ANNA UNIVERSITY COIMBATORE

CURRICULUM AND SYLLABI 2007

M.E. (ELECTRONICS AND COMMUNICATION ENGINEERING)

ELIGIBILITY:

Candidates for admission to the M.E. Course in Electronics and Communication Engineering should have passed B.E/ B.Tech in Electronics & Communication Engineering / Electrical and Electronics Engineering / Electronics and Instrumentation Engineering/ Bio-Medical Engineering/ Medical Electronics Engineering (or) an examination of any University or Authority accepted by the Anna University.

CURRICULUM 2008 - FULL TIME MODE

SEMESTER – I

Code No.	Course Title	L	T	P	M	C
Theory						
	Applied Mathematics	3	1	0	100	4
	Advanced Digital Signal Processing	3	0	0	100	3
	Advanced Radiation Systems	3	0	0	100	3
	Optical Fiber Communication	3	0	0	100	3
	VLSI Design Techniques	3	0	0	100	3
	Wireless Communication Networks	3	0	0	100	3
Practical						
	Electronics and Communication Engineering LAB - I	0	0	4	100	2

SEMESTER – II

Code No.	Course Title	L	T	P	M	C
Theory						
	Machine Vision	3	0	0	100	3
	RF system Design	3	0	0	100	3
	Optical Signal Processing	3	0	0	100	3
	Elective I	3	0	0	100	3
	Elective II	3	0	0	100	3
	Elective III	3	0	0	100	3
Practical						
	Electronics and Communication Engineering LAB - II	0	0	4	100	2

SEMESTER – III

Code No.	Course Title	L	T	P	M	C
Theory						
	Elective IV	3	0	0	100	3
	Elective V	3	0	0	100	3
	Elective VI	3	0	0	100	3
Practical						
	Project Work (Phase I)	0	0	12	200	6

SEMESTER – IV

Code No.	Course Title	L	T	P	M	C
	Project Work (Phase II)	0	0	24	400	12

LIST OF ELECTIVES
FOR SEMESTER-II (ELECTIVE- I, ELECTIVE-II, ELECTIVE-III)

Code No.	Subject Name	L	T	P	M	C
	Mobile and Personal Communications	3	0	0	100	3
	Data Communication Networks	3	0	0	100	3
	Neural Networks and Applications	3	0	0	100	3
	ASIC Design	3	0	0	100	3
	High Performance Communication Networks	3	0	0	100	3
	Low Power VLSI Design	3	0	0	100	3
	Analysis and Design of Analog Integrated Circuits	3	0	0	100	3
	Multimedia Systems	3	0	0	100	3
	Design of Semiconductor Memories	3	0	0	100	3
	Communication Network Security	3	0	0	100	3

LIST OF ELECTIVES
FOR SEMESTER-III (ELECTIVE- IV, ELECTIVE-V, ELECTIVE-VI)

Code No.	Subject Name	L	T	P	M	C
	Speech and Audio Signal Processing	3	0	0	100	3
	VLSI Signal Processing	3	0	0	100	3
	Satellite Communication	3	0	0	100	3
	Real Time Embedded Systems	3	0	0	100	3
	Genetic Algorithms and Applications	3	0	0	100	3
	Network Routing Algorithms	3	0	0	100	3
	Simulation of Communication Systems and Networks	3	0	0	100	3
	E-Commerce Technology	3	0	0	100	3
	Wireless LAN	3	0	0	100	3
	Microwave Integrated Circuits	3	0	0	100	3
	Optical Communication Networks	3	0	0	100	3

SEMESTER - I

APPLIED MATHEMATICS 3 1 0 100

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

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, Publlishers 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.

ADVANCED DIGITAL SIGNAL PROCESSING 3 0 0 100

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

UNIT I 9

DISCRETE RANDOM SIGNAL PROCESSING

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 9

SPECTRUM ESTIMATION

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 9

LINEAR ESTIMATION AND PREDICTION

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 9

ADAPTIVE FILTERS

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 9

MULTIRATE DIGITAL SIGNAL PROCESSING

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

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)

ADVANCED RADIATION SYSTEMS 3 0 0 100

UNIT I 9

CONCEPTS OF RADIATION

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. Totalpower 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 9

ANTENNA ARRAYS

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 9

APERTURE ANTENNAS

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

UNIT V 9

HORN, MICROSTRIP, REFLECTOR ANTENNAS.

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

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

OPTICAL FIBER COMMUNICATION 3 0 0 100

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

REFERENCES:

1. G.P. Agrawal, “Fiber optic communication systems”, 3nd 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.
1. Selvarajan, S. Kar and T. Srinivas, Optical fiber Communication – Principle and Systems, Tata McGraw-Hill, 2002.

VLSI DESIGN TECHNIQUES 3 0 0 100

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 - II INVERTERS AND LOGIC GATES (9)

NMOS and CMOS Inverters, Stick diagram, Inverter ratio, DC and transient characteristics , switching times, Super buffers, Driving large capacitance loads, CMOS logic structures , Transmission gates, Static CMOS design, dynamic CMOS design.

UNIT - III CIRCUIT CHARACTERISATION & PERFORMANCE ESTIMATION (9)

Resistance estimation, Capacitance estimation, Inductance, switching characteristics, transistor sizing, power dissipation and design margining. Charge sharing .Scaling.

UNIT - IV VLSI SYSTEM COMPONENTS CIRCUITS (9)

Multiplexers, Decoders, comparators, priority encoders, Shift registers. Arithmetic circuits – Ripple carry adders, Carry look ahead adders, High-speed adders, Multipliers

UNIT - V VERILOG HARDWARE DESCRIPTION LANGUAGE (9)

Overview of digital design with Verilog HDL, hierarchical modelling concepts, modules and port definitions, gate level modelling, data flow modelling, behavioral modelling, task & functions, Test Bench.

Total 45

REFERENCES:

1. Jan M Rabaey, " Digital Integrated Circuits" Prentice Hall of India, 2002.
2. Sung-Mo Kang and Yusuf Leblebici, "CMOS Digital Integrated Circuits- Analysis and Design",Tata McGraw Hill,2003.
3 Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2nd edition, 2000.
4 John P.Uyemura "Introduction to VLSI Circuits and Systems", John Wiley & Sons, Inc., 2002.
5 Samir Palnitkar, "Verilog HDL", Pearson Education, 2nd Edition, 2004
6 Eugene D.Fabricius, Introduction to VLSI Design McGraw Hill International Editions, 1990
7 J.Bhasker, B.S.Publications, "A Verilog HDL Primer", 2nd Edition, 2001
8 Pucknell, "Basic VLSI Design", Prentice Hall of India Publication, 1995.
9 Wayne Wolf "Modern VLSI Design System on chip. Pearson Education.2002.

WIRELESS COMMUNICATION NETWORKS 3 0 0 100

UNIT - I WIRELESS MEDIUM (9)
Air Interface Design – Radio propagation mechanism – Pathloss modeling and Signal Coverage – Effect of Multipath and Doppler – Channel Measurement and Modelling – Simulation of Radio Channel.

UNIT - II WIRELESS MEDIUM ACCESS (9)
Fixed Assignment Access for Voice Networks – Random Access for Data Networks -Integration of Voice and Data Traffic.

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

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

ELECTRONICS AND COMMUNICATION ENGINEERING LAB – I

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.

SEMESTER -II

MACHINE VISION 3 0 0 100

UNIT I DIGITAL IMAGE PROCESSING FUNDAMENTALS 9

Digital image representation – an image model – digital image processing transforms – overview of L-transforms – transforms and Fourier Transforms

UNIT II IMAGE PROCESSING & SEGMENTATION 9

Image enhancement and image restoration – histogram modification techniques – image smoothening – image sharpening – algebraic approach to restoration – constrained and unconstrained restoration – image encoding – image segmentation and description – point and region dependent techniques.

UNIT III BOUNDARY DETECTION 9

Edge finding – surface orientation – optical flow – design – growing

UNIT IV IMAGE REPRESENTATION 9

Texture – texture as pattern recognition problem – two and three dimensional geometric structures – boundary representation- regions representation – shape properties-knowledge representation and use

UNIT V MATCHING AND INFERENCE 9

Semantic nets – matching – inference – computer reasoning – production systems – active knowledge – goal achievement

TOTAL : 45

REFERENCES:

1. Computer Vision, A modern Approach By Forsyth and Ponce, Pearson Education, 2003.
2. Rosenfeld A and Kak A.C., “Digital Picture Processing”, Academic Press, 1982
3. Ballard B and Brown B, “Computer Vision”, Prentice Hall of India, 1982
4. Mallot, Computational Vision: Information Processing in Perception and Visual Behavior. Cambridge, MA: MIT Press, 2000.
5. Gonzalez.R and Wintz.P, Digital Image Processing Addison Wesley Publishing Co. USA, 1987.

RF SYSTEM DESIGN 3 0 0 100

UNIT I 9

RF ISSUES

Importance of RF design, Electromagnetic Spectrum, RF behaviour of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.

UNIT II 9

RF FILTER DESIGN

Overview , Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

UNIT III 9

ACTIVE RF COMPONENTS & APPLICATIONS

RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstripline matching networks, Amplifier classes of operation and biasing networks.

UNIT IV 9

RF AMPLIFIER DESIGNS

Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers.

UNIT V 9

OSCILLATORS, MIXERS & APPLICATIONS

Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers ; Phase Locked Loops ; RF directional couplers and hybrid couplers ; Detector and demodulator circuits.

Total: 45 Hours

REFERENCES:

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. Joseph . J. Carr, Secrets of RF Circuit Design , McGraw Hill Publishers, Third Edition, 2000.
3. Mathew M. Radmanesh, Radio Frequency & Microwave Electronics, Pearson Education Asia, Second Edition, 2002.
4. Ulrich L. Rohde and David P. NewKirk, RF / Microwave Circuit Design, John Wiley & Sons USA 2000.
5. Roland E. Best, Phase - Locked Loops: Design, simulation and applications, McGraw Hill Publishers 5^{TH} edition 2003.

OPTICAL SIGNAL PROCESSING 3 1 0 100

UNIT I 9
BASIC SIGNAL PARAMETERS

Characterisation, Sample function, geometrical optics, basic laws, refraction by prisms, lens formula, imaging condition, optical invariants, physical optics, Transforms: Fresnel, Fourier, Inverse Fourier and Extended Fourier.

UNIT II 9
SPECTRAL ANALYSIS

Spatial light modulation, spatial light modulators, detection process, system performance process, dynamic range, raster format, spectral analysis.

UNIT III 9
SPATIAL FILTERING AND FILTERING SYSTEM

Types of spatial filters, optical signal processing and filter generation, read out module, orientation and sequential search, applications of optical spatial filter.

UNIT IV 9
ACOUSTO-OPTIC DEVICES AND POWER SPECTRUM ANALYSIS

Acousto-optic cells, spatial light modulators, Raman – Nath and Bragg mode, basic spectrum analyzer, aperture weighting, dynamic range and SNR, photo detector, geometric considerations, radiometer.

UNIT V 9
HOMODYNE AND HETERODYNE SPECTRUM ANALYSERS

Overlapping of waves, photo detector size, optimum photo detector size for 1D and 2D structure, Optical radio, spatial and temporal frequencies. Distributed and local oscillator. Dynamic range comparison of heterodyne and power spectrum analysers.

L + T = 45 + 15 = 60

REFERENCES:

1. Vanderlught, Optical Signal Processing, John Wiley & Sons, New York, 1992.
2. P.K. Das, Optical Signal Processing Fundamentals, Narosa Publishing New Delhi, 1991.
3. Bradley G. Boone "Signal Processing using optics", Oxford University Press, 1998.

ELECTRONICS AND COMMUNICATION ENGINEERING LAB – II

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1. Simulation and implementation of congestion control algorithm in ATM Network. (Using free ATM network simulator software)
2. Simulation of audio compression algorithm
3. Simulation of video compression algorithm
4. Demonstrate a simple multicast client/server
5. Test the Transaction TCP in client/server architecture
6. RFID Development Kit
   (a) Tag all assets inside Embedded Wireless Lab with RFID
   (b) Use of passive and active tags for Library Management system
7. Using CDMA Spread Spectrum Trainer
   (a) Embedded wireless solutions using CDMA network
   (b) GPS integrated GSM modules using SMS for in tracking & remote monitoring applications
8. Study of Smart Wireless Applications & Wireless Sensor Networks

LIST OF ELECTIVES
FOR SEMESTER-II (ELECTIVE- I, ELECTIVE-II, ELECTIVE-III)

MOBILE AND PERSONAL COMMUNICATIONS 3 0 0 100

UNIT I 9

INTRODUCTION TO MOBILE AND PERSONAL COMMUNICATION

History of wireless communications, Mobile and Personal communications: Past, present and future, Cell phone generations, cellular networks, The mobile radio environment, Cellular concept and frequency reuse, Multiple access technologies for cellular systems, Channel assignment and hand off, Mobile radio interference.

UNIT II 9

PROPAGATION ISSUES

Prediction of propagation loss-Prediction over flat terrain, Point-point prediction, Calculation of fading and methods of reducing fading- Amplitude fading, Selective fading, Diversity schemes, combining techniques.

UNIT III 9

ANTENNA SYSTEMS

Design parameters at the Base station- Antenna locations, spacing, heights, configurations, Design parameters at the Mobile unit- Directional antennas and diversity schemes, Antenna connections and locations.

UNIT IV 9

PERSONAL COMMUNICATION SYSTEMS (PCS)

The concept of PCS/PCN, Function , Evolution of personal Communications, Requirements of PCS,PCS environment, Differences between PCS and Cellular systems, IS-136(TDMA)PCS, IS-95 CDMA PCS, Data Communication with PCS, PCS standards, PCS economics

UNIT V 9

UNIVERSAL PERSONAL TELECOMMUNICATION (UPT)

UPT: Concept and service aspects, Functional Architecture, Numbering, Routing and Billing aspects, Access security requirements for UPT Digital Cellular Mobile Systems- GSM, IS-136, PDC, IS-95, IMT-2000: Third generation Mobile Communication Systems, W-CDMA, CDMA-2000, EDGE

REFERENCES:

1. William C.Y.Lee, “Mobile Communications Design Fundamentals”, second edition, John Wiley & sons, 1993.
2. RajPandya, “Mobile and Personal Communication systems and services”, PHI, New Delhi, 2003.
3. Blake, “Wireless Communication Technology”, Thomson Asia Pte, Ltd, Singapore, 2001.
4. Bud Bates, “Wireless networked telecommunications- Concepts, Technology and Implementation” , McGraw-Hill International Editions, 1995.
5. Jack.M.Holtzman, David J. Goodman (Er.s), “ Wireless and Mobile Communications”, Allied Publishers Limited, 1996.
6. Andy Dorman, “The Essential Guide to Wireless Communications applications”, Pearson Education Asia, 2001.

DATA COMMUNICATION NETWORKS 3 0 0 100

UNIT I 9

DATA COMMUNICATION FUNDAMETNALS AND OSI REFERENCE MODEL

Overview of Data Communication and Networking – Analog / Digital signals and transmission, Simplex / Half and Full duplex and Synchronous / Asynchronous communication – Multiplexing – Transmission Media – Circuit switching and Telephone network – DSL, ADSL and Cable Modem – Network Configuration, Concepts of layering , ISO's OSI reference model – Physical Layer Standards – RS 232C, RS 449, RS 422A / 423A, X.21 and V.24.

UNIT II 9

DATA LINK LAYER

Error detection and correction – Data link control and protocols – Flow and Error control – Sliding window protocol – ARQ schemes – HDLC protocol – Point to Point Protocol – Multiple Access Techniques – Random Access, Controlled Access – Logical Link Control (LLC) and Medium Access Sub-layer functions – LAN standards – IEEE 802.3(CSMA/CD) – Fast Ethernet – Giga Bit Ethernet, IEEE 802.4 (Token Bus), IEEE 802.5 (Token Ring), IEEE 802.11 (Wireless LAN).

UNIT III 9

NETWORK LAYER

Network layer - Services - Virtual circuits and Data-grams – Inter-networking – Addressing – Routing – Link state and Distance Vector Routing - Congestion control algorithms - Network Layer Protocols – ARP, RARP, IPv4, ICMP, IPv6 and ICMPv6 – Uni-cast Routing - RIP, OSPF, BGP and Multicast Routing – IGMP, DVMRP, MOSPF, CBT, PIM.

UNIT IV 9

TRANSPORT LAYER

Transport layer - Services – Processes to Processes Delivery – Transmission Control Protocol (TCP) - User Datagram Protocol – Data Traffic – Congestion Control and Quality of Service – Techniques to improve QOS – Integrated Services – Differentiated Services.

UNIT V 9

SESSION, PRESENTATION AND APPLICATION LAYERS

Session layer Design Issues, services - Presentation layer Design Issues – Network security – Cryptography, Message Security, Digital Signature, User Authentication, Key Management, Security Protocols in Internet – Application layer Design Issues – DNS, E-mail (SMTP), FTP, HTTP, WWW, Virtual Terminal Protocol.

Total: 45

REFERENCES :

1. Forouzan : Data Communications and Networking, TMH, 3rd Edition, 2004.
2. William Stallings : Data and Computer Communications, PHI, 7th Edition, 2003.
3. Brijendra Singh : Data Communication and Computer Networks, PHI, 2004.
4. Michael A.Gallo, William A. Hancock : Computer Communication and Networking Technologies, Thomson Asia, 2003.
5. S.Tanenbaum : Computer Networks, 4th Edition, Pearson Education Asia Inc., 2004.
6. Leon-Garcia, Widjaja : Communication Networks, Fundamental Concepts and Key Architecture, TMH, 2nd Edition, 2004.
7. Gerd E.Keiser : Local Area Networks, TMH, 2nd Edition, 2002

NEURAL NETWORKS AND APPLICATIONS 3 0 0 100

UNIT I 9

BASIC LEARNING ALGORITHMS:

Biological Neuron – Artificial Neural Model - Types of activation functions – Architecture: Feedforward and Feedback – Learning Process: Error Correction Learning –Memory Based Learning – Hebbian Learning – Competitive Learning - Boltzman Learning – Supervised and Unsupervised Learning – Learning Tasks: Pattern Space – Weight Space – Pattern Association – Pattern Recognition – Function Approximation – Control – Filtering - Beamforming – Memory – Adaptation - Statistical Learning Theory – Single Layer Perceptron – Perceptron Learning Algorithm – Perceptron Convergence Theorem – Least Mean Square Learning Algorithm – Multilayer Perceptron – Back Propagation Algorithm – XOR problem – Limitations of Back Propagation Algorithm.

UNIT II 9

RADIAL-BASIS FUNCTION NETWORKS AND SUPPORT VECTOR MACHINES:

RADIAL BASIS FUNCTION NETWORKS:

Cover's Theorem on the Separability of Patterns - Exact Interpolator – Regularization Theory – Generalized Radial Basis Function Networks - Learning in Radial Basis Function Networks - Applications: XOR Problem – Image Classification.

SUPPORT VECTOR MACHINES:

Optimal Hyperplane for Linearly Separable Patterns and Nonseparable Patterns – Support Vector Machine for Pattern Recognition – XOR Problem - ϵ-insensitive Loss Function – Support Vector Machines for Nonlinear Regression

UNIT III 9

COMMITTEE MACHINES:

Ensemble Averaging - Boosting – Associative Gaussian Mixture Model – Hierarchical Mixture of Experts Model(HME) – Model Selection using a Standard Decision Tree – A Priori and Postpriori Probabilities – Maximum Likelihood Estimation – Learning Strategies for the HME Model - EM Algorithm – Applications of EM Algorithm to HME Model

NEURODYNAMICS SYSTEMS:

Dynamical Systems – Attractors and Stability – Non-linear Dynamical Systems- Lyapunov Stability – Neurodynamical Systems – The Cohen-Grossberg Ttheorem.

UNIT IV 9

ATTRACTOR NEURAL NETWORKS:

Associative Learning – Attractor Neural Network Associative Memory – Linear Associative Memory – Hopfield Network – Content Addressable Memory – Strange Attractors and Chaos - Error Performance of Hopfield Networks - Applications of Hopfield Networks – Simulated Annealing – Boltzmann Machine – Bidirectional Associative Memory – BAM Stability Analysis – Error Correction in BAMs - Memory Annihilation of Structured Maps in BAMS – Continuous BAMs – Adaptive BAMs – Applications

ADAPTIVE RESONANCE THEORY:

Noise-Saturation Dilemma - Solving Noise-Saturation Dilemma – Recurrent On-center –Off-surround Networks – Building Blocks of Adaptive Resonance – Substrate of Resonance Structural Details of Resonance Model – Adaptive Resonance Theory – Applications

UNIT V 9

SELF ORGANISING MAPS:

Self-organizing Map – Maximal Eigenvector Filtering – Sanger's Rule – Generalized Learning Law – Competitive Learning - Vector Quantization – Mexican Hat Networks - Self-organizing Feature Maps – Applications

PULSED NEURON MODELS:

Spiking Neuron Model – Integrate-and-Fire Neurons – Conductance Based Models – Computing with Spiking Neurons.

Total: 45

REFERENCES:

1. Satish Kumar, "Neural Networks: A Classroom Approach", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2004.
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation", 2ed., Addison Wesley Longman (Singapore) Private Limited, Delhi, 2001.
3. Martin T.Hagan, Howard B. Demuth, and Mark Beale, "Neural Network Design", Thomson Learning, New Delhi, 2003.
4. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education (Singapore) Private Limited, Delhi, 2003.

ASIC DESIGN 3 0 0 100

UNIT I 9

INTRODUCTION TO ASICS, CMOS LOGIC AND ASIC LIBRARY DESIGN

Types of ASICs - Design flow - CMOS transistors CMOS Design rules CombinationalLogic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors - Transistor Parasitic Capacitance- Logical effort –Library cell design - Library architecture .

UNIT II 9

PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS

Anti fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT - Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

UNIT III 9

PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN ENTRY

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 - Altera FLEX –Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation.

UNIT IV 9

LOGIC SYNTHESIS, SIMULATION AND TESTING

Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

UNIT V 9

ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING

System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow –global routing - detailed routing - special routing - circuit extraction - DRC.

TOTAL : 45

REFERENCES

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.
2. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical
3. Approach,Prentice Hall PTR, 2003.
4. Wayne Wolf, FPGA-Based System Design, Prentice Hall PTR, 2004.
5. R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.
6. F. Nekoogar. Timing Verification of Application-Specific Integrated Circuits (ASICs). Prentice Hall PTR, 1999.

HIGH PERFORMANCE COMMUNICATION NETWORKS 3 0 0 100

UNIT I 9

PACKET SWITCHED NETWORKS

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE802.11) FDDI, DQDB, SMDS: Internetworking with SMDS

UNIT II 9

ISDN AND BROADBAND ISDN

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

UNIT III 9

ATM AND FRAME RELAY

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.

Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

UNIT IV 9

ADVANCED NETWORK ARCHITECTURE

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V 9

BLUE TOOTH TECHNOLOGY

The Blue tooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio, The Link Manager, The Host controller interface; The Blue tooth module-Protocol stack Part I: Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

TOTAL : 45

REFERENCES:

1. William Stallings,"ISDN and Broadband ISDN with Frame Relay and ATM", 4th edition, Pearson education Asia, 2002.
2. Leon Gracia, Widjaja, "Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Jennifer Bray and Charles F.Sturman,"Blue Tooth" Pearson education Asia, 2001.
4. Sumit Kasera, Pankaj Sethi, "ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
5. Rainer Handel, Manfred N.Huber and Stefan Schroder ,"ATM Networks",3rd edition, Pearson education asia,2002.
6. Jean Walrand and Pravin varaiya ,"High Performance Communication networks",2nd edition, Harcourt and Morgan Kauffman,London,2000.
7. William Stallings,"High-speed Networks and Internets", 2nd edition, Pearson education Asia, 2003.

LOW POWER VLSI DESIGN 3 0 0 100

UNIT I 9

POWER DISSIPATION IN CMOS

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices- Basic principle of low power design.

UNIT II 9

POWER OPTIMIZATION

Logical level power optimization – Circuit level low power design – Circuit techniques for reducing power consumption in adders and multipliers.

UNIT III 9

DESIGN OF LOW POWER CMOS CIRCUITS

Computer Arithmetic techniques for low power systems – Reducing power consumption in memories – Low power clock, Interconnect and layout design – Advanced techniques – Special techniques

UNIT IV 9

POWER ESTIMATION

Power estimation techniques – Logic level power estimation – Simulation power analysis – Probabilistic power analysis.

UNIT V 9

SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER

Synthesis for low power –Behavioral level transforms- Software design for low power -

Total: 45

REFERENCES:

1. K.Roy and S.C. Prasad , LOW POWER CMOS VLSI circuit design, Wiley,2000
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, Designing CMOS Circuits For Low Power, Kluwer,2002
3. J.B. Kuo and J.H Lou, Low voltage CMOS VLSI Circuits,Wiley 1999.
4. A.P.Chandrakasan and R.W. Broadersen, Low power digital CMOS design, Kluwer,1995.
5. Gary Yeap, Practical low power digital VLSI design, Kluwer,1998.
6. Abdellatif Bellaouar,Mohamed.I. Elmasry, Low power digital VLSI design,s Kluwer, 1995.
7. James B. Kuo, Shin – chia Lin, Low voltage SOI CMOS VLSI Devices and Circuits. John Wiley and sons, inc 2001

ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS 3 0 0 100

UNIT I 9

MODELS FOR INTEGRATED CIRCUIT ACTIVE DEVICES

Depletion region of a PN junction – large signal behavior of bipolar transistors- small signal model of bipolar transistor- large signal behavior of MOSFET- small signal model of the MOS transistors- short channel effects in MOS transistors – weak inversion in MOS transistors- substrate current flow in MOS transistor.

UNIT II 9

CIRCUIT CONFIGURATION FOR LINEAR IC

Current sources, Analysis of difference amplifiers with active load using BJT and FET, supply and temperature independent biasing techniques, voltage references. Output stages: Emitter follower, source follower and Push pull output stages.

UNIT III 9

OPERATIONAL AMPLIFIERS

Analysis of operational amplifiers circuit, slew rate model and high frequency analysis, Frequency response of integrated circuits: Single stage and multistage amplifiers, Operational amplifier noise

UNIT IV 9

ANALOG MULTIPLIER AND PLL

Analysis of four quadrant and variable trans conductance multiplier, voltage controlled oscillator, closed loop analysis of PLL, Monolithic PLL design in integrated circuits: Sources of noise- Noise models of Integrated-circuit Components – Circuit Noise Calculations – Equivalent Input Noise Generators – Noise Bandwidth – Noise Figure and Noise Temperature

UNIT V 9

ANALOG DESIGN WITH MOS TECHNOLOGY

MOS Current Mirrors – Simple, Cascode, Wilson and Widlar current source – CMOS Class AB

output stages – Two stage MOS Operational Amplifiers, with Cascode, MOS Telescopic-Cascode Operational Amplifier – MOS Folded Cascode and MOS Active Cascode Operational Amplifiers

TOTAL: 45

REFERENCES

1. Gray, Meyer, Lewis, Hurst, “Analysis and design of Analog IC’s”, Fourth Edition, Willey International, 2002.
2. Behzad Razavi, “Principles of data conversion system design”, S.Chand and company ltd, 2000
3. Nandita Dasgupata, Amitava Dasgupta,”Semiconductor Devices, Modelling and Technology”, Prentice Hall of India pvt. ltd, 2004.
4. Grebene, Bipolar and MOS Analog Integrated circuit design”, John Wiley & sons,Inc.,2003.
5. Phillip E.Allen Douglas R. Holberg, “CMOS Analog Circuit Design”, Second Edition-Oxford University Press-2003

MULTIMEDIA SYSTEMS 3 0 0 100

1. INTRODUCTION AND QOS 9

Introduction-QOS Requirements and Constraints-Concepts-Resources- Establishment Phase-Run-Time Phase-Management Architectures.

2. OPERATING SYSTEMS 9

Real-Time Processing-Scheduling-Interprocess Communication-Memory and Management-Server Architecture-Disk Management.

3. FILE SYSTEMS AND NETWORKS 9

Traditional and Multimedia File Systems-Caching Policy-Batching-Piggy backing-Ethernet-Gigabit Ethernet-Token Ring-100VG AnyLAN-Fiber Distributed Data Interface (FDDI)- ATM Networks-MAN-WAN.

4. COMMUNICATION 9

Transport Subsystem-Protocol Support for QOS-Transport of Multimedia-Computer Supported Cooperative Work-Architecture-Session Management-MBone Applications.

5. SYNCHRONIZATION 9

Synchronization in Multimedia Systems-Presentation-Synchronization Types-Multimedia Synchronization Methods-Case Studies-MHEG-MODE-ACME.

Total : 45

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt, “Multimedia Systems”, Springer, I Edition 2004.
2. Ralf Steinmetz and Klara Nahrstedt , Media Coding and Content Processing, Prentice hall, 2002.
3. Vaughan T, Multimedia, Tata McGraw Hill, 1999.
4. Mark J.B., Sandra K.M., Multimedia Applications Development using DVI technology, McGraw Hill, 1992.
5. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovacovic, D. A. Milovacovic , Multimedia Communication Systems: Techniques, Standards, and Networks, Prentice Hall, 1st Edition, 2002
6. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson, 2004.

DESIGN OF SEMICONDUCTOR MEMORIES 3 0 0 100

UNIT 9

RANDOM ACCESS MEMORY TECHNOLOGIES

STATIC RANDOM ACCESS MEMORIES (SRAMs):

SRAM Cell Structures-MOS SRAM Architecture-MOS SRAM Cell and Peripheral Circuit Operation-BipolarSRAM Technologies-Silicon On Insulator (SOl) Technology-Advanced SRAM Architectures and Technologies-Application Specific SRAMs.

DYNAMIC RANDOM ACCESS MEMORIES (DRAMs):

DRAM Technology Development-CMOS DRAMs-DRAMs Cell Theory and Advanced Cell Strucutures-BiCMOS,DRAMs-Soft Error Failures in DRAMs-Advanced DRAM Designs and Architecture-Application
Specific DRAMs.

UNIT II 9

NONVOLATILE MEMORIES

Masked Read-Only Memories (ROMs)-High Density ROMs-Programmable Read-Only Memories (PROMs)-BipolarPROMs-CMOS PROMs-Erasable (UV) - Programmable Road-Only Memories (EPROMs)-Floating-GateEPROM Cell-One-Time Programmable (OTP) Eproms-Electrically Erasable PROMs (EEPROMs)-EEPROM Technology And Arcitecture-Nonvolatile SRAM-Flash Memories (EPROMs or EEPROM)-AdvancedFlash Memory Architecture.

UNIT III 9

MEMORY FAULT MODELING, TESTING, AND MEMORY DESIGN FOR TESTABILITY AND FAULT TOLERANCE

RAM Fault Modeling, Electrical Testing, Peusdo Random Testing-Megabit DRAM Testing-Nonvolatile Memory Modeling and Testing-IDDQ Fault Modeling and Testing-Application Specific Memory Testing

UNIT IV 9

SEMICONDUCTOR MEMORY RELIABILITY AND RADIATION EFFECTS

General Reliability Issues-RAM Failure Modes and Mechanism-Nonvolatile Memory Reliability-Reliability Modeling and Failure Rate Prediction-Design for Reliability-Reliability Test Structures-Reliability Screening andQualification. RAM Fault Modeling, Electrical Testing, Peusdo Random Testing-Megabit DRAM Testing-Nonvolatile Memory Modeling and Testing-IDDQ Fault Modeling and Testing-Application Specific Memory Testing.

UNIT V 9

PACKAGING TECHNOLOGIES

Radiation Effects-Single Event Phenomenon (SEP)-Radiation Hardening Techniques-Radiation Hardening Process and Design Issues-Radiation Hardened Memory Characteristics-Radiation Hardness Assurance and Testing - Radiation Dosimetry-Water Level Radiation Testing and Test Structures. Ferroelectric Random Access Memories (FRAMs)-Gallium Arsenide (GaAs) FRAMs-Analog Memories-Magnetoresistive Random Access Memories (MRAMs)-Experimental Memory Devices. Memory Hybrids and MCMs (2D)-Memory Stacks and MCMs (3D)-Memory MCM Testing and Reliability Issues-Memory Cards-High Density Memory Packaging Future Directions.

TOTAL : 45

REFERENCES

1. Ashok K. Sharma, Semiconductor Memories: Technology, Testing, and Reliability, Wiley-IEEE Press, 2002.
2. Ashok K. Sharma , Semiconductor Memories, Two-Volume Set, Wiley-IEEE Press, 2003.
3. Ashok K. Sharma, Semiconductor Memories: Technology, Testing, and Reliability, Prentice Hall of India, 1997.
4. Brent Keeth, R. Jacob Baker, DRAM Circuit Design: A Tutorial, Wiley-IEEE Press, 2000.
5. Betty Prince , High Performance Memories: New Architecture DRAMs and SRAMs – Evolution and Function, Wiley, 1999.

COMMUNICATION NETWORK SECURITY 3 0 0 100

UNIT I 9

SYMMETRIC CIPHERS

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security; Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles, BlockCipher Modes of Operation,Stegnography;

UNIT II

ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS 9

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5- Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution,

UNIT III 9

PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm; Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

UNIT IV 9

NETWORK SECURITY PRACTICE

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT V 9

SYSTEM SECURITY

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats, Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

TOTAL : 45

REFERENCES

1. William Stallings, “Cryptography and Network Security”, 3rd Edition. Prentice Hall of India, New Delhi ,2004
2. William Stallings, “Network Security Essentials”, 2nd Edition. Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman , “Network Security: Private Communication in Public World”, 2nd Edition. Prentice Hall of India, New Delhi ,2004

LIST OF ELECTIVES
FOR SEMESTER-III (ELECTIVE- IV, ELECTIVE-V, ELECTIVE-VI)

SPEECH AND AUDIO SIGNAL PROCESSING 3 0 0 100

UNIT I- INTRODUCTION OF SPEECH PROCESSING 8
Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features.
Music production – Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system – Psycho acoustics

UNIT II
TIME DOMAIN METHODS FOR SPEECH PROCESSING 8
Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

UNIT III
FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9
Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder.

HOMOMORPHIC SPEECH ANALYSIS:
Cepstral analysis of Speech – Formant and Pitch Estimation – Homomorphic Vocoders.

UNIT IV 10
LINEAR PREDICTIVE ANALYSIS OF SPEECH
Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method – Covariance method – Solution of LPC equations – Cholesky method – Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods – Application of LPC parameters – Pitch detection using LPC parameters – Formant analysis – VELP – CELP.

UNIT V
APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 10
Algorithms: Spectral Estimation, dynamic time warping, hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR – Deterministic sequence recognition – Statistical Sequence recognition – ASR systems – Speaker identification and verification – Voice response system – Speech Synthesis: Text to speech, voice over IP.

TOTAL : 45

REFERENCES

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall - 1978
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 1972
5. I.H.Witten – – Principles of Computer Speech – Academic Press – 1982

VLSI SIGNAL PROCESSING 3 1 0 100

UNIT I 9

INTRODUCTION TO DSP SYSTEMS

Introduction To DSP Systems -Typical DSP algorithms; Iteration Bound – data flow graph representations, loop bound and iteration bound, Longest path Matrix algorithm; Pipelining and parallel processing – Pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power.

UNIT II 9

RETIMING, FOLDING AND UNFOLDING

Retiming - definitions and properties Retiming techniques; Unfolding – an algorithm for Unfolding, properties of unfolding, sample period reduction and parallel processing application; Folding – Folding transformation – Register minimizing techniques – Register minimization in folded architectures

UNIT III 9

FAST CONVOLUTION

Fast convolution – Cook-Toom algorithm, modified Cook-Took algorithm – Winograd Algorithm, Iterated Convolution – Cyclic Convolution; Pipelined and parallel recursive and adaptive filters – inefficient/efficient single channel interleaving, Look-Ahead pipelining in first- order IIR filters, Look-Ahead pipelining with power-of-two decompositionparallel processing of IIR filters, combined pipelining and parallel processing of IIR filters, pipelined adaptive digital filters, relaxed look-ahead, pipelined LMS adaptive filter.

UNIT IV 9

BIT-LEVEL ARITHMETIC ARCHITECTURES

Bit-Level Arithmetic Architectures- parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x 4 bit Baugh- Wooley carry-save multiplication tabular form and implementation, design of Lyon’s bit-serial multipliers using Horner’s rule, bit-serial FIR filter, CSD representation, CSD multiplication using Horner’s rule for precision improvement.

UNIT V 9

PROGRAMMING DIGITAL SIGNAL PROCESSORS

Synchronous, Wave and asynchronous pipelining- synchronous pipelining and clocking styles, clock skew in edge-triggered single-phase clocking, two-phase clocking, wave pipelining, asynchronous pipelining bundled data versus dual rail protocol; Programming Digital Signal Processors – general architecture with important features; Low power Design – needs for low power VLSI chips, charging and discharging capacitance, short-circuit current of an inverter, CMOS leakage current, basic principles of low power design.

L :45 T:15 Total 60

REFERENCES

1. Keshab K.Parhi, “VLSI Digital Signal Processing systems, Design and implementation”, Wiley, Inter Science, 1999.
2. Gary Yeap, “Practical Low Power Digital VLSI Design”, Kluwer Academic Publishers, 1998.
3. Mohammed Isamail and Terri Fiez, “Analog VLSI Signal and Information Processing”, Mc Graw-Hill, 1994.
4. S.Y. Kung, H.J. White House, T. Kailath, “VLSI and Modern Signal Processing”, Prentice Hall, 1985.

SATELLITE COMMUNICATION 3 0 0 100

UNIT I 9

ORBITAL MECHANICS

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellitein the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT II 9

SPACECRAFT SUB SYSTEMS AND EARTH STATION

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems, Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III 9

SPACE LINKS

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV 9

MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS).Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures. Hybrid satellite-terrestrial networks

UNIT V 9

SERVICES AND APPLICATIONS

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS, INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Video conferencing and Internet connectivity

TOTAL : 45

REFERENCES

1. Dennis Roddy, “Satellite Communications”, Third Edition, Mc Graw Hill International Editions, 2001
2. Bruce R.Elbert, "The Satellite Communication Applications Hand Book, Artech House Boston,1997.
3. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson,"Satellite Communication Systems Engineering", 2nd Edition, Prentice Hall, New Jersey, 1993
4. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.1990

REAL TIME AND EMBEDDED SYSTEMS 3 0 0 100

UNIT I 9

INTRODUCTION

Introduction to Embedded systems – Processor and memory organization-Devices and buses for Device Networks – Device drivers and Interrupt servicing mechanism.

UNIT II 9

RTOS

RTOS – Programming tools – Case studies- Hardware- software Co0design in an Embedded system

UNIT III 9

REAL TIME SYSTEMS

Basic Real time concepts – Computer hardware – Language issues – Software life Cycle

UNIT IV 9

REAL TIME SPECIFICATIONS

Design techniques – Real-time kernels – Intertask communication and synchronization – Real –time memory management

UNIT V 9

MULTIPROCESSING SYSTEMS

Multiprocessing Systems - Hardware/Software integration- Real time Applications

TOTAL : 45

REFERENCES:

1. Raj Kamal, 'Embedded Systems Architecture, Programming and Design', Tata Mc-Graw-Hill,2003
2. Phillip A.Laplante, " Real –Time Systems Design and Analysis, An Engineer's Handbook', Prentice-Hall of India,2002
3. R.J.A.Buhr, D.L.Bailey, "An Introduction to Real Time Systems: Design to networking with C/C++", Prentice- Hall, International, 1999.
4. Grehan Moore and Cyliax, "Real Time Programming: A guide to 32 Bit Embedded Development Reading: Addison- Wisley-Longman, 1998.
5. Haeth, Steve, "Embedded systems Design", Newnes,1997.

GENETIC ALGORITHMS AND THEIR APPLICATION 3 0 0 100

UNIT I 9

Introduction, GA Technology-Steady State Algorithm-Fitness Scaling-Inversion

UNIT II 9

GA for VLSI Design, Layout and Test automation- partitioning-automatic placement, routing technology, Mapping for FPGA- Automatic test generation- Partitioning algorithm Taxonomy-Multiway Partitioning

UNIT III 9

Hybrid genetic – genetic encoding-local improvement-WDFR-Comparison of Cas- Standard cell placement-GASP algorithm-unified algorithm.

UNIT IV 9

Global routing-FPGA technology mapping-circuit generation-test generation in a GA frame work-test generation procedures.

UNIT V 9

Power estimation-application of GA-Standard cell placement-GA for ATG-problem encoding-fitness function-GA vs Conventional algorithm.

Total = 45.

REFERENCES

1. Pinaki Mazumder,E.MRudnick,"Genetic Algorithm for VLSI Design,Layout and test Automation", Prentice Hall,1998.
2. Randy L. Haupt, Sue Ellen Haupt, "Practical Genetic Algorithms" Wiley – Interscience,1977.
3. Ricardo Sal Zebulum, Macro Aurelio Pacheco, Marley Maria B.R. Vellasco, Marley Maria Bernard Vellasco "Evolution Electronics: Automatic Design of electronic Circuits and Systems Genetic Algorithms", CRC press, 1st Edition Dec 2001.
4. John R.Koza, Forrest H.Bennett III, David Andre , Morgan Kufmann, "Genetic Programming Automatic programming and Automatic Circuit Synthesis", 1st Edition , May 1999.

NETWORK ROUTING ALGORITHMS 3 0 0 100

UNIT I 9

CIRCUIT SWITCHING NETWORKS

AT & T's Dynamic Routing Network, Routing in Telephone Network-Dynamic Non Hierarchical Routing-Trunk Status Map Routing-Real Time Network Routing, Dynamic Alternative Routing-Distributed Adaptive Dynamic Routing-Optimized Dynamic Routing

UNIT II 9

PACKET SWITCHING NETWORKS

Distance vector Routing, Link State Routing, Inter domain Routing-Classless Interdomain routing (CIDR), Interior Gateway routing protocols (IGRP) - Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Exterior Gateway Routing Protocol (EGRP) – Border Gateway Protocol (BGP), Apple Talk Routing and SNA Routing

UNIT III 9

HIGH SPEED NETWORKS

Routing in optical networks-The optical layer, Node Designs, Network design and operation, Optical layer cost tradeoffs, Routing and wavelength assignment, Architectural variations, Routing in ATM networks-ATM address structure, ATM Routing, PNNI protocol, PNNI signaling protocol, Routing in the PLANET network and Deflection Routing.

UNIT IV 9

MOBILE NETWORKS

Routing in Cellular Mobile Radio Communication networks-Mobile Network Architecture, Mobility management in cellular systems, Connectionless Data service for cellular systems, Mobility and Routing in Cellular Digital Packet Data (CDPD) network, Packet Radio Routing-DARPA packet radio network, Routing algorithms for small, medium and large sized packet radio networks.

UNIT V 9

MOBILE AD-HOC NETWORKS (Manet)

Internet based mobile ad-hoc networking, communication strategies, routing algorithms – Table-driven routing - Destination Sequenced Distance Vector (DSDV), Source initiated on-demand routing- Dynamic Source Routing (DSR), Ad-hoc On- demand Distance Vector (AODV), Hierarchical based routing- Cluster head Gateway Switch Routing (CGSR) and Temporally-Ordered Routing Algorithm (TORA), Quality of Service.

TOTAL : 45

REFERENCES

1. M. Steen strub, "Routing in Communication networks", Prentice Hall International, NewYork, 1995.
2. "Internetworking Technologies Handbook", Fourth Edition, Inc. Cisco Systems, ILSG Cisco Systems, 2003.
3. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", PHI, New Delhi, 2004.
4. Behrouz A Forouzan, "Data Communications and Networking (3/e), TMH, 2004
5. William Stallings, "High Speed Networks TCP/IP and ATM Design Principles", Prentice Hall International, New York, 1998.
6. Mohammad Ilyas, "The Handbook of Ad hoc Wireless Networks" CRC Press, 2002.

7. Vijay K.Garg, “Wireless Network Evolution: 2G to 3G”, Pearson Education, New Delhi, India, 2003.
8. Rajiv Ramaswami and Kumar N.Sivarajan, “Optical Networks”,Morgan Kaufmann Publishers,1998.
9. Sumit Kasera and Pankaj sethi, ”ATM Networks”, Tata McGraw-Hill Publishing Company limited, New Delhi,2001.
10. IEEE Journal on Selected Areas in Communications, Special issue on Wireless Ad-hoc Networks, Vol. 17, No.8, 1999.
11. Scott. M. Corson, Joseph P. Macker, Gregory H. Cirincione, IEEE Internet Computing Vol.3, No. 4, July – August 1999.
12. Alder M.Scheideler.Ch. Annual ACM Symposium on Parallel Algorithms and Architectures, ACM, NewYork 1998.
13. http://www.cisco.com/univercd/cc/td/doc/cisintwk/ito_doc/
14. www.moment.cs.ucsb.edu

SIMULATION OF COMMUNICATION SYSTEMS & NETWORKS 3 0 0 100

UNIT I 9

MODELLING OF COMMUNICATION SYSTEM

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bustry channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

UNIT II 9

SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS

Univariate and multivaraiate models, Transformation of random variables, Bounds and approximation, Random process models-Markov AND a ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

UNIT III 9

ESTIMATION OF PERFORMANCE MEASURES

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system, BER of digital communication systems, Montre carlo method and Importance sampling method, estimation of power spectral density of a process

UNIT IV 9

COMMUNICATION NETWORKS

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem ,M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

UNIT V 9

NETWORK OF QUEUES

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart, Routing model, Network layout and Reliability

TOTAL : 45

REFERENCES

1. M.C.Jeruchim,Philip Balaban and K.Sam Shanmugam, "Simulation of communication systems",Plenum Press,New York,1992
2. A.M.Law and W.David Kelton, "Simulation Modelling and analysis", Mc Graw Hill Inc.,New York ,1991
3. J.F.Hayes, "Modelling and Analysis of Computer Communication networks,Plenum Press,New York,1984
4. Jerry Banks and John S.Carson,Deiscrete-event system Simulation",Prentice Hall,Inc.,New Jersey,1984

E-COMMERCE TECHNOLOGY 3 0 0 100

UNIT - I

INTRODUCTION 9

Infrastructure for Electronic Commerce - Networks - Packet Switched Networks - TCP/IP Internet protocol - Domain name Services - Web Service Protocols - Internet applications - Utility programs - Markup Languages - Web Clients and Servers - Intranets and Extranets - Virtual private Network.

UNIT -II

CORE TECHNOLOGY 9

Electronic Commerce Models - Shopping Cart Technology - Data Mining - Intelligent Agents – Internet Marketing - XML and E-Commerce

UNIT - III

ELECTRONIC PAYMENT SYSTEMS 9

Real world Payment Systems - Electronic Funds Transfer - Digital Payment -Internet Payment Systems – Micro Payments - Credit Card Transactions - Case Studies.

UNIT - IV

SECURITY 9

Threats to Network Security - Public Key Cryptography - Secured Sockets Layer - Secure Electronic Transaction - Network Security Solutions - Firewalls.

UNIT - V

INTER/INTRA ORGANIZATIONS ELECTRONIC COMMERCE 9

EDI - EDI application in business - legal, Security and Privacy issues - EDI and Electronic commerce - Standards - Internal Information Systems - Macro forces - Internal commerce - Workflow Automation and Coordination - Customization and Internal commerce - Supply chain Management.

TOTAL : 45

REFERENCES

1. Ravi Kalakota and Andrew B Whinston , Frontiers of Electronic commerce, Addison Wesley, 1996
2. Pete Loshin, Paul A Murphy , Electronic Commerce, 2nd Edition , Jaico Publishers1996.
3. David Whiteley, e - Commerce : Strategy, Technologies and Applications - McGraw Hill 2000.

WIRELESS LAN 3 0 0 100

UNIT I 9

WIRELESS LAN TECHNOLOGY:

Radiowave LAN – Infrared LAN – Microwave LAN – Long distance LAN Systems and Services – Wireless LAN Standards and Protocols.

UNIT II 9

PACKET SWITCHING NETWORKS:

Routing in Packet Networks – Short Path Algorithm – Traffic Management and QoS – Congestion Control - OSI / IP models - Ethernet (IEEE 802.3) – Token ring (IEEE 802.5) – FDDI – DQDB – Frame Relay – SMDS.

UNIT III 9

TCP/IP NETWORKS:

Architecture - Internet protocol – IPv6 – User Datagram Protocol – Transmission Control Protocol – DHCP and Mobile IP – Internet Routing Protocol – Multicast Routing – Performance of TCP / IP Networks.

UNIT IV 9

ATM NETWORKS:

Features of ATM – BISDN Reference Model – ATM Layer – ATM Adaptation Layer – ATM Signalling – Routing – Management and control – Internetworking with ATM.

UNIT V 9

OPTICAL NETWORKS AND SWITCHING:

Optical links – WDM systems – Cross-connects – Optical LANs – Optical Paths and Networks – DWDM – SONET – Fiber to the home.

Total: 45

REFERENCES:

1) Leon Garcia, Widjaja, “Communication Networks”, Tata McGraw Hill, New Delhi, 2000.
2) Jean Warland and Pravin Varaiya, “High Performance Communication Networks”, 2nd edition, Harcourt and Morgan Kauffman, London, 2002
3) Sumit Kasera, Pankaj Sethi, “ATM Networks”, Tata McGraw Hill, New Delhi, 2000.
4) Behrouz A. Forouzan, “Data Communication and Networking “, Tata McGraw Hill, New Delhi, 2000.

MICROWAVE INTEGRATED CIRCUITS 3 1 0 100

UNIT I 9

TECHNOLOGY OF HYBRID MICS

Dielectric substrates - thick film technology and materials - thin film technology and materials – methods of testing – encapsulation of devices for MICs – mounting of active devices.

UNIT II 9

TECHNOLOGY OF MONOLITHIC MICS

Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer – diffusion-ion implantation – electron beam technology.

UNIT III 9

ANALYSIS OF MICROSTRIP LINE

Methods of conformal transformation – numerical method for analysis – hybrid mode analysis – coupled mode analysis- method of images – losses in miscrostrips.

UNIT IV 9

COUPLED MICROSTRIPS, SLOT LINE AND COPLANAR VEGUIDES

Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch line couplers – periodic branch line couplers – synchronous branch line couplers.

UNIT V 9

LUMPED ELEMENTS AND NON-RECIPROCAL COMPONENTS

Design and fabrication using microstrips – flat resistors – flat inductors – interdigital capacitors – sandwich capacitors – ferromagnetic substrates for non-reciprocal devices – microstrip circulators – latching circulators – isolators – phase shifters.

L-45 T-15 Total-60

REFERENCES:

1. Gupta,K.C, and Amarjit singh – “Microwave Integrated Circuits” – John Wiley and sons – Wiley Eastern Reprint, 1978.
2. Hoffmann, R.K – “Handbook of Microwave Integrated Circuits” – Artech House, 1987.

OPTICAL COMMUNICATION NETWORKS 3 0 0 100

UNIT I 9

OPTICAL NETWORKING COMPONENTS:

First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers, filters, amplifiers, switches, and wavelength converters.

UNIT II 9

SONET AND SDH NETWORKS:

Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.

UNIT III 9

BROADCAST – AND- SELECT NETWORKS:

Topologies, Single-hop, Multihop, and Shufflenet multihop networks, Media-Access control protocols, Test beds.

UNIT IV 9

WAVELENGTH-ROUTING NETWORKS

Node designs, Network design and operation, Optical layer cost Tradeoffs, Routing and Wavelength assignment, Wavelength routing test beds.

UNIT V 9

HIGH CAPACITY NETWORKS:

SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test beds.

TOTAL : 45

REFERENCES

1) Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective, Morgan Kaufmann, 2nd Edition, 2001.
2) Vivek Alwayn, Optical Network Design and Implementation, Pearson Education, 2004.
3) Hussein T.Mouftab and Pin-Han Ho, Optical Networks: Architecture and Survivability, Kluwer Academic Publishers, 2002.
4) Biswanath Mukherjee, Optical Communication Networks, McGraw Hill, 1997