Theory

nMOS and pMOS Enhancement transistor, Threshold voltage equations, Body effects, MOS device Design equations, Basic DC equations, Latch-up in CMOS circuits and other second order effects, MOS Models, depletion MOS.

Unit II

Introduction to CMOS Circuits

CMOS Logic- Complementary CMOS inverter- DC Characteristics, Noise margin, Static load MOS Inverters, Differential Inverter, the transmission gate, Tristate Inverter, Bi-CMOS Inverters, SPICE Model; Combination logic- static and dynamic design strategies, The NAND and NOR Gates, Compound gates, Multiplexers.

Unit III

Designing Sequential logic Circuits

Static latches and registers, Dynamic latches and registers, non bistable sequential circuits.

Unit IV

CMOS Subsystem Design

Adder, Multiplier, Shifter, other arithmetic operators; power and speed tradeoffs; Memory cells and Arrays, ROM, RAM- SRAM, DRAM, clocking disciplines; Design, power optimization, case studies in memory design.

Unit V

CMOS Processing Technology

Basic CMOS technology, n and p well processes, CMOS Process Enhancements, Layout design rules, layouts of various gates, Technology related CAD issues.

Unit VI

Circuit Performance Parameters

Resistance and capacitance estimation, Inductance; Switching characteristics- analytical, empirical delay models, gate delays, CMOS Gate transistor sizing, Zpu/Zpd, Power dissipation, Sizing routing conductors, Charge sharing, Yield, reliability, Scaling of MOS Transistor dimensions.

Unit VII

Layout Design and Tools

Transistor structures, Wires and Vias , Scalable Design rules , Layouts of various gates; CMOS logic structures, Clocking strategies, I/O structures, Low power design.

Floor Planning and Architecture Design: Floor planning methods, off-chip connections, High level synthesis, Architecture for low power, SOCs and Embedded CPUs, Architecture testing.

References:

1. Jan M Rabaey, Digital integrated circuits: a design perspective. PHI Publications
2. Neil Weste, Kamran Eshrghian, Principles of CMOS VLSI design: a systems perspective, 2nd ed., Addison Wesley Publishing company, 1993.
3. Wayne Wolf, Modern VLSI design, Pearson Education.
4. Sung-Mo Kang and Y. Leblebici, CMOS digital Integrated Circuits.
5. Ivan Sutherland. Logical effort, Morgan Kaufeman, CA.

Advanced Computer Networks

Paper: 3 Hours, 100 Marks **Test:25 Marks**

Unit I

Computer Network and the Internet

What is the Internet? The Network Edge, The Network Core, Network Access and Physical Media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, Protocol Layers and Their Service Models, History of Computer Networking and the Internet.

Unit II

Application Layer

Principles of Application Layer Protocols, The Web and HTTP, File Trasfer: FTP, Electronic Mail in the Internet, DNS-The Internet's Directory Service, Socket Programming with TCP, Socket Programming with UDP, Building a simple Web Server, Content Distribution.

Unit III

Transport Layer

Introduction and Transport Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented transport: TCP, Principles of Congestion Control, TCP Congestion Control.

Unit VI

Network Layer and Routing

Introduction and Network Service Models, Routing Principles, Hierarchical Routing, The Internet Protocol (IP), Routing in the Internet, What's Inside the Router? IPv6, Multicast Routing, Mobility and the Network Layer.

Unit VII

Link Layer and Local Area Networks

Data link Layer: Introduction and Services, Error-Detection and Correction techniques, Multiple Access Protocols, LAN Addresses and ARP, Ethernet, Hubs, Bridges and Switches, Wireless Links, PPP: The point-to-Point Protocol, Asynchronous Transfer Mode(ATM), Frame Relay.

Unit VIII

Multimedia Networking

Multimedia Networking Applications, Streaming Stored Audio and Video, Making the Best of the Best-Effort Service: An Internet Phone Example, Protocols for real-Time Interactive Applications, Beyond Best-Effort, Scheduling and policing Mechanisms. Integrated Services, RSVP, Differentiated Services.

Unit IX

Security in Computer Networks

What is Network Security? Principles of Cryptography, Authentication, Integrity, Key Distribution and Certification, access Control: Firewalls, Attacks and Countermeasures, Security in Many Layers: Case Studies.

Unit X

Network Management

What is Network Management? The Infrastructure for Network Management, The Internet-Standard Management Framework, ASN.1.

References:

1. J. F. Kurose, K.W. Ross, " Computer Networking – A Top Down Approach Featuring the Internet " , Pearson Education.
2. B.A. Forouzan, " TCP/IP Protocol Suite" Tata McGraw Hill 3rd edition.
3. Douglas E Comer, "Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture", 5th edition, PHI.
4. Andrew S. Tanenbaum, "Computer Networks", 4th edition, PHI

Modern Instrumentation System

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Basic Concepts of Design

Design procedure, Basic concept of instrument design, Functional requirement and specifications of instrumentation component. Introduction to advanced instrumentation system engineering (AISE), scope of AISE in process industry.

Unit II

Design Aspects and Selection Criteria

For flow, temperature, pressure, and level transducer, orientation table, general selection criteria for transducer, general transducer design consideration.

Unit III

Principles and Design of Electronic Instruments

Digital voltmeters, electronic counters, Frequency synthesizers, weave analyzers, spectrum analyzers, sweep waveform generators and pulse generators, Lock in amplifiers, Q-meters, High frequency impedance bridges, ground loops, Electromagnetic and static pick-up, Interference, shielding and grounding ,Floating voltage measurements, common signals and their effects.

Unit IV

Measurements Techniques for Water Quality Parameters

Conductivity-temperature-turbidity. Measurement techniques for chemical pollutants-chloride-sulphides-nitrates and nitrites-phosphates-fluoride-phenolic compounds. Measurement techniques for particulate matter in air. Measurement of oxides of sulpher, oxides of nitrogen unburnt hydrocarbons, carbon-monoxide, dust mist and fog.

Unit V

Review of Components inPprocess Control

Data loggers, data acquisition system (DAS), direct digital control(DDC), supervisory control and data acquisition systems(SCADA), sampling considerations. Functional block diagram of computer control systems. Alarms, interrupts. Characteristics of digital data, controller software, linearization. Digital controller modes: Error, proportional, derivatives and composite controller modes.

Unit IV

Programmable Logic Controller (PLC)

Definition, overview of PLC systems, input/output modules, power supplies, Isolators. General PLC programming procedures, programming on-off input/outputs. Auxiliary commands and functions: PLC basic functions: Register basics, timer function, counter functions.

Unit-VII

Distributed Control Systems (DCS)

Definition, local control (LCU) architecture, LCU languages, LCU process interfacing issues, communication facilities, configuration of DCS, displays, redundancy concept-case studies in DCS.

Unit VIII

Multisensor Data Fusion

Introduction, sensors and sensor data, use of multiple sensors, fusion applications. The interface hierarchy: output data, data fusion model. Architectural concepts and issues. Benefits of data fusion, mathematical tools used: Algorithms, coordinate transformation, rigid body motion. Dependability and markov chains ,Meta heuristics.

References:

1. H.H. Willard, Merrit and Dean, "Instrumental Methods of Analysis", 5 Edn.,1974
2. R.K. Jain, "Fundamentals of Mechanical and Industrial Instrumentation",1985.
3. john. W.Webb Ronald A Reis, programmable logic controllers-Principles and Applications, Third edition, Prentice Hall Inc, New Jersey 1995.
4.Lukcas M.P.Distributed control systems,Van Nostrand Reinhold co, New york,1986.
5. David L. Hall, Mathmatical techniques in multisensor data fusion, Artech House, Boston,1992
6. Gary Johnson, LabVIEW graphical programming second edition, McGraw Hill,Newyork,1997.
7. B.M. oliver and J.M. cage, Electronics Measurements and Instrumentation McGraw Hill.

Pattern Recognition

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

Introduction

Pattern recognition overview: Engineering approach to PR relationship of PR to other areas Pattern recognition applications, pattern techniques, pattern recognition approaches (StatPR, SyntPR, NeurPR). Features and feature extractions techniques: Introduction, zoned features, Graph representation techniques, sequentially detected features, feature extraction, feature vector and feature space.

Unit II

Bays Decision Theory

Introduction, bays decision theory continuous case, two category classification, minimum error rate classification, classifier, discriminate functions and decision surfaces (multicategory and two category case). The normal density function (Univariate and multivariate normal density function) Parameter estimation and supervised learning.

Unit III

Maximum Likelihood Estimation

Maximum likelihood estimation, Bayes classifier, general Bayesian learning, problem of dimensionally, non-paramateric techniques, density estimation, Parzen window, k-nearest estimation, nearest neighbor rule.

Unit IV

Linear Discriminate Functions

Linear discriminate functions and decision surface, two category and multi-category case generalized linear discriminate functions, minimizing the perception criteria functions, relaxation procedure. Learning: Unsupervised learning, automatic determination of features, a relational system, transference of learning, associative memory, scientific basis for automatic pattern recognition. Contextual: Linguistic and array techniques, context, scene, analysis, picture syntax, analysis of synthesis, iterate array techniques.

Unit V

Coefficient Analysis

Higher moments, slit scanning techniques, Fourier transformation, pattern recognition by Fourier optics, autocorrelation, speech recognition.

References:

1. R. O. Duda and P. E. Hart, Pattern classification and scene analysis, Wiley Interscience publications.
2. Robert Schaloff, Pattern recognition: statistical, structural and neural approaches, John Wiley and Sons. Inc.
3. J.R. Ullamann, Pattern recognition techniques, Butterworths publications, London
4. Don Person (ed.), Image processing, MGH.

Adaptive Signal Processing

Paper: 3 Hours, 100 Marks **Test: 25 Marks**

Unit I

General Introduction

Adaptive systems-Definition and characteristics, areas of applications, general properties, open and closed loop adaptation, applications of closed loop adaptation. The adaptive liner combiner-General description, input signal and weight vectors, desired response and error, the performance function, gradient and minimum mean square error, Example of performance surface, alternative expression of the gradient, de-correlation of error and input components.

Unit II

Theory of Adaptation with Stationary Signals

Properties of the quadratic performance surface-Normal form of the input correlation matrix, eigen values and eigen vectors of the input correlation matrix, an example with two weights, geometrical significance of eigen vectors and eigen values.Searching the performance surface-Methods of searching the performance surface, basic ideas of gradient search methods, a simple gradient search algorithm and its solution, stability and rate of convergence, Gradient estimation and its effects on adaptation – Gradient component estimation by derivative measurement, the performance penalty, derivative measurement and performance penalties with multiple weights, varience of the gradient estimate.

Unit III

Stochastic Processes and Models

Partial Characterization of a Discrete-Time Stochastic Process, Mean Ergodic Therom, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, World Decomposition, Asymptotic Stationarity of an Autoregressive Process, Yule-Walker Equations, Computer Experiment: Autoregressive Process of Order Two, Selecting the Model Order, Complex Gaussian Process, Power Spectral Density, Properties of Power Spectral Density, Transmission of a Stationary Process Through a Liner Filter, Cramer Spectral Representation for a Stationary Process, Power Spectrum Estimation, Other Statistical Characteristics of a Stochastic Process, Polyspectra, Spectral-Correlation Density.

Unit IV

Wiener Filters

Linear Optimum Filtering, Statement of the problem, Principle of Orthogonality, Minimum Mean-Square Error Adaptive algorithms and structures: The LMS algorithms, The z-transform in ASP, Other adaptive algorithms and structures.

Unit V

RLS Adaptive Filters

Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted Recursive Least-Squares Algorithm, Selection of The Regularizing Parameter, Update Recursion for the sum of weighted Error Squares, Example, Single-weight Adaptive

noise canceller, convergence analysis of the RLS Algorithm, Computer Experiment on Adaptive Equalization, Robustness of RLS filter

Unit VI
Applications
Adaptive modeling and system identification, Inverse adaptive modeling, de-convolution, and equalization, Adaptive control systems, Adaptive interference canceling.

References :
1. Adaptive Filter Theory- S. Haykin, (4th Edition)
2. Adaptive Signal Processing, - B. Windrow, S.D. Sterns.
3. Digital Signal Processing, S. K. Mitra, TMH
4. Digital Signal Processing: Princiaples, Algorithums & Applications, John G Prokis, D. G.Manolakis, PHI