WITH EFFECT FROM THE ACADEMIC YEAR 2016-2017

SCHEME

MASTER OF TECHNOLOGY
IN
ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER-I	Subject	L	T	P	Total	Sessional*	Theory	Duration of Exam (Hrs.)
MTECE-101N	Advanced Communication Systems	4	-	-	4	40	60	3
MTECE-102N	Advanced Digital Signal Processing	4	-	-	4	40	60	3
MTECE-103N	Antenna Theory and Design	4	-	-	4	40	60	3
MTECE-104N	Advanced Information Theory and Coding	4	-	-	4	40	60	3
MTECE-105N	VLSI Signal Processing	4	-	-	4	40	60	3
MTECE-106N	Antenna Design (Lab.)	-	-	3	3	40	60	3
MTECE-107N	Advanced Digital Signal Processing (Lab.)	-	-	3	3	40	60	3
					Total	**280**	**420**	
						700		

SEMESTER-II	Subject	L	T	P	Total	Sessional*	Theory	Duration of Exam (Hrs.)
MTECE-201N	Advanced Image Processing	4	-	-	4	40	60	3
MTECE-202N	Advanced Wireless and Mobile Communication	4	-	-	4	40	60	3
MTECE-203N	Digital IC Design	4	-	-	4	40	60	3
MTECE-204N	Adaptive Filter Theory	4	-	-	4	40	60	3
MTECE-205N	Optical Networks	4	-	-	4	40	60	3
MTECE-206N	Image Processing (Lab.)	-	-	3	3	40	60	3
MTECE-207N	Wireless and Mobile Communication (Lab.)	-	-	3	3	40	60	3
					Total	**280**	**420**	
						700		

*As per M.Tech. Ordinance Rules

SEMESTER-III	Subject	L	T	P	Total	Sessional*	Theory	Duration of Exam(Hrs.)
-	Elective-I	4	-	-	4	40	60	3
-	Elective-II	4	-	-	4	40	60	3
MTECE-315N	Synopsis	-	-	-	-	100	-	3
					Total	**180**	**120**	
						300		

SEMESTER-IV		L	T	P	Total	Sessional*	Theory	Duration of Exam(Hrs.)
MTECE-401N	Dissertation	-	-	-	-	100	200	3
						100	**200**	
					Total	**300**		

*As per M.Tech. Ordinance Rules

LIST OF ELECTIVE – I (ECE) for 3rd Semester		
1.	MTEC-ELI-301N	RF MEMS for Communication Engineering
2.	MTEC-ELI-303N	Advanced Processor and Embedded Systems
3.	MTEC-ELI-305N	Digital Control Systems
4.	MTEC-ELI-307N	Advance Electronics Devices & Sensors
5.	MTEC-ELI-309N	Soft Computing
6.	MTEC-ELI-311N	Advanced Verilog HDL
7.	MTEC-ELI-313N	Security, Networks and Cryptography

LIST OF ELECTIVE – II (ECE) for 3rd Semester		
1.	MTEC-ELII-302N	Bio-Medical Signal Processing
2.	MTEC-ELII-304N	Detection and Estimation Techniques
3.	MTEC-ELII-306N	Wireless Sensor Networks
4.	MTEC-ELII-308N	Pattern Recognition
5.	MTEC-ELII-310N	Multimedia Communication Systems
6.	MTEC-ELII-312N	Quality and Reliability of Electronic Systems
7.	MTEC-ELII-314N	Radar & Satellite Communication Systems

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCED COMMUNICATION SYSTEMS

Paper: MTECE-101N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

INTRODUCTION TO COMMUNICATION SIGNALS & SYSTEMS:- Characterization of Communication Signals and Systems :- Representation of Band pass Signals and Systems ,Representation of Linear Band pass Systems ,Response of a Band pass System to a Band pass Signal ,Representation of Band pass Stationary Stochastic Processes, Signal Space Representation ,Signal Space Concepts , Memory less Modulation Methods ,Spectral Characteristics of Digitally Modulated Signals ,Power Spectra of Linearly Modulated Signals.

Unit-II

OPTIMUM RECEIVER DESIGN:- Optimum Receivers for the Additive White Gaussian Noise Channel :- Optimum Receiver for Signals Corrupted by AWGN ,Correlation Demodulator ,Matched-Filter Demodulator, Performance of the Optimum Receiver for Memory less ,Modulation ,Probability of Error for Binary Modulation , Probability of Error for M-ary Orthogonal Signals , Probability of Error for Simplex Signals, Probability of Error for M-ary Binary-Coded Signals ,Differential PSK (DPSK) and its Performance , Comparison of Digital Modulation Methods

Unit-III

SYNCHRONIZATION IN TIMING AND FREQUENCY:- Synchronization Timing and Frequency Offset in OFDM, Synchronization & System Architecture, Timing and Frame Synchronization, Frequency Offset Estimation, Phase Noise Channel Estimation and Equalization, Introduction, Channel Estimation, Coherent Detection, Block-Type Pilot Arrangement, Comb-Type Pilot Arrangement, Non-coherent Detection, Performance, Channel Estimation for MIMO-OFDM. Equalization, Time Domain Equalization, Equalization in DMT, Delay Parameter, Frequency Domain Equalization, Echo Cancellation, OFDM based Multiple Access Techniques, FDM/ Multiple Access, TDM/ Multiple Access, CDMA.

Unit-IV

OPTICAL FIBER COMMUNICATION SYSTEM:- Optical Fiber Communication System: Telecommunication, local distribution series, computer networks local data transmission & telemetry. Optical networking: data communication networks, network topologies, Design of LED's for optical fiber communications, semiconductor LASER for optical fiber Communication system, Liquid crystal devices; porous silicon optical devices.

Text Books

1. Proakis J. Digital communications (4ed, MGH, 2001).
2. Bernard Sklar, Digital Communications Fundamentals and Applications, 2ed, Pearson Education.

Reference Books

1. Ahmad R. S. Bahai, Burton R. Saltzberg, Mustafa Ergen, Multi-carrier Digital Communications: Theory and Applications of OFDM, Springer; 2nd edition (October 7, 2004).
2. Edward A Lee & David G Messerschmitt: Digital Communication, 3rd Ed; K
3. Senior J., optical fiber communications, principles & practice, PHI.
4. Keiser G., optical fiber communications, McGraw-hill.
5. Gowar J., optical communication systems, PHI

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCED DIGITAL SIGNAL PROCESSING

Paper: MTECE-102N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Review of Filter concepts- Review of design techniques and structures for FIR and IIR filters, representation of numbers, quantization of filter coefficients, round-off effects in digital filters.

Unit-II

Multirate Digital Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, sampling rate conversion by rational factor I/D, implementation of sampling rate conversion, multistage implementation of sampling rate conversion, sampling rate conversion of band pass signals, sampling rate conversion by an arbitrary factor, application of Multirate signal processing, digital filter bank, two-channel quadrature-mirror filter bank, M-channel QMF bank.

Unit-III

Wavelet Transform: Introduction to wavelet transform- Short Time Fourier Transform (STFT), Wavelet transform, Haar wavelet and Multirate resolution analysis, Daubechies wavelet, some other standard wavelets, applications of wavelet transform.

Unit-IV

Power Spectrum Estimation: Estimation of spectra from finite-duration observation of signals, non-parametric methods for power spectrum estimation, parametric methods for power spectrum estimation, filter bank methods, Eigen analysis algorithms for spectrum estimation.

Text Books:

1. Digital Signal Processing : Principles, Algorithms, and Applications, 4/e, Authors : John G. Proakis Dimitris G Manolakis Imprint : Pearson Education
2. Digital Signal Processing, Authors, Oppenheim, Alan V, Schafer, Ronald W., PHI

Reference Books:

1. Advanced Digital Signal Processing, Authors: Dr. Shaila D. Apte, Imprint: Wiley
2. Digital Signal Processing, 3/e, Authors: S.K.Mitra, Imprint : McGraw Hill
3. Digital Signal Processing and Applications with the TMS 320C6713 and TMS 320C6416 DSK, 2/e,Authors: Rulph Chassaing,Donald Reay, Imprint : Wiley
4. Digital Signal Processing, Authors: Tarun Kumar Rawat, Imprint: Oxford
5. Digital Signal Processing, Spectral Computation and Filter Design, Authors:CHI-Tsong Chen, Indian Edition, Imprint: Oxford
6. Theory and Applications of Digital Signal Processing,Authors: Lawrence R. Rabiner, Bernard Gold,Imprint:Prentice- Hall
7. Digital Signal Processing, Authors:Thomas J. Cavicchi, Imprint: Wiley
8. Modern Digital Signal Processing, Authors: V. Udayshankar, Imprint: PHI
9. Digital Signal Processing using MAT and Wavelets,2/e, Authors: Michael Weeks, Imprint: Jones & Bartlett Publishers.

Master of Technology (ELECTRONICS & COMMUNICATION)

ANTENNA THEORY AND DESIGN

Paper: MTECE-103N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Radiation and Antennas: - Performance parameters of Antenna: Radiation resistance, Power gain, Directive gain, Directivity, Half –Power Beamwidth & Bandwidth , Radiation from Hertzian dipole : Calculation of field strength at different points in spherical coordinates & calculation of Radiation resistance, Radiation from half-wave dipole : Calculation of field strength at different points in spherical coordinates & calculation of Radiation resistance.

Unit-II

Analysis of linear arrays:- Various forms of Antenna Arrays . Analysis of Array of two point sources with Equal amplitude and same phase, Equal amplitude and opposite phase, Unequal amplitude and any phase. Calculation of field strength at distant point due to linear array of N- Isotropic sources. Calculation of Direction of Pattern maximum, Direction of pattern minimum, Beam width of Major lobe for Broadside & End fire arrays of N Isotropic sources .Multiplication of Pattern, Tapering of arrays, Binomial & Dolph-Chebychef arrays.

Unit-III

Frequency Independent Antennas and Antenna Measurements:-Rumseys Principal for frequency independent antenna, Frequency independent log spiral antenna, Frequency independent Log Periodic antenna, Antenna Ranges, Radiation Patterns, Gain Measurements, Directivity Measurements, Impedance Measurements, current Measurements, Polarization Measurements.

Unit-IV

Antennas for Special Applications:-Micro strip patch antennas-basic configuration and advantages, radiation mechanism, basic characteristics and feeding techniques, broad banding techniques, microstrip arrays, Antennas for biomedical applications. Smart antennas for mobile communications. Antenna for infrared detectors.

Text Books

1. John D. Kraus and R.J. Marhetka — Antennas for All Applications —, 3rd edition Tata McGraw Hill, 2003.
2. Balanis. C.A , —Antenna Theory Analysis and Design‖, 2nd edition John Wiley & Sons Inc., 2003.

Reference Books

1. S.N.Raju, — Antenna Propagation‖, Pearson Education, 1st edition 2005.
2. Collin and Zucker ,Antenna Theory, Mc Graw Hill

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCED INFORMATION THEORY AND CODING

Paper: MTECE-104N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Information Theory and Source Coding: Introduction, Uncertainty and Information, Average Mutual Information and Entropy, Information measures for Continuous Random Variables, Source Coding Theorem, Huffman Coding, Shannon-Fano-Elias Coding, and Entropy Rate of a Stochastic Process
Channel Capacity and Coding: Channel Models, Capacity, Coding, Information Capacity Theorem, The Shannon limit, Channel capacity For MIMO System.

Unit-II

Linear Block Codes: Introduction to Error Correcting codes, matrix description, Equivalent codes, Decoding of LBC, Syndrome Decoding, Error Probability after Coding, Perfect Codes, Hamming Codes, LDPC, Optimal Linear Codes, Maximum Distance Separable Codes, Bounds on Minimum Distance Space Time Block codes.
Cyclic Codes: Introduction, Polynomials, Division Algorithm for Polynomials, Generating Cyclic codes, Quasi-Cyclic codes and Shortened Cyclic codes, Burst Error Correction, Fire Codes, Golay Codes, Cyclic Redundancy Check codes, Circuit Implementation of Cyclic Codes, BCH Codes.

Unit-III

Convolution Codes: Introduction to Convolutional Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolutional Codes, Distance Notions for Convolutional Codes, The Generating Function, Matrix Description of Convolutional Codes, Viterbi Decoding of Convolutional Codes, Distance Bounds For Convolutional Codes, Performance Bounds, Turbo Codes, Turbo Decoding, Interleaver Design for Turbo Codes.
Trellis Code Modulation: Introduction, The concept of Coded Modulation, Mapping by set Partioning, Ungerboeck's TCM Design Rules, TCM Decoder, Performance evaluation for AWGN Channel, Computation of dtree, TCM for fading Channels, Space Time Trellis Codes.

Unit-IV

Cryptography: Introduction, Overview, operations used by encryption Algorithms, Symmetric Cryptography, DES, IDEA, RC Ciphers, Asymmetric Algorithms, RSA, PGP, One way hashing, Elliptic Curve cryptography, Quantum Cryptography, biometric Encryption, cryptanalysis

Text Books

1. Information Theory, Coding and Cryptography by Ranjan Bose Publisher: TMH

Reference Books

1. Principles of digitals communication: J. Dass, S.K. Malik & P.K. Chatterjee, 1991.
2. Introduction to the theory of Error correcting codes: Vera Press, 1992

Master of Technology (ELECTRONICS & COMMUNICATION)
VLSI SIGNAL PROCESSING

Paper: MTECE-105N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Basics: - Vector Quantization, Decimator and Expander, Representations of DSP Algorithms: Block Diagrams, Signal-Flow-Graph, Data-Flow Graph, Dependence Graph.
Iteration Bound: - Data Flow Graph Representations, Loop Bound and Iteration Bound, Algorithms for computing Iteration Bound: Longest Path Matrix Algorithm, Minimum Cycle Mean Algorithm, Iteration Bound of Multirate Data-Flow Graphs.

Unit-II

Pipelining and Parallel Processing: - Cutset, Feed-Forward Cutset, Pipelining of FIR Digital Filters: Data-Broadcast Structures, Fine-Grain pipelining, Parallel Processing: Designing a Parallel FIR System, Pipelining and Parallel Processing for Low Power: Pipelining for Low Power, Parallel Processing for Low Power, Combining Pipelining and Parallel Processing.
Retiming: - Quantitative Description of Retiming, Properties of Retiming, Solving Systems of Inequalities, Retiming Techniques: Cutset Retiming and Pipelining, Retiming for Clock Period Minimization, Retiming for Register Minimization.

Unit-III

Unfolding: - Algorithm for Unfolding, Properties of Unfolding, Critical Path, Unfolding and Retiming, Applications of Unfolding: Sample Period Reduction, Word-Level Parallel Processing, Bit-Level Parallel Processing.
Folding:- Folding Transformation, Register Minimization Techniques: Lifetime Analysis, Data Allocation using Forward-Backward Register Allocation, Register Minimization in Folded Architectures: Biquad Filter, IIR Filter, Folding of Multirate Systems.

Unit-IV

Bit-Level Arithmetic Architectures: - Parallel Multiplication with Sign Extension**,** Baugh-Wooley Multipliers, Parallel Multipliers with Modified Booth Recoding, Interleaved Floor-Plan and Bit-Plane based Digital Filters.
Computer Arithmetic:- Floating Point Numbers, Floating Point Addition, Floating Point Multiplication, Floating Point Division, Floating Point Reciprocal, CORDIC Algorithm: Introduction, Modes, Architectures, Computation of special functions using CORDIC Algorithm (e.g. Trigonometric, Hyperbolic, Square Root etc.)

Text Books

1. K. K. Parhi, VLSI Digital Signal Processing Systems, John Wiley, 2010.
2. U. Meyer-Baese, Digital Signal Processing with FPGAs, Springer, 2011

Reference Books

1. P.B. Denyer and D. Renshaw, VLSI Signal Processing, Addison-Wesely, 1986.
2. R.I. Hartley and K. K. Parhi, Digit-Serial Computation, Kluwer, 1995
3. S.Y. Kung, H.J. White House, T. Kailath, "VLSI and Modern Signal Processing ", Prentice Hall, 1985.

Master of Technology (ELECTRONICS & COMMUNICATION)

ANTENNA DESIGN (Lab.)

Paper: MTECE-106N **L-T-P: 0-0-3** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

1. Construction and analysis of monopole antenna.
2. Construction and analysis of dipole antenna.
3. Construction and analysis of yagi-uda antenna,
4. Construction and analysis of turnstile antenna,
5. Construction and analysis of parabolic antenna.
6. To study microwave bench and to find the frequency generated by the Microwave source.
7. To find parameters of microwave components by using microwave bench.
8. Construction and analysis of patch antenna.
9. Designing and analysis of Waveguide for microwave applications.
10. Design and analysis of circulator for microwave applications.

Master of Technology (ELECTRONICS & COMMUNICATION)

ADVANCED DIGITAL SIGNAL PROCESSING (Lab.)

Paper: MTECE-107N **L-T-P: 0-0-3** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

1. Write a program for cascade and parallel realization of an FIR transfer function.
2. Write a program for cascade and parallel realization of an IIR transfer function.
3. Write a program to design a Butterworth IIR Band Pass Filter.
4. Write a program to design an FIR filter using various window functions.
5. Write a program to implement the interpolation and decimation.
6. Write a program to design two channels QMF Bank.
7. Write a program to compute the CWT.
8. Write a program to compute the DWT.
9. Write a program to design a wavelet filter.
10. Write a program to find the magnitude response of a wavelet.

Master of Technology (ELECTRONICS & COMMUNICATION)

ADVANCED IMAGE PROCESSING

Paper: MTECE-201N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit -I

Introduction: Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization.
Spatial Domain Filtering: Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution, Smoothing filters, sharpening filters, gradient and Laplacian.

Unit-II

Filtering in the Frequency domain: Hotelling Transform, 2D-Fourier Transform and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.
Image Restoration: Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.

Unit-III

Image Compression: Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCT implementation using FFT, Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding
Wavelet based Image Compression: Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking.

Unit-IV

Morphological Image Processing: Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.
Image Segmentation: Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative Thresholding, Otsu's method, Moving averages, Multivariable Thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation

Text Books

1. Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education.

Reference Books

1. Digital Image Processing by S. Sridhar , Publisher: Oxford
2. Fundamentals of Digital Image Processing By Anil K Jain. Publisher: Prentice Hall.

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCED WIRELESS AND MOBILE COMMUNICATION

Paper: MTECE-202N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

INTRODUCTION:- Introduction to Wireless Mobile Communications ,Personal Communication Services (PCS): PCS architecture, Mobility ,Types of mobile wireless services / systems- Cellular, WLL, Paging, Satellite systems, Standards, management, Networks signaling. Wireless Transmission - signal propagation - spread spectrum - Satellite Networks - Capacity Allocation - FAMA - DAMA - MAC.

Unit-II

MOBILE NETWORKS:- Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations; cellular concept, spectral efficiency; Cellular Wireless Networks – GSM – Architecture – Protocols - Connection Establishment - Frequently Allocation – Routing – Handover – Security - GPRA.

Unit-III

WIRELESS NETWORKS:- History and evolution of mobile radio systems; General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes, Mobile Data Communication: Wireless LAN-IEEE 802.11: Standard – Architecture – Services; AdHoc Networks- Hiper LAN - Blue Tooth. Routing: Mobile IP-DHCP - AdHoc Networks - Proactive and Reactive Routing Protocols - Multicast Routing.

Unit-IV

TRANSPORT AND APPLICATION LAYERS:- TCP over Adhoc Networks – WAP – Architecture - WWW Programming Model – WDP – WTLS – WTP – WSP – WAE - WTA Architecture – WML .

Text Books

1. "Wireless and mobile Networks Architecture," by Lin & Chlamatac, Wiley India, 2001.
2. "Mobile & Personnel communication Systems and Services", By Raj Pandya, Prentice Hall India, 2001.
3. "Wireless Communication- Principles and practices," 2nd Ed., Theodore S. Rappaport, Pearson Education Pvt. Ltd, 2003.
4. "Mobile communications," Jochen Schiller, Pearson Education Pvt. Ltd., 2002.
5. "The Wireless Application Protocol," Singhal & Bridgman et. al., Pearson Education, 2004.

Reference Books

1. "Principles of Mobile Computing," 2nd Ed., Hensmann, Merk, & Stober, Springer International Edition, 2003.
2. "Ad Hoc Wireless Networks : Architectures and Protocols", 1/e Authors : C. Siva Ram Murthy,B.S. Manoj
3. "Modern Wireless Communications", 1/e Authors : Simon Haykin,Michael Moher
4. "Mobile Computing," Talukdar & Yaragal, TMH, 2005.
5. "3G Wireless Networks," Smith & Collins, TMH, 2007.
6. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.
7. William Stallings, "Wireless communications and Networks", PHI/Pearson Education, 2002.
8. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile computing", Springer, New york, 2003.

Master of Technology (ELECTRONICS & COMMUNICATION)

DIGITAL IC DESIGN

Paper: MTECE-203N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Basics:-Issues in Digital Integrated Circuit Design, Quality Metrics of a Digital Design, Manufacturing CMOS Integrated Circuits, Introduction to devices, The Diode, The MOS(FET) Transistor, Perspective: Technology Scaling

Device Models and Circuit Simulation: Interconnect Parameters — Capacitance, Resistance, and Inductance, Electrical Wire Models, SPICE Wire Models.

Unit-II

The Static CMOS Inverter: Perspective, Evaluating the Robustness of the CMOS Inverter, Performance of CMOS Inverter, Power, Energy, and Energy-Delay, Technology Scaling and its Impact on the Inverter Metrics.

Designing Combinational Logic Gates in CMOS: Static CMOS Design, Dynamic CMOS Design, How to Choose a Logic Style, Gate Design in the Ultra Deep-Submicron Era.

Unit-III

Designing Sequential Logic Circuits: Timing Metrics for Sequential Circuits, Classification of Memory Elements, Static Latches and Registers, Dynamic Latches and Registers, Pulse Registers, Sense-Amplifier Based Registers, Pipelining: An approach to optimize sequential circuits, Non-Bistable Sequential Circuits.

Unit-IV

Designing Complex Digital Integrated Circuits: Introduction, The Standard-cell Design Approach, Array-based Design, Configurable and Reconfigurable Design.

Timing Issues in Digital Circuits: Introduction - Classification of Timing Approaches, Synchronous systems, Impact of clock variation on performance, Clock Distribution Basics, Asynchronous Design, Asynchronous-synchronous Interface, Clock Signal Generation

Text Books

1. Digital Integrated Circuits A Design Perspective by Rabey, Chandrakasan, Nikolic, PHI.
2. Digital IC Design by Martin, Oxford University Press.

Reference Books

1. CMOS VLSI Design by Weste, Pearson.
2. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Pearson.

Master of Technology (ELECTRONICS & COMMUNICATION)

ADAPTIVE FILTER THEORY

Paper: MTECE-204N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Introduction:-Variance of a random variable, Estimation: Given No Observations, Given Dependent Observations, Complex and Vector Cases, Normal Equations, Design Examples, Linear Models and applications. Minimum-Variance Unbiased Estimation and applications.

Steepest-Descent Algorithms:- Steepest-Descent Method, Transient Behavior, Iteration-Dependent Step-Sizes, Newton's Method.

Unit-II

Stochastic-Gradient Algorithms:- LMS Algorithm and applications, Normalized LMS Algorithm, Non-Blind Algorithms, Blind Algorithms and properties, Affine Projection Algorithms, Ensemble-Average Learning Curves.

Steady-State Performance of Adaptive Filters:- Performance Measures, Stationary Data Model, Fundamental Energy-Conservation Relation, Fundamental Variance Relation, Mean-Square Performance of LMS and ε-NLMS.

Unit-III

Tracking Performance of Adaptive Filters:-Non-stationary Data Model, Fundamental Energy-Conservation Relation, Fundamental Variance Relation, Tracking Performance of LMS and ε-NLMS.

Transient Performance of Adaptive Filters:-Data Model, Data-Normalized Adaptive Filters, Weighted Energy-Conservation Relation, Weighted Variance Relation, Transient Performance of LMS and ε-NLMS.

Unit-IV

Recursive Least-Squares:-RLS Algorithm, Exponentially-Weighted RLS Algorithm, RLS Array Algorithms: Square-Root Factors, Norm and Angle Preservation, Motivation for Array Methods, RLS Algorithm, Inverse QR Algorithm, QR Algorithm, Extended QR Algorithm.

Text Books

1. "Fundamentals of Adaptive Filtering" by Ali H. Sayed, John Wiley and Sons.
2. "Adaptive Filter Theory" by S. Haykin, Pearson India.

Reference Books

1. "Adaptive Filters Theory and Applications", by B. Farhang-Boroujeny, John Wiley and Sons.
2. "Linear Estimation" by Kailath & Sayed, PHI
3. "Adaptive Filters" by Ali H. Sayed, John Wiley and Sons.

Master of Technology (ELECTRONICS & COMMUNICATION)

OPTICAL NETWORKS

Paper: MTECE-205N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Introduction and Challenges:- Advantages of optical network, telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network. Optical transmitters, semiconductor laser diode, photo detectors, tunable and fixed optical filters, channel equalizers, optical amplifiers

Unit-II

Single and Multi-hop Networks:- Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, experimental single hop networks: LAMBDANET, STARNET, SONATA, Rainbow, experimental multi-hop networks: Shuffle net, De Bruijn Graph, Hypercube.
Optical Access Network:- Introduction to access network, PON, EPON and WDN EPON: overview, principal of operation, architecture; dynamic wavelength allocation, gigabit Ethernet, radio over fiber network. Optical Metro Network: Introduction to metro network, overview of traffic grooming in SONET ring, traffic grooming in WDM ring, Interconnected WDM networks, packet communication using tunable WADM.

Unit-III

Optical switching:- Optical packet switching basics, slotted and unslotted networks, header and packet format, contention resolution in OPS networks, self-routing, examples on OPS node architecture, optical burst switching, signaling and routing protocols for OBS networks, contention resolution in OPS networks, multicasting, implementation and application.

Unit-IV

Routing and wavelength assignment:- Problem formulation, routing sub-problem: fixed routing, adaptive routing, fault tolerant routing, wavelength assignment sub-problem, algorithms: simulated annealing, flow deviation algorithm.
Optical Multicasting and traffic grooming:- Introduction to multicasting, Multicast-capable switch architecture, unicast, broadcast and multicast traffic, traffic grooming overview, static and dynamic traffic grooming.

Text Books

1. Rajiv Ramaswami and Kumar N. Sivarajan, "Optical Networks: A Practical Perspective", Morgan Kauffman (Elsevier Indian Edition), Second Edition, 2004.
2. C.Siva Ram Murthy and Mohan Guruswamy, "WDM Optical Networks: Concepts, Designs And Algorithms", Prentice Hall of India, 2002.

Reference Books

1. Optical Switching: Tarek S.El. Bawab, Springer.
2. Data Communication by Behrouz A, A Forouzen, Mc-Graw Hill,4th Edition

Master of Technology (ELECTRONICS & COMMUNICATION)

IMAGE PROCESSING (Lab.)

Paper: MTECE-206N **L-T-P: 0-0-3** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

1. Write a program (WAP) to implement point to point transformation on an image.
2. WAP to implement Morphological operations on an image.
3. WAP to implement Histogram equalization.
4. WAP to implement Geometric Transformations like rotation, scaling and translation.
5. WAP to implement 2-D FFT of an image.
6. WAP to implement filtering in Spatial Domain.
7. WAP to implement filtering in Frequency Domain.
8. WAP to implement various edge detection algorithms.
9. WAP to compute Entropy as a compression measure.
10. WAP to implement Digital Watermarking.

Master of Technology (ELECTRONICS & COMMUNICATION)
WIRELESS AND MOBILE COMMUNICATION (Lab.)

Paper: MTECE-207N **L-T-P: 0-0-3** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

1. Introduction to LabVIEW with its basic functions and study of modulation toolkit.
2. Study the interfacing of hardware (USRP module) with the PC and configuring the same.
3. Design and verify the FSK modulator and demodulator.
4. Design and verify the PSK modulator and demodulator.
5. Design and verify the QAM modulator and demodulator
6. Design and verify the FM modulator and demodulator sound card using USRP.
7. Design and verify the GPS modulator using USRP.
8. Design and verify the GPS demodulator using USRP.
9. Demonstrates the use of the Bluetooth functions to set up data transfer via Bluetooth between a server VI and a client VI.
10. Design two-dimensional convolution to perform image edge detection.

WITH EFFECT FROM THE ACADEMIC YEAR 2016-2017

ELECTIVE – I
for
ECE-3rd Semester

Master of Technology (ELECTRONICS & COMMUNICATION)
RF MEMS FOR COMMUNICATION ENGINEERING

Paper: MTEC-ELI-301N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Wireless Systems:-Introduction, spheres of wireless activities, the home and office, the ground fixed/mobile platform, the space platform, wireless standards, systems and architectures, conceptual wireless systems, wireless transceiver wireless appliances enable ubiquitous connectivity.

Unit-II

Elements of RF Circuit Design:-Physical aspects of RF circuit design, skin effect, transmission lines on thin substrates, self-resonance frequency, quality factor packaging, practical aspects of RF circuit design, DC biasing, impedance mismatch effects in RF MEMS.

Unit-III

RF MEMS:-RF MEMS, enabled circuit elements and models, RF/microwave substrate properties, micro machined, enhanced elements, capacitors, inductors, varactors, MEM switch, shunt MEM switch, low voltage hinged MEM switch approaches, push-pull series switch, folded-beam springs suspension series switch, resonators- transmission line planar resonators, cavity resonators, micromechanical resonators, film bulk acoustics wave resonators, MEMS modeling- mechanical modeling, electromagnetic modeling.

Novel RF MEMS:-Novel RF MEMS, enabled circuits, reconfigurable circuits, the resonant MEMS switch, capacitors, inductors, tunable CPW resonator, MEMS micro-switch arrays, reconfigurable circuits, double, stud tuner, Nth-stub tuner, filters, resonator tuning system, massively parallel switchable RF front ends, true delay digital phase shifters, reconfigurable antennas, tunable dipole antennas, tunable microstrip patch-array antenna.

Unit-IV

Phase shifters:- Fundamentals, X-band RF MEMS phase shifter for phased array applications, Ka-band RF MEMS phase shifter for radar systems applications, Film bulk acoustic wave filters, FBAR filter fundamentals, FBAR filter for PCS applications, RF MEMS filters, A Ka-band millimeter wave Micro machined tunable filter, a High-Q 8 MHz MEM resonators filter, RF MEMS Oscillators- fundamentals, a 14GHz MEM Oscillator, a Ka-Band micro machined cavity oscillator, a 2.4 GHz MEMS based voltage controlled oscillator.

Text Books

Hector J. De, Los Santos, “RF MEMS Circuit Design for Wireless Communications”, Artech House, 2002.

Reference Books

1. Vijay K. Varadan, K.J. Vinoy, K.A. Jose, “RF MEMS and their Applications”, John Wiley and Sons, Ltd., 2002.

2. Gabriel M. Rebeiz, “RF MEMS Theory, Design & Technology”, Wiley Interscience, 2002

Master of Technology (ELECTRONICS & COMMUNICATION)

ADVANCED PROCESSOR AND EMBEDDED SYSTEMS

Paper: MTEC-ELI-303N L-T-P: 4-0-0 Duration of Exam: 3 Hr.
Theory Marks: 60 Sessional Marks: 40

Unit-I

Microprocessor Architecture:-Instruction set – Data formats – Instruction formats – Addressing modes – Memory Hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline – pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation.

Unit-II

High Performance CISC Architecture:- PENTIUM The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipe lining – Branch prediction – The instruction and caches – Floating point unit – protected mode operation – Segmentation – paging – Protection – multitasking – Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing – Instruction types – Addressing modes – Processor flags – Instruction set – Basic programming of the Pentium Processor.

Unit III

High Performance RISC Architecture ARM:- The ARM architecture – ARM organization and implementation – The ARM instruction set – The thumb instruction set – Basic ARM Assembly language program – ARM CPU cores. 80196 ARCHITECTURE CPU operation – Interrupt structure – Timers – High Speed Input / Output Ports – I/O control and Status registers – Instruction Set – Addressing Modes – Simple Programming – Queues – Tables and Strings – Stack Memories – Key Switch – Parsing.

Unit IV

MOTOROLA 68HC11 Micro Controllers:- Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – Parallel I/O ports – Flats – Real time clock – Programmable timer – pulse accumulator – serial communication interface – A/D converter – hardware expansion – Basic Assembly Language programming.

PIC Micro Controller CPU Architecture:- Instruction set – Interrupts – Timers – Memory – I/O port expansion – I2 C bus for peripheral chip access – A/D converter – UART.

Text Books

1. Daniel Tabak, “Advanced Microprocessors”, McGraw Hill. Inc., 1995.
2. James L. Antonakos, “The Pentium Microprocessor”, Pearson Education, 1997.

Reference Books

1. Steave Furber, “ARM system – on – chip architecture”, Addison Wesley, 2000.
2. John.B..Peatman, “Design with PIC Micro controller”, Pearson Education, 1988
3. Gene. H.Miller, “Micro Computer Engineering”, Pearson Education, 2003.
4. James L Antonakos, “An Introduction to the Intel family of Microprocessors”, Pearson, 1999.
5. Barry B.Brey,, “The Intel Microprocessors Architecture, Programming and Interfacing”, PHI, 2002.

Master of Technology (ELECTRONICS & COMMUNICATION)
DIGITAL CONTROL SYSTEMS

Paper: MTEC-ELI-305N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

UNIT-I

Introduction and Modeling of Discrete Time System:-Introduction, Discrete Time System Representation, Mathematical Modeling of Sampling Process, Data Reconstruction. Revisiting Z-Transform, Mapping S-domain to Z-domain, Pulse Transfer Function, Pulse Transfer Function of Closed Loop Systems, Sampled Signal Flow Graph.

UNIT-II

Stability Analysis and Time Response of Discrete Time Systems:-Jury Stability Test, Stability Analysis using Bilinear Transformation. Transient and Steady State responses, Time Response Parameters of Prototype Second order System. Root Locus Method, Controller Design Using Root Locus. Root Locus based Controller Design Using MATLAB.

UNIT-III

Design of Sampled Data Control System:-Nyquist Stability Criterion Bode Plot, Lag, Lead and Lead-Lag Compensator Design Using Bode Plot, Design of Digital Control System with Deadbeat Response, Sampled Data Control System with Deadbeat Response.

UNIT-IV

Discrete State Space Model:-Introduction to State Variable Model, Various Canonical forms, Characteristic Equation, State Transition Matrix, Solution to Discrete State Equation, Controllability, Observability, Stability, Lyapunov Stability Theorem Pole Placement by State Feedback, Full order observer, Reduced Order Observer, Output Feedback Design: Theory and examples, LQR Design.

Text Books

1. B C Kuo, Digital control Systems, Oxford University Press, 2/e Indian Edition, 2007.
2. K Ogata, Discrete Time Control System, Prentice Hall, 2/e, 1995

Reference Books

1. M Gopal Digital Control & State Variable Methods,Tata Mc Graw Hill,2/e 2003.
2. G F Fraklin, J D Powell, M L Workman, Digital Control of Dynamic Systems Adison Wesley, Pearson Education, 2014.

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCE ELECTRONICS DEVICES & SENSORS

Paper: MTEC-ELI-307N L-T-P: 4-0-0 Duration of Exam: 3 Hr.
Theory Marks: 60 Sessional Marks: 40

Unit-I

Quantum Devices:- Quantum Electronic devices – Electrons in mesocopic structures – Short channel, MOS Transistor – split Gate Transistor – Electron wave transistor – Electron spin transistor – Quantum Dot array – Quantum computer- Bit and Qubit. Carbon Nanotube based logic gates, optical devices. . Connection with quantum dots, quantum wires, and quantum wells.

Unit-II

Tunneling Devices:- Tunneling element – Tunnel Effect and Tunneling Elements-Tunneling Diode – Resonant Tunneling Diode – Three -Terminal Resonate Tunneling Devices-Technology of RTD-Digital circuits design based on RTDs - Basics Logic Circuits – Single Electron Transistor(SET) – Principle – Coulomb Blockade-Performance – Technology- Circuit Design- Logic and Memory Circuits – SET adder as an Example of a Distributed Circuit.

Unit-III

Superconducting Devices And Photonics:- Basics - Macroscopic model- Super conducting switching Devices – Cryotron- Josephson Tunneling Devices- Elementary circuits – Associative or Content – Addressable Memory - SQUID – Flux Quantum device –LC –Gate – Magnetic Flux Quantum – Quantum cellular Automata-Quantum computer with Single Flux devices – SFQD- RSFQD – Application of superconducting devices

Unit-IV

Nano Sensors:- Micro and nano-sensors, Fundamentals of sensors, biosensor, micro fluids, Packaging and characterization of sensors, Method of packaging at zero level, dye level and first level. Sensors for aerospace and defense: Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, nano-cutting tools, Integration of sensor with actuators and electronic circuitry, Metal Insulator Semiconductor devices, molecular electronics, information storage, molecular switching, Schottky devices

Text Bools:

1. K. Goser, P. Glosekotter and J. Dienstuhl, “Nanoelectronics and Nanosystems-From Transistors to Molecular Quantum Devices” , Springer, 2004.

Reference Books:

1. Herve Rigneault, Jean-Michel Lourtioz, Claude Delalande, Ariel Levenson, “Nanophotonics”, ISTE.
2. W.R.Fahrner, “Nanotechnology and Nanoelectronics – Materials, Devices and Measurement Techniques” Springer, 2006 13
3. Sensors: Micro & Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.
4. Nanoscience & Technology: Novel structure and phenomea by Ping Sheng (Editor)
5. Nano Engineering in Science & Technology : An introduction to the world of nano design by Michael Rieth.
6. Tai –Ran Hsu, “MEMS & Microsystems Design and Manufacture”, Tata McGraw-Hill publication, 2001.

Master of Technology (ELECTRONICS & COMMUNICATION)

SOFT COMPUTING

Paper: MTEC-ELI-309N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**
Theory Marks: 60 **Sessional Marks: 40**

UNIT-I

Fuzzy Set Theory:- Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT-II

Optimization:- Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT-III

Neural Networks:- Supervised Learning Neural Networks – Perceptrons - Adaline – Backpropagation Mutilayer Perceptrons – Radial Basis Function Networks – Unsupervised Learning Neural Networks – Competitive Learning Networks – Kohonen Self-Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT-IV

Neuro Fuzzy Modeling:- Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

Applications Of Computational Intelligence:- Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Text Books

J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004

Reference Books

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

Master of Technology (ELECTRONICS & COMMUNICATION)
ADVANCED VERILOG HDL

Paper: MTEC-ELI-311N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Overview of FPGA: - Overview of a general FPGA device, FPGA Logic Cell Structures, FPGA Programmable Interconnect and I/O Ports, Overview of the Xilinx Spartan3 devices, Development flow.

Basics: - HDL based Design Flow, Why Verilog, Top-Down and Bottom-Up Design Methodology, Differences between modules and module instances, Parts of Simulation, Design Blocks, Stimulus Blocks, Basic Lexical Elements and Data Types, Operators.

Unit-II

Combinational Circuit: - Always block for a combinational circuit, If statement, Case statement, Routing structure of conditional control constructs, General coding guidelines for an always block, Parameter and constant, Test Bench for combinational circuits, Design examples: Hexadecimal digit to seven-segment LED decoder, Sign-magnitude adder, Barrel shifter.

Sequential Circuit:- D FF and register, Synchronous System, Code development of the FF and register, Shift register, Binary counter, Test Bench for sequential circuits, LED time-multiplexing circuit.

Unit-III

FSM:- Mealy and Moore outputs, FSM representation, FSM code development, Rising-edge detector, Debouncing circuit, Testing circuit, Dual-edge detector, Alternative Debouncing circuit, Parking lot occupancy counter.

FSMD:- Single RT operation, ASMD chart, Decision box with a register, Debouncing circuit based on RT methodology, Code with explicit data path components, Code with implicit data path components, Comparison, Testing circuit.

Unit-IV

Selected Topics of Verilog: - Blocking versus non-blocking assignment, Alternative coding style for sequential circuit, Use of the signed data type, Use of function in synthesis, Additional constructs for test bench development.

Text Books

1. Michael D. Ciletti, Advanced Digital Design with the Verilog HDL, Pearson India.
2. Pong P. Chu, FPGA Prototyping Using Verilog Examples, John Wiley

Reference Books

1. Steve Kilts, Advanced FPGA Design, Wiley Inter-Science
2. Zainalabedin Navabi,Verilog Digital System Design, McGraw Hill Edition
3. Samir Palnitkar,Verilog HDL, Pearson India

Master of Technology (ELECTRONICS & COMMUNICATION)
SECURITY, NETWORKS AND CRYPTOGRAPHY

Paper: MTEC-ELI-313N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Symmetric Ciphers:- Overview – classical Encryption Techniques – Block Ciphers and the Data Encryption standard – Introduction to Finite Fields – Advanced Encryption standard – Contemporary Symmetric Ciphers – Confidentiality using Symmetric Encryption.

Unit-II

Network Security Practice:- Authentication Applications – Kerbors – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security architecture – Authentication Header – Encapsulating Security Payload – Key Management.

Unit-III

System Security:- Intruders – Intrusion Detection – Password Management – Malicious Software – Firewalls – Firewall Design Principles – Trusted Systems.

Unit-IV

Wireless Security:- Introduction to Wireless LAN Security Standards – Wireless LAN Security Factors and Issues.

Text Books

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, 3rd Edition, 2003.

2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw Hill, 2003.

Reference Books

1. Bruce Schneier, “Applied Cryptography”, John Wiley and Sons Inc, 2001.

2. Stewart S. Miller, “Wi-Fi Security”, McGraw Hill, 2003.

3. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, 3rd Edition, Pearson Education, 2003.

WITH EFFECT FROM THE ACADEMIC YEAR 2016-2017

ELECTIVE – II
for
ECE-3rd Semester

Master of Technology (ELECTRONICS & COMMUNICATION)
BIO-MEDICAL SIGNAL PROCESSING

Paper: MTEC-ELII-302N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

The nature of biomedical signals, reasons for studying biomedical signal processing, what is a signal?, some typical sources of biomedical signals, continuous-time and discrete-time signals, assessing the relationship between two signals, why we do process signals?, types of signals: stochastic, fractal and chaotic, signal modeling as a framework for signal processing, noise.

Memory and correlation, properties of operators and transformations, memory in physical system, energy and power signals, the concept of autocorrelation, auto-covariance and autocorrelation for DT signals.

Unit-II

The impulse response, thought experiment and computer exercise: glucose control, convolution from of an LSI system, convolution for continuous-time system, convolution as signal processing, relation of impulse response to differential equation, convolution as a filtering process, impulse response for nonlinear systems, the glucose control problem revisited.

Frequency response, biomedical example(transducers for measuring knee angle), sinusoidal inputs to LTIC systems, generalized frequency response, frequency response of discrete-time systems, series and parallel filter cascades, ideal filters, frequency response and nonlinear systems, other biomedical examples.

Unit-III

Responses of linear continuous-time filters to arbitrary inputs, introductory example, conceptual basis of the Laplace transform, properties of (unilateral) Laplace transforms, inverse Laplace transform, transfer functions, feedback systems, biomedical applications of Laplace transform.

Modeling signals as sums of discrete-time sine waves, interactive example: periodic oscillation in the amplitude of breathing, discrete-time Fourier series, Fourier transform of discrete-time signals, parseval's relation for DT non-periodic signals, output of an LSI system, relation of an DFS and DTFT, Windowing, Sampling, Discrete Fourier Transform(DFT), Biomedical application.

Unit-IV

Noise removal and signal compensation, introductory example: reducing the ECG artifacts functions of LSI systems and Z-transform, properties of bilateral Z-transform, unilateral Z-transform, analyzing digital filter using Z-transform(DT transfer function), biomedical application of DT filters, overview: design of digital filters, IIR filter design, biomedical example of IIR filter design, IIR filter design by minimization of an error function, FIR filter design, frequency-band transformation, biomedical application of digital filtering.

Text Books:

1. Biomedical Signal Processing and Signal Modeling, *Authors* : Eugene N. Bruce, *Imprint* : Wiley Edition.

Reference Books

1. Biomedical Signal Processing, Akay, Elsevier
2. Biomedical Signal Processing, Rakesh Kumar

Master of Technology (ELECTRONICS & COMMUNICATION)
DETECTION AND ESTIMATION TECHNIQUES

Paper: MTEC-ELII-304N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Introduction:- Representations and models for random processes, Probability Spaces, Random variables, distribution and density functions, expectation, conditional probability, Bayes theorem, General Gaussian models.

Hypothesis testing:- Binary hypothesis testing, MAP criteria, Bayes risk, Neyman-Pearson theorem, multiple hypothesis tests, Performance of Binary Receivers in AWGN, Sequential Detection and Performance.

Unit-II

Signal detection with random parameters:- Detection of known signals in noise, Matched filter, Performance evaluations, Composite Hypothesis Testing, Unknown Phase, Unknown Amplitude, Unknown Frequency, White and Colored Gaussian Noise for Continuous Signals, Estimator-Correlator.

Detection of multiple hypotheses:- Bayes Criterion, MAP Criterion, M-ary Detection Using Other Criteria, Signal-Space Representations, Performance of M-ary Detection Systems, Sequential Detection of Multiple Hypotheses, Linear models, Rayleigh fading sinusoid.

Unit-III

Fundamentals of estimation theory:- Formulation of the General Parameter Estimation Problem, Relationship between Detection and Estimation Theory, Types of Estimation Problems.

Properties of Estimators:- Un-biasedness, efficiency, Criteria for good estimators, Minimum variance unbiased estimation, Cramer-Rao lower bound, asymptotic properties.

Unit-IV

Parameter estimation:- Random parameter, Bayes estimation, Mean square error (MSE), linear minimum mean-square estimates, linear square estimation, Maximum Likelihood Estimation, Least Square Estimation, Generalized Likelihood Ratio Test, Linear minimum variance estimator, BLUE.

Applications:- Detection and Estimation in Non-Gaussian Noise Systems, Characterization of Impulsive Noise, Detector Structures in Non-Gaussian Noise, Selected Examples of Noise Models, Receiver Structures, and Error-Rate Performance, Estimation of Non-Gaussian Noise Parameters.

Text Books

1. Harry L. Van Trees, "Detection, Estimation, and Modulation Theory, Part I," John Wiley & Sons, Inc. 2001.
2. A. Papolis and S. Unnikrishna Pillai, "Probability, Random Variables and stochastic processes". The McGraw-Hill 2002.

Reference Books

1. Steven M. kay, "Fundamentals of Statistical signal processing, volume-1: Estimation theory". Prentice Hall 1993.
2. Steven M. kay, "Fundamentals of Statistical signal processing, volume-2: Estimation theory". Prentice Hall 1993.

Master of Technology (ELECTRONICS & COMMUNICATION)
WIRELESS SENSOR NETWORKS

Paper: MTEC-ELII-306N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit I

Introduction Cellular and Ad Hoc Wireless Networks:-Applications of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks: Medium Access Scheme-Routing-Multicasting-Transport Layer Protocols-Pricing Scheme-Quality of Service Provisioning-Self Organization-Security-Addressing and Service Discovery Energy management-Scalability-Deployment Considerations, Ad Hoc Wireless Internet.

Unit II

Sensor Networks:- Comparison with Adhoc wireless networks-Challenges for WSNs - Difference between sensor networks and Traditional sensor networks –Types of Applications –Enabling Technologies for Wireless Sensor Networks –Single Node Architectures –Hardware Components – Energy Consumption of Sensor Nodes, Issues in Designing a Multicast Routing Protocol.

Unit III

Sensor Network Architecture:- Data Dissemination-Flooding and Gossiping-Data gathering Sensor Network Scenarios –Optimization Goals and Figures of Merit – Design Principles for WSNs- Gateway Concepts – Need for gateway – WSN to Internet Communication – Internet to WSN Communication –WSN Tunneling.

MAC Protocols:- MAC Protocols for Sensor Networks -Location Discovery-Quality of Sensor Networks-Evolving Standards-Other Issues- Low duty cycle and wake up concepts- The IEEE 802.15.4 MAC Protocols Energy Efficiency -Geographic Routing Mobile nodes

Unit IV

Routing Protocols:- Flat, Location based, Hierarchical Protocol, Design Constraints for Routing in WSN's, Clustered Architecture, LEACH Protocol, Hybrid energy efficient distributed clustering, Routing Gossiping and Agent based Unicast Forwarding-Energy Efficient Unicast-Broadcast and Multicast Geographic Routing-Mobile nodes-Security-Application Specific Support - Target detection and tracking-Contour/ edge detection-Field Sampling.

Text Books

1. Ibrahiem M.M. El Emary, S.Ramakrishnan, "Wireless Sensor Networks from Theory to Applications", CRC Press Taylor & Francis group, 2013

2. Holger Karl and Andreas Wiilig, "Protocols and Architectures for Wireless Sensor Networks" John Wiley & Sons Limited 2008.

Reference Books

1. Wilson , "Sensor Technology hand book," Elsevier publications 2005.

2. Anna Hac "Wireless Sensor Networks Design," John Wiley& Sons Limited Publications 2003.

3. C.Siva Ram Murthy and B.S.Manoj "Ad Hoc Wireless Networks," Pearson Edition 2005.

Master of Technology (ELECTRONICS & COMMUNICATION)
PATTERN RECOGNITION

Paper: MTEC-ELII-308N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit –I

Introduction:- Polynomial Curve Fitting, Probability theory, Model Selection, Curse of Dimensionality.
Probability Distributions:- Binary and Multinomial Variables, Gaussian Distribution, Exponential Family, Non parametric methods

Unit –II

Linear Model for Regressions:- Linear Basis Function Models, The Bias-Variance Decomposition, Bayesian Linear Regression, Bayesian Model Comparison
Linear Models for Classification:- Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models

Unit –III

Mixture Models and EM:- *K*-means Clustering, Mixtures of Gaussians An Alternative View of EM
Continuous Latent Variables:- Principal Component Analysis, Probabilistic PCA, Kernel PCA, Nonlinear Latent Variable Models

Unit –IV

Sparse Kernel Machines:- Maximum Margin Classifiers- SVM, Multiclass SVM, Relevance Vector Machines- RVM for regression, Analysis of sparsity, RVM for classification
Text Book:

Pattern Recognition and Machine Learning by Christopher M. Bishop Publisher: Springer

Reference Books

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
2. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.
3. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

Master of Technology (ELECTRONICS & COMMUNICATION)
MULTIMEDIA COMMUNICATION SYSTEMS

Paper: MTEC-ELII-310N L-T-P: 4-0-0 Duration of Exam: 3 Hr.

Theory Marks: 60 Sessional Marks: 40

Unit-I

Multimedia Communications:- Introduction about MMC, Multimedia information representation, Multimedia Applications: Interpersonal Applications & Entertainment applications .Multimedia Storage Device.

Unit-II

Text & Image Compression:-Compression principles, Text compression coding techniques, Still image coding: JPEG, Sequential and Progressive DCT based encoding algorithms, Lossless coding, Graphics Interchange Format, Tagged image file format, Introduction to JPEG 2000.

Unit-III

Audio Compression:-Digital audio representation and processing time domain and transform domain representations Transmission & processing of Digital Audio, Predictive DPCM , Linear Predictive Coding, Psychoacoustic model, perceptual coding, MPEG Audio Coder, Musical Instrument synthesizers.

Unit-IV

Video Compression:-Video Compression principles, frames in video and their encoders, concept of motion estimation and compensation, Content based video coding, Block diagram of MPEG 4 video encoder and decoder, An overview of H.261 and H.263 video coding techniques.

Text Books

1. Fred Halsall, Multimedia Communications, Pearson.
2. Y.Q. Shi & H.Sun, Image and Video Compression for Multimedia Engineering, CRC press, 2000

Reference Books

1. J.F.K Buford, Multimedia Systems, Pearson,2000
2. S.V.Raghavan & S. K. Tripathi , Networked Multimedia Systems, Prentice Hall,1998

Master of Technology (ELECTRONICS & COMMUNICATION)
QUALITY AND RELIABILITY OF ELECTRONIC SYSTEMS

Paper: MTEC-ELII-312N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Introduction:-Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF. Reliability mathematics: Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of probability, conditional probability, and random variables. Probability distribution: Exponential distribution, gamma distribution, binomial distribution, normal distribution and Weibull distribution.

Unit-II

Reliability Data Analysis: - The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model. System Reliability: Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.

Unit-III

Electronics System Reliability:- Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.

Unit-IV

Quality Management System & TQC: - Quality policy, cost & quality, concept of TQM, management of reliability & quality, elements of quality systems, essential steps in implementing quality system for ISO: 9000.

Text books:

1. Practical Reliability Engineering/ Patrick D.T., O'Connor/ John Wiley & Sons 4th edition).
2. Reliability Engineering/ E. Balagurusamy/ Tata McGraw- Hill.

Reference Books:

1. Quality control & Total quality Management / P.L.Jain/ Tata McGraw- Hill.
2. Reliability and Maintainability Engineering / Charles E. Ebeling / TMH .

Master of Technology (ELECTRONICS & COMMUNICATION)
RADAR AND SATELLITE COMMUNICATION SYSTEMS

Paper: MTEC-ELII-314N **L-T-P: 4-0-0** **Duration of Exam: 3 Hr.**

Theory Marks: 60 **Sessional Marks: 40**

Unit-I

Radar Basics:-Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses.

Unit-II

CW and MTI Radar:-Doppler Effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, delay line canceller, range gated MTI radar, blind speeds, staggered PRF, limitations to the performance of MTI radar, non-coherent MTI radar.

Tracking Radar:-Tracking radar: sequential lobing, conical scan, monopulse: amplitude comparison and phase comparison methods, Radar antennas. Radar displays. Duplexer

Unit-III

Basics Of Sattelite Communication:-Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, locating the satellite with respect to the earth, sub-satellite point, look angles, mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites.

Unit-IV

Sattelite Communication with Multiple Access Techniques:-Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Space craft antennas, multiple access techniques, comparison of FDMA, TDMA, CDMA.

Sattelite Links:-Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols

Text Books

1. Merril. I. Skolnik, *"Introduction to Radar Systems",* 2/e, MGH, 1981
2. Timothy Pratt and Charles Bostian, *"Satellite Communications",* John Wiley, 1986.

Reference Books

1. Mark A. Richards, James A. Scheer and William A. Holm, *"Principles of Modern Radar: Basic Principles,"* YesDee Publishing Pvt. Ltd., India, 2012.
2. Byron Edde, *"Radar: Principles, Technology, Applications",* Pearson, 2008.
3. Dennis Roddy, *"Satellite Communications",* MGraw Hill, Millan, 4th edition, 2013.