

AFFILIATED INSTITUTIONS
ANNA UNIVERSITY , CHENNAI
CURRICULAM AND SYLLABI - REGULATIONS – 2009
M.E – ELECTRONICS AND COMMUNICATION ENGINEERING
SEMESTER I

COURSE CODE	COURSE TITLE	L	T	P	C
THEORY					
MA9311	Applied Mathematics	3	1	0	4
EC9311	Advanced Digital Signal Processing	3	0	0	3
EC9312	Advanced Radiation Systems	3	0	0	3
EC9313	Optical Fiber Communication	3	0	0	3
EC9314	VLSI Design Techniques	3	0	0	3
EC9315	Wireless Communication Networks	3	0	0	3
PRACTICAL					
EC9317	Electronics and Communication Engineering Lab - I	0	0	4	2
TOTAL CREDITS					21

UNIT – I LINEAR ALGEBRAIC EQUATION AND EIGEN VALUE PROBLEMS (12)

System of equations- Solution by Gauss Elimination, Gauss-Jordan and LU decomposition method- Jacobi, Gauss-Seidal iteration method- Eigen values of a matrix by Jacobi and Power method.

UNIT - II WAVE EQUATION (12)

Solution of initial and boundary value problems- Characteristics- D'Alembert's Solution - Significance of characteristic curves - Laplace transform solutions for displacement in a long string - a long string under its weight - a bar with prescribed force on one end- free vibrations of a string.

UNIT - III SPECIAL FUNCTIONS (12)

Bessel's equation - Bessel Functions- Legendre's equation - Legendre polynomials Rodrigue's formula - Recurrence relations- generating functions and orthogonal property for Bessel functions - Legendre polynomials.

UNIT - IV RANDOM VARIABLES (12)

One dimensional Random Variable - Moments and MGF – Binomial, Poisson, Geometrical, Normal Distributions- Two dimensional Random Variables – Marginal and Conditional Distributions – Covariance and Correlation Coefficient - Functions of Two dimensional random variable

UNIT - V QUEUEING THEORY (12)

Single and Multiple server Markovian queueing models - Steady state system size probabilities – Little's formula - Priority queues - M/G/1 queueing system – P.K. formula.

L:45 T:15 TOTAL : 60 PERIODS

REFERENCES:

1. Sankara Rao.K. "Introduction to Partial Differential Equation ", PHI, 1995.
2. Taha. H.A., "Operations Research- An Introduction " 6th Edition, PHI, 1997.
3. Jain M.K. Iyengar, S.R.K. & Jain R.K., "International Methods for Scientific and
4. Engineering Computation", New Age International (P) Ltd, Publishers 2003.
5. Kanpur J.N. & Saxena. H.C. "Mathematical Statistics", S.Chand & Co.,New Delhi, 2003.
6. Greweal B.S. "Higher Engineering Mathematics", Khanna Publishers, 2005.

[Review of discrete-time signals and systems- DFT and FFT, Z-Transform, Digital Filters is recommended]

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes- Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener-Khintchine Relation- Power Spectral Density-Periodogram Spectral Factorization, Filtering random processes. Low Pass Filtering of White Noise. Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Estimation of spectra from finite duration signals, Non-Parametric Methods-Correlation Method , Periodogram Estimator, Performance Analysis of Estimators -Unbiased, Consistent Estimators-Modified periodogram, Bartlett and Welch methods, Blackman –Tukey method. Parametric Methods - AR, MA, ARMA model based spectral estimation. Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction- Forward and backward predictions, Solutions of the Normal equations-Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction , FIR Wiener filter and Wiener IIR filters ,Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm, Normalized LMS. Adaptive channel equalization-Adaptive echo cancellation-Adaptive noise cancellation- Adaptive recursive filters (IIR). RLS adaptive filters- Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation , Decimation by an integer factor - Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion- direct form FIR structures, Polyphase filter structures, time-variant structures. Multistage implementation of multirate system. Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

TOTAL: 45 PERIODS

REFERENCES:

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al.'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.' Statistical and adaptive signal Processing', McGraw Hill, Newyork, 2000.
5. Rafael C. Gonzalez, Richard E.Woods, 'Digital Image Processing', Pearson Education, Inc., Second Edition, 2004.(For Wavelet Transform Topic)

UNIT I CONCEPTS OF RADIATION**9**

Retarded vector potentials – Heuristic approach and Maxwell's equation approach. Electric vector potential F for a magnetic current source M . Duality theorem. The Lorentz gauge condition. Vector potential in Phasor form. Fields radiated by an alternating current element and half wave dipole. Total power radiated and radiation resistance of alternating current element and half wave dipole. Power radiated in the far field. Linear, Elliptical and circular polarization. Development of the Poincare sphere.

UNIT II ANTENNA ARRAYS**9**

N element linear arrays – uniform amplitude and spacing- Phased arrays- Directivity of Broadside and End fire arrays. Three dimensional characteristics - Pattern multiplication- Binomial arrays and Dolph- Tchebycheff arrays. Circular array. Mutual coupling in arrays, multidimensional arrays- phased arrays and array feeding techniques.

UNIT III ANTENNA SYNTHESIS**9**

Synthesis problem-Line source based beam synthesis methods (Fourier transform and Woodward- Lawson sampling method – Linear array shaped beam synthesis method – Low side lobe, narrow main beam synthesis methods - discretization of continuous sources. Schelkunoff polynomial method

UNIT IV APERTURE ANTENNAS**9**

Radiation from apertures - Huygens Principle. Rectangular apertures- techniques for evaluating gain, Circular apertures and their design considerations- Babinet's principle Fraunhofer and Fresnel diffraction. Complimentary screens and slot antennas. Slot and dipoles as dual antennas. Fourier transform in aperture antenna theory.

UNIT V HORN, MICROSTRIP, REFLECTOR ANTENNAS**9**

E and H plane sectoral Horns. Pyramidal horns. Conical and corrugated Horns. Multimode horns. Phase center. Microstrip antennas – feeding methods. Rectangular patch- Transmission line model – Circular patch Parabolic Reflector antennas – Prime focus and Cassegrain reflectors. Equivalent focal length of Cassegrain antennas. Spillover and taper efficiencies. Optimum illumination.

TOTAL:45 PERIODS**REFERENCES:**

1. Balanis, C.A., "Antenna Theory" Wiley, 2003
2. Warren L. Stutzman and Gary A. Thiele, "Antenna theory and design" John Wiley and sons 1998
3. Jordan, E.C., "Electromagnetic waves and Radiating systems". PHI 2003
4. Krauss, J.D., "Radio Astronomy" McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D., Fleisch, D.A., "Electromagnetics" McGraw-Hill, 1999

EC9313

OPTICAL FIBER COMMUNICATION

L T P C
3 0 0 3

UNIT - I OPTICAL FIBERS (9)

Geometrical description – wave propagation- Dispersion in single mode (SM) and multimode (MM) fibers – Limitations due to dispersion – Fiber Losses – Non liner optical effects.

UNIT - II OPTICAL AMPLIFIERS (9)

Concepts- Semiconductor optical Amplifier – Raman and Brillouin amplifier – Fiber amplifiers – Erbium doped amplifiers – System applications

UNIT - III DISPERSION MANAGEMENT (9)

Need- Precompensation schemes – Postcompensation techniques – Dispersion compensating fibers – Optical filters – Fiber Bragg gratings - Optical Phase Conjugation – Long Haul lightwave systems – High capacity systems.

UNIT - IV MULTICHANNEL SYSTEMS (9)

WDM lightwave systems- WDM components – System performance issues – Time Division Multiplexing (TDM) - Sub carrier multiplexing – Code Division Multiplexing, DWDM.

UNIT - V COHERENT LIGHTWAVE SYSTEMS (9)

Concepts – Modulation formats – Demodulation formats – Bit Error Rate (BER) – Sensitivity degradation – System performance.

TOTAL: 45 PERIODS

REFERENCES:

1. G.P. Agrawal, "Fiber optic communication systems", 3rd Ed, John Wiley & Sons, New York, 2002.
2. H. Franz & V.K.Jain, "Optical Communication Systems", Narosa Publications New Delhi, 1995.
3. G. Keiser, "Optical fiber communication systems", McGraw-Hill, 3rd Edition, NewYork, 2000.
4. H. Franz & V.K. Jain, "Optical communication, Components and Systems, Narosa Publications, New Delhi, 2002.
5. Selvarajan, S. Kar and T. Srinivas, Optical fiber Communication – Principle and Systems, Tata McGraw-Hill, 2002.

EC9314

VLSI DESIGN TECHNIQUES

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3 0 0 3

UNIT - I VLSI DESIGN PROCESS & MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY (9)

VLSI Design Process – Architectural Design – Logical Design – Physical Design – Layout Styles –Full custom, Semicustom approaches. NMOS and PMOS transistors, Threshold voltage- Body effect- Design equations- Second order effects. MOS models and small signal AC characteristics. Basic CMOS technology.

UNIT - III WIRELESS NETWORK OPERATION (9)

Wireless Network Topologies – Cellular Topology – Cell fundamentals – Signal to Interference Ratio – Capacity Expansion – Mobility Management – Resources and Power Management – Security in Wireless Networks.

UNIT - IV WIRELESS WAN (9)

GSM and TDMA Technology – Mobile Environment – Communication in the Infrastructure – CDMA Technology – IS95 – IMT2000 – Mobile Data Networks – CDPD Networks – GPRS – Mobile Application Protocol.

UNIT - V WIRELESS LANS AND HIPERLANS (9)

Introduction to wireless LANs – IEEE 802.11 – WPAN IEEE 802.15 – Mobile AdHoc Networks(MANET)- Principle and operation - Wireless Home Networking – Concepts of Bluetooth Technology – Wireless Geolocation.

TOTAL: 45 PERIODS

REFERENCES:

1. Kaveth Pahlavan, K.Prasanth Krishnamurthy, "Principles of Wireless Networks", Pearson Education Asia, 2002
2. Leon Garcia, Widjaja, "Communication Networks", Tata McGraw Hill, New Delhi, 2000.
3. William Stallings, "Wireless Communications and Networks", Second Edition Prentice Hall, India 2007
4. Jon W Mark , Weihua Zhuang, "Wireless communication and Networking", Prentice Hall India 2003

**EC9317 ELECTRONICS AND COMMUNICATION ENGINEERING LAB - I L T P C
0 0 4 2**

1. Modeling of Sequential Digital system using VHDL.
2. Modeling of Sequential Digital system using Verilog.
3. Writing Test Benches Using Verilog / VHDL
4. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
5. Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
6. Implementation of 8 Bit ALU in FPGA / CPLD.
7. Implementation of MAC Unit using FPGA
8. Implementation of RF circuits - Mixers, Oscillators and Frequency Synthesizers
9. Optical link simulation using simulator packages.
10. Study of Blue Tooth Techniques & GPS Receiver.