M.TECH. (ELECTRONICS AND COMMUNICATION ENGINEERING)

CURRICULUM AND SYLLABUS

(Effect from the Academic Year 2007 – 08)

PONDICHERRY UNIVERSITY

PUDUCHERRY – 605014.

M.TECH IN (ELECTRONICS AND COMMUNICATION ENGINEERING)
CURRICULUM AND SCHEME OF EXAMINATION

(Total number of Credit required for the completion of the Programme: 72)

ELIGIBILITY:

M.Tech. in Electronics and Communication Engineering : Candidates for admission to the first semester of the four semester M.Tech. Course in Electronics and Communication Engineering should have passed B.E/ B.Tech in Electronics & Communication Engineering / Electronics Engineering / Computer Science & Engineering (or) an examination of any University or Authority accepted by the Pondicherry University as equivalent thereto, with at least 55% marks in the degree examination or equivalent CGPA.

SEMESTER – I

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	MA 901	Random Process and Queueing Theory	3	1	0	4	40	60	100
2.	EC 901	Digital Communication	3	1	0	4	40	60	100
3.	EC 902	Telecommunication Networks	3	1	0	4	40	60	100
4.		Elective – I	3	0	0	3	40	60	100
5.		Elective – II	3	0	0	3	40	60	100
6.	EC 907	Communication Design and Simulation Laboratory	0	0	6	2	50	50	100
						20	250	350	600

SEMESTER – II

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.	EC 903	Broad Band Networks	3	1	0	4	40	60	100
2.	EC 904	Cellular Mobile Communication	3	1	0	4	40	60	100
3.	EC905	Advanced Digital Signal Processing	3	1	0	4	40	60	100
4.		Elective – III	3	0	0	3	40	60	100
5.		Elective –IV	3	0	0	3	40	60	100
6.		Elective – V	3	0	0	3	40	60	100
7.	EC 908	Seminar	0	0	3	2	100	-	100
						23	340	360	700

SEMESTER – III

Sl. No.	Code	Subject	Hours / Week			Credits	Evaluation (marks)		
			L	T	P		Internal	External	Total
1.		Elective – VI	3	0	0	3	40	60	100
2.		Elective – VII	3	0	0	3	40	60	100
3.	EC 961	Directed Study	0	0	6	3	100	---	100
4.	EC 909	Dissertation Project (Phase I)	0	0	24	8	200	100	300
						17	380	220	600

SEMESTER – IV

Sl. No.	Code	Subject	Hours / Week	Credits	Evaluation (marks)

			L	T	P		Internal	External	Total
	EC 910	Dissertation Project (Phase II)	0	0	36	12	250	150	400
						12	250	150	400

LIST OF ELECTIVE SUBJECTS

SL.NO.	Code	SUBJECT
1	EC921	Advanced Fiber Optic Communication
2	EC922	Antennas
3	EC923	Application Specific Integrated Circuits
4	EC924	CDMA- Technology
5	EC925	Data Communication, Computer Networks and Open Systems
6	EC926	Digital Logic Design with – VHDL
7	EC927	Embedded Systems
8	EC928	Image Processing
9	EC929	Information Theory and Coding
10	EC930	Microwave Circuit Analysis and Design
11	EC931	Modern Satellite Communication
12	EC932	OFDM for Wireless Communication
13	EC933	Optical Computers
14	EC934	RF MEMS for Wireless Communication
15	EC935	Sensor Networks
16	EC936	Special Communication Networks
17	EC937	Wireless LAN and PAN
18	EC938	Wireless Networks and Mobile Computing
19	EC939	Wireless Security

MA901 – RANDOM PROCESSES AND QUEUEING THEORY

Unit – I: Discrete Random Variables 8 Hours

Random Variables and their event spaces – The probability mass function- Distribution functions – Special discrete distributions (Bernoulli, Binomial and Geometric, Negative Binomial, Poisson, Hypergeometric, Discrete Uniform, Constant, Indicator) – Probability Generating function.

Unit – II: Continuous Random Variables 8 Hours

The Exponential distribution – The Reliability, Failure density and Hazard function – Some important distributions (Hypoexponential, Erlang, Gamma, Hyperexponential, Weibull, Gaussian, Uniform and Pareto distributions)

Unit – III: Stochastic Processes 8 Hours

Definition, Classification of Stochastic Processes - Strictly Stationary Process, Wide Sense Stationary, Independent Process, Renewal Processes – Availability analysis, Bernoullli process – Poisson process – Renewal processes – Availability analysis.

Unit – IV: Discrete Parameter Markov Chains 8 Hours

Introduction, Computation of n-step transition probabilities – Chapman-Kolmogorov equation – State classification and limiting Probabilities – M/G/I queueing system, Pollaczek-Khinchine transform equation.

Unit – V: Continuous Parameter Markov Chains 8 Hours

The Birth and Death process (M/M/1, M/M/C, M/M/1/N, M/M/C/N (N>C), M/M/C/C, M/M/∞ models only, derivation of Mean number of customer in the system, in the queue and Waiting time – Simple applications) – Special case of Birth and Death model (Pure Birth and Pure Death Processes)

Text Book:

1. Kishor S.Trivedi, Probability and Statistics with Reliablity, Queueing and Computer Science Applications, second Edition, 2002, John Wiley & Sons, Inc.

Reference Books:

1. J.Medhi, Stochastic Processes, New Age International (P) Ltd., Second Edition, 1994.
2. D.Gross and C.M.Harris, Fundamentals of Queueing Theory, Third Edition, Wiley Students Edition.

EC901 – DIGITAL COMMUNICATION

Unit – I: Introduction 8 Hours

Elements of a digital communication system – An overview of source coding technique for analog sources – Temporal waveform coding – Spectral waveform coding – Model-based source coding – Channel capacity and coding : Channel models and channel capacity, achieving channel capacity with orthogonal signals.

Unit – II:

Linear Block Codes 8 Hours

The generator matrix and the parity check matrix – Examples of linear block codes – Cyclic codes – Hard decision and soft decision decoding of block codes – Performance comparison of the above two schemes.

Convolution Codes – Transfer function of a convolutional code – Optimum decoding of convolutional codes – The viterbi algorithm – Probability of error for soft decision and hard decision decoding schemes – Practical considerations in the application of convolutional codes – coded modulation for bandwidth constrained channels.

Unit – III:

Baseband data transmission 8 Hours

Characterisation of bandlimited channels - Signal design for band limited channels. Nyquist Criterion for zero ISI - Partial response signaling, design of bandlimited signals with controlled ISI, data detection for controlled ISI - Signal design for channels with distortion - Optimum receiver for channels with ISI and AWGN.

Equalisation:

Linear decision feedback equalization, adaptive line equalizer – Adaptive decision feedback.

Unit – IV: Digital Modems 8 Hours

Review of ASK, FSK, PSK and QPSK, MSK and GMSK schemes. Constant envelope and nonconstant envelope modulation schemes. Power efficient coherent modems. Diffrentially Coherent modems. Spectrally efficient modulation techniques and their receiver structures. Probability of error for binary modulation schemes.

Unit – V: 8 Hours

Spread Spectrum Communications

Review of DS and FH Spread Spectrum systems. Synchronisation – Acquisition and tracking – Jamming considerations – Commercial applications - CDMA and multipath channels – digital cellular systems – Interference limited Vs dimension limited systems – Multicarrier CDMA.

Design Considerations of a Digital communication system:

Defining, designing, and evaluating digital communication system – Bandwidth efficiently – Error probablitiy plane – Modualtion and coding trade off - Bandwidth efficient modulation – Modulation and coding for bandlimited channels.

Reference Books:

1. John .G.Proakis, "Digital Communications", (3/e), Mc Graw Hill.
2. Bernard Sklar, " Digital Communications – Fundamentals and Applications", (2/e) Pearson Education, Asia.
3. Dr.Kemilo Feher, "Wireless Digital Communication - Modulation and Spread spectrum communication", PHI Pvt., Ltd., New Delhi-1999.

4. Simon Haykin, "Digital communication", John Wiley and Sons.
5. John Schiller, "Mobile communication", Addison - Wesley publication.

EC902 TELECOMMUNICATION NETWORKS

UNIT-1: Introduction 8 Hours

Basics of a switching system - Review of strowger switching system, Electronic space and time division switching system and telephone networks - Data transmission in PSTNS - ISO-OSI Reference Model - Link-to-Link layers - Satellite based networks. local area networks, metropolitan area networks. fiber optic networks, data network-standards and internetworking.

UNIT-II: Data Communications 8 Hours

Protocol layering and Protocol Implementation-Protocol layering - Importance of layering-Problems with Layering - Protocol Implementation - Factors affecting protocol stack performance - Common protocol stacks procedures - Partitioning strategies - Interface among protocol layers. Data transmission - Transmission media - Data Encoding - The Data communication Interface - Asynchronous Synchronous transmission - Data Link control - Flow control - Error detection, Error control, HDLC, other Data link control protocols - Multiplexing systems.

UNIT-III: Wide Area Networks 8 Hours

Circuit switching networks - Packet Switching networks - Routing and congestion control - X.25 networks - Frame relay - Protocol architecture - User data transfer - Network function - Congestion control ATM - ATM cells - Transmission of ATM Cells - Traffic and congestion control.

UNIT-IV: High-Speed LAN and Backbone Networks 8 Hours

Backbone network components - Shared media technologies - Fast ethernet - Fast token ring, FDDI, Switching media technologies improving backbone performance-Improving circuit capacity - Reducing Network demand and selecting a backbone network.

UNIT-V: Network Security 8 Hours

Cryptographic Algorithms - The data encryption standard (DES) - RSA, Message digest 5 (MD5) - Security mechanisms - Public key distribution(X 509) - Example systems - Fire walls, Filter based firewalls, Proxy based firewalls and limitations.

Reference Books:

1. William Stallings, " Data and computer communications",PHI.1999
2. S.Keshav, "An Engineering Approach to computer Networking", Addison Wesley,2000
3. Larry L.Peterson and Bruce.S.Davia, "Computer networks-A system Approach", Harcourst Asia Pvt.Ltd,2000
4. Jerry Fitgerald and Alan Dennis, " Business data communications and networking", John Wiley,2000
5. Thiagarajan and Viswanathan, "Telecommunication Switching systems and networks",PHI,1994
6. Andrew.S.Tanenbaum, "Computer networks",PHI,Third Edition 1999

7. Uyless Black, "Computer networks-protocols, standards and Interfaces",PHI,1987
8. Mish Schwartz, "Telecommunication networks-protocols, modeling and Analysis", Addision Wesley 1989.

EC903 - BROAD BAND NETWORKS

UNIT - I: Introduction to B-ISDN 8 Hours

B-ISDN, B-ISDN services. Protocol reference model. Reference configurations, Issues in B-ISDN. Network evolution through ISDN to B-ISDN, asynchronous TDM, congestion control issues.

UNIT - II: Asynchronous Transfer Mode 10 Hours

Transfer modes; Circuit switched networks, message switching, and packet switching. ATM cell header fields. ATM protocol reference model. The human noise and ATM. Source Characterization in networks: CBR services. VBR services. Quality of service metrics in ATM networks. Traffic Management in ATM networks. Characteristics of ATM networks. Resource provisioning. Call admission control. Traffic shaping. Traffic policing. Selective discarding. Reactive congestion control mechanisms.

UNIT - III: Routing 10 Hours

Routing in current networks. Routing in ATM networks. Routing methodologies. Routing modes, Transport layer.

UNIT -IV: ATM Switching 8 Hours

Shared medium architectures. Shared memory architectures, Space division architecture Performance analysis of ATM architectures.

UNIT - V: Network Architectures for High Speed LANs And MANs 8 Hours

FDDI, FDDI-II IEEE 802.6; topology, protocol, architecture, DQDB layer, distributed queue access protocol. SMDS and frame relay services.

Reference Books:

1. W.Stallings, "Local and Metropolitan Area Networks", (5/E), P.H.
2. W. Stallings, "ISDN and Broadband ISDN With Frame Relay and ATM", (3/E), P.H.
3. R.O. Onvural, "Asynchronous Transfer Mode Networks: Performance Issues", Artech House.
4. M.Schwartz, "Broadband Integrated Networks".
5. R.Handel, M.N. Huber and S.Schroder, "ATM Networks", Addison Wesely.
6. De Pryker, "ATM Networks".
7. A.Pattavina, "Switching Theory : Architecture and performance in broadband ATM networks", John Wiley. 1998.

EC904 CELLULAR MOBILE COMMUNICATION

UNIT - I: Introduction to Cellular concepts 8 Hours

Evolution of mobile radio communications. Examples of mobile radio systems. System design fundamentals, frequency reuse, hand-off strategies, interference. Paging systems: on-site paging, wide area paging, signaling methods, POCSAG, transmitters and receivers, propagation system architectures, paging terminal, Digital european cordless telephone (DECT).

UNIT - II: Cellular Radio Design Principles 8 Hours

The Cellular principle radio coverage by single cell. Multiple cell plan. The fixed supporting network Hand over. Analog cellular frequency allocation plans. Base station site engineering. Concepts and benefits of channel sharing.

UNIT - III: Mobile Radio Propagation 8 Hours

Introduction, free space propagation model. The three basic propagation mechanisms; reflection, diffraction and scattering. Practical propagation models; long - distance path loss models, outdoor propagation models, small scale fading: flat fading and frequency selective fading.

UNIT - IV: Co-channel Interference Reduction 8 Hours

Exploring Co-channel interference areas in a system, real time Co-channel interference measurements, omni directional and directional antenna designs for interference reduction. Power control, diversity techniques. Types of non-Cochannel interference and their reduction.

UNIT - V: Digital Cellular Systems 8 Hours

Second-generation systems. Time division multiple access. Possible advantages of TDMA European Cellular system. Features of GSM, The OSI reference model fixed network supporting GSM, the radio part, timing structure of GSM, channel coding and training sequence, radio link management, signaling within GSM. The north american digital cellular system: capacity of cellular CDMA ,CDMA power control, CDMA digital cellular standard (IS_95). Current topics: Personal access communication. Systems using infrared Wireless LAN, wireless ATM, intelligent network concepts in mobile communications, UMTS and wireless multimedia.

Reference Books:

1. R.C.V Macario, "Cellular Radio", Macmillan.
2. C.Y.Lee, "Mobile Cellular Telecommunications", (2/E), Mcgraw Hill.
3. Raj Pandya, "Mobile And Personnel Communication System", PHI. 2000.
4. J.D.Gibson, "The Mobile Communications Handbook", IEEE Press.
5. T.S Rappaport, "Wireless Communications Principles", P.H
6. Parsons and Gardiner, "Mobile Communication Systems", Halsted Press.
7. Johen Schiller, "Mobile Communication", Addison Wesley, 2000

EC905 - ADVANCED DIGITAL SIGNAL PROCESSING

UNIT I: Discrete Time Signals and Systems 8 Hours

Discrete time signals – Classification of signals – Manipulations on discrete time signals – Correlation of discrete time signals. Discrete time systems – Definition – Classification of systems – Convolution sum and its properties – Discrete time fourier transform – Implementation of discrete time systems.

UNIT II: Discrete Time Random Signal Processing 8 Hours

Discrete time random processes – Ensemble averages – Stationary processes – Autocorrelation and autocovariance matrices – Ergodicity – White noise – Power spectral density – Filtering random processes – Low pass filtering of white noise – Spectral factorization – Parameter estimation: Bias and consistency.

UNIT III: Spectrum Estimation 8 Hours

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 – ARMA, ARMA model based spectral estimation. Parameter estimation – Yule – Walker equations, solutions using Durbin's algorithm.

UNIT IV: Linear Estimation and Prediction 8 Hours

Linear prediction – Forward and backward predictions, solutions for the normal equations – Levinson-Durbin algorithm. Least mean square error criterion – Wiener filter for filtering and prediction – FIR Wiener filter and Wiener IIR filters – Discrete Kalman filter.

UNIT V: Adaptive Filters 8 Hours

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

Reference Books:

1. Monson H. hayes, "Statiscal Digital Signal Processing and Modelling", John Wiley and Sons Inc., Singapore, 2002.
2. Tamal Bose, "Digital Signal and Image Processing", John Wiley and Sons Inc., Singapore, 2004.
3. John G.Proakis, Dimitris G.Manolakis, "Digital Signal Processing", Pearson Education, 2002.
4. John G.Proakis et al., "Algorithm for Statiscal Signal Processing", Pearson Education, 2002.
5. Dimitris G.Manolakis et al., "Statiscal and Adaptive Signal Processing", McGraw Hill, New York, 2000.

EC929 – INFORMATION THEORY AND CODING

Unit – I : Information and Channel Capacity 8 Hours

Measure of Information – Information content of message – Average information content (Entropy) of symbols in long independent sequences - Average information content (Entropy) of symbols in long depends sequences – Markov statistical model for information sources – Entropy and information rate of Markov sources.

Unit – II: Source Encoding 8 Hours

Shannon's first fundamental theorem – Noiseless coding – Source with finite memory – Shannon's second fundamental theorem on coding for memory less noisy channels – Channel capacity theorem - Shannon's Encoding algorithm – Huffman Coding Algorithm.

Unit – III: Communication Channels 8 Hours

Discrete Communication channels – Rate of information transmission over a discrete channel – Capacity of discrete channel with continuous noise – Discrete channel with discrete noise- Continuous channels – Shannon Hartley theorem implication – Continuous channel with continuous noise – Efficiencies of different communication system

Unit – IV: Error Correcting Codes 8 Hours

Types of errors – Linear block codes – Error detection and error correction – Single error correcting Hamming codes – Binary cyclic codes – Encoder, Syndrome calculation, error detection and correction - BCH Codes – Burst Error Correcting codes – Burst and random error correcting codes.

Unit – V: Error Correcting Codes 8 Hours

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

Text Book:

1. J.Das, S.K.Mullick, P.K.Chatterjee, "Principles of Digital communication", Wiley Eastern Limited, 1986.

Reference Books:

1. K.Sam Shanmugam, "Digital and Analog Communication systems", John Wiley and sons, 1985.
2. A.J.Viterbi and J.K.Omura, "Principles of Digital communication and coding", McGraw Hill.

EC925 DATA COMMUNICATION, COMPUTER NETWORKS AND OPEN SYSTEMS

Unit – I: Introduction 8 Hours

Data communication networks and open system standards – The electrical interface - Data transmission protocol basics - Data link control protocols.

Unit – II: Networks 8 Hours

High speed and bridged local area networks – Wide area networks – Internetworking – Broadband multiservice networks.

Unit – III: Protocols 8 Hours

Open system – Transport protocols – OSI protocols – Service definition – Protocol specification – Transport layer

Unit – IV: Presentation and Session Layer 8 Hours

Application support protocols – Session layer – Presentation layer – ASN.1 – Data encryption - Presentation protocol – Association control service element – Commitment, concurrency and recovery - Reliable transfer service element.

Unit – V: Applications 8 Hours

Application specific protocols – TCP/IP application protocol – ISO application protocols – Directory services – Example OSI environments layer interaction – Implementation issues – Related standards

Reference Books:

1. Fred Halsall, "Data Communication, Computer networks and Open system", Addision Wesley, 2000.

EC927 EMBEDDED SYSTEMS

UNIT I 8 Hours

Embedded Hardware Architecture – 32 Bit Microcontrollers : ARM 2 TDMI core based 32 Bit microcontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations interrupt structure, ARM cache. ARM Bus, Embedded systems with ARM. Networks for Embedded systems: Serial bus protocols: The CAN bus, and the USB bus, Parallel bus protocols: The PCI Bus and GPIB bus, The Embedded Computing Platform: Design, PC as a platform, Development. Environment, Debugging techniques and Debugging Challenges.

UNIT II 8 Hours

Program Design and Analysis: Formalism for system design using UML (Unified Modeling Language) Model for Program flow graph (flow graphs). Basic Compilation techniques, Analysis and optimization of execution time, program size, energy and power. Processes and Operating system: Multiple tasks and processes, context switching, OS states, structure, timing requirements, Scheduling policies, and Inter- process communication Mechanisms Evaluating OS performance, Power Optimization strategies for processes.

UNIT III 8 Hours

Real Time Scheduling: Systems of State Machines: State-machines, State charts, Declarative specifications: Regular expressions and extn, traditional logics and real-time logic. Deterministic scheduling: assumptions and candidate Algorithms, RM (rate monotonic) and EDF (earliest deadline first), realizing the assumptions, priority inversion and inheritance, Execution time prediction: Approaches and issues, measurement of S/W by S/W, program analysis by timing scheme, prediction by optimization and system interferences and architectural complexities. Keeping time on computers: Timer applications, properties of real and ideal clocks, clock servers and clock synchronization, real time language features.

UNIT IV 8 Hours

Real time operating systems: Real time function and services, real time UNIX and POSIC processes and threats. Comparative study of sample of RTOS such as eCOS, real time Linux, Windows CE.

UNIT V 8 Hours

Validation and testing of Embedded Systems: Program validation and testing, clearbox testing, blackbox, evaluating function tests and performance testing. System design techniques: Design methodologies, requirements analysis, specifications , quality assurance.

Text Books:

1. (Unit I, II &V) Wayne Wolf, Computers as Components – Principles of Embedded Computing system Design – Harcourt India Pvt. Ltd – Morgan Kaufmann Publishers – First Indian Reprint 2001, Chapter 1, 5, 6, 7, 8, 9 & Appendix A on UML.
2. Philip A. Laplante, Real time systems analysis and design – an Engineer's. Handbook IEEE Computer Society Press PHI, Second edition. 1997 Chap 6, 7, 9,10.
3. (Unit III &IV) Allan C. Shaw – Real time systems & Software – John Wiley & Sons – India Reprint 2001 Chapter 4 – 10.

References:

1. Karl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", 5th Edition McGraw Hill, 2002, Chap 3,4,9,10 (Course material for ARM processors only).

2. Frank Vahid & Tony Givargis, "Embedded system design – A unified hardware / software introduction ", John Wiley & Sons, India 2002 – Chap 6-8 only.
3. Stephen B. Furber, "ARM system architecture", Addison Wesly, 1996.
4. Rajkamal,"Embedded systems–architecture, programming and design", TMH India 2003.

EC923 APPLICATION SPECIFIC INTEGRATED CIRCUITS

UNIT – I: Introduction to ASICS 8 Hours

Types of ASICS – Design flow – Case study – Economics of ASICS.

UNIT – II: CMOS Logic 8 Hours

CMOS transistors – CMOS Process –Design rules – Combinational logic cells – Sequential logic – Data path logic cells – I/O cells – Cell compilers.

UNIT – III: ASIC Design 8 Hours

ASIC library design - Programmable ASICS - Programmable ASIC logic cells - Programmable ASIC I/O cells - Programmable ASIC interconnect - Programmable ASIC design software – Low level design entry.

UNIT - IV: VHDL 8 Hours

A counter - A 4 bit multiplier - Syntax and semantics - Identifiers and hiterds - entities architecture - Packages and library interface declaration - Sequential statements – Operators- Arithmetic - Concurrent statements - Execution – Configurations and specifications.

UNIT - V: Applications 8 Hours

Verilog HDL - Logic synthesis - Simulation - Test - ASIC construction - Floor planning and placement - Routing. Design examples in Verilog.

Reference Books:

1. Michaeel John Sebastian Smith, "Application Specific integrated Circuits", Addison Wesley, 2000.
2. M.D.Ciletti, "Modelling, Synthesis and Rapid prototyping with the Verilog HDL", PHI,1999.
3. M.G.Arnold, "Verilog Digital Computer Design", PHI, 1999.

EC922 ANTENNAS

UNIT I: Radiation and Antennas 9 Hours

Definition – Radiation principle – Hertzian dipole – different current distribution in linear antennas – radiation from half-wave dipole.

UNIT II: Analysis of linear arrays 9 Hours

Radiation pattern of alternating current element – centre fed vertical dipoles- uniform linear arrays – Broadside and end-fine arrays – Multiplication of patterns – Binomial array.

UNIT III: Array Synthesis 9 Hours

Synthesis method – Schelkunoff Polynomial method – Fourier transform method – Dolph–Chebychev method – Taylor's method – Amplitude Distributions.

UNIT IV: Antenna measurements 9 Hours

Introduction – Basic concepts – typical source of error in antenna measurements – measurement range - measurement of different antenna parameters – impedance – antenna patterns - radiation resistance – gain – Directivity – Beam width – SLR – radiation efficiency – aperture efficiency – Polarization.

UNIT V: Antennas for Special Applications 9 Hours

Electrically small antennas – physically small antennas – the high gain omni - antenna design consideration for satellite communication – ILS antennas – LEO satellite link antennas – cell–Tower trees – antennas for terrestrial mobile communication systems – embedded antennas – UWB antennas for Digital applications – the plasma antenna.

Reference 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.
3. K.D. Prasad, " Antenna and Wave Propagation", Satya Prakashan, New Delhi, 2004.
4. S.N.Raju, " Antenna Propagation", Pearson Education , 1st edition 2005.

EC931 MODERN SATELLITE COMMUNICATION

Unit - I: Satellite Communication Technology 8 Hours

Satellite orbits, Satellite constellation and ISL, orbital parameters, look angle determination, launching procedures. Spacecraft subsystems - Attitude and orbit control, power, TT & C, communication and antennas. Earth station design - Digital transmitter and receiver, antenna and beam steering techniques.

Unit - II: Link Design 8 Hours

Digital satellite link analysis and design for FSS and BSS - link budget and E_b/N_o calculations. Performance impairments - Noise, interference, propagation effects and frequency considerations.

Unit - III: Access Techniques 8 Hours

FDMA concept- Intermodulation and back off - SPADE system. TDMA concept - Frame and burst structure - Frame acquisition and synchronization - Satellite Switched TDMA system. CDMA concepts - DS and FH System acquisition and Tracking.

UNIT - IV: Satellite Services 8 Hours

Packet satellite networks – Packet switching - Services and access methods.
Direct Broadcasting services - INSAT. Direct to Home TV broadcasting, Maritime Satellite services – INMARSAT, Satellites for internet applications.
Audio broadcasting via satellite – World Space Services through Teledesic, LEO system and Globstar.

Unit - V: Mobile Satellite Networks 8 Hours

System architecture – air interface for network consideration – mobility management, network management, Radio resource management, EIRP management, RF monitoring and QoS, license issues.
System planning – Traffic forecast – regulatory issues and billing issues.

Reference Books:

1. Pratt and Bostain, "Satellite Communication", John Wiley and sons, 1986.
2. Tri.T.Ha, "Digital Satellite Communication Systems Engineering", McGraw Hill, 1990.
3. M.Richharia, "Mobile satellite communications- Principles and trends", Pearson education, 2003.
3. Pritchard and Sculli, "Satellite Communication Systems Engineering", Prentice Hall India, 1986.
5. Robert.M.Gagliardi, "Satellite Communication", CBS Publishers.
6. Mono Racharia, "Satellite Communication Systems design and analysis", McMillan Publishers, 1996.

7. Dennis Roddy, "Satellite Communications", 2nd Edition, McGraw Hill, l994

EC921 ADVANCED FIBER OPTIC COMMUNICATION

UNIT – I: Components **9** Hours

Introduction to optical components – optical amplifiers –types – issues in optical amplifiers – photonic switching – cross connect – wavelength conversion – multiplexer – demultiplexer – filters – tunable filters – introduction to OICs and its applications.

UNIT – II: First Generation Optical Networks 9 Hours

SONET/SDH- multiplexing, elements of a SONET/SDH infrastructure- SONET/SDH physical layer. Computer interconnects-ESCON, Fiber channel, HIPPI. Metropolitan area networks – FDDI, ATM. Layered architecture – SONET/SDH layers – Second generation optical network layers.

UNIT – III: WDM Technology 9 Hours

Introduction – WDM optical networking evolution – enabling technologies for WDM optical networks – WDM optical network architecture – DWDM – issues in WRN.

UNIT – IV: OTDM Technology 9 Hours

Important issues of OTDM – optical solitons – applications of solitons. Optical pulse compression – fiber grating compressor – soliton effect compressor.

UNIT – V: FTH and PON Technology 9 Hours

Proposed architecture and issues of Fiber to the home (FTH) – Passive optical networks (PON) – Near space communication – Open air optical communication – Inter satellite link hops (ISL). Introduction to all optical networks (AON). Military, civil, consumer and industrial applications.

Reference Books :

1. Rajiv Ramaswami and Kumar N. Sivarajan, " Optical networks – A Practical Perspective", A Harcourt Publishers International Company, 2000.
2. R.G. Junsperger, " Integrated Optics – Theory and Technology, Springer Series in Optical Sciences", 3rd Edition 1991.
3. Gerg Keiser, "Optical Fiber Communications", McGraw Hill International Edition, 1991.
4. John Gowar, "Optical Communications Systems", 2nd Edition PHI of India, 1995.
5. John M. Senior , "Optical Fiber Communications Principles and Practice",. PHI, 1992.
6. G.P. Agarwal, "Non-Linear Optics", Academic Press.
7. Stamatios V.Kartalopoulos,"Understanding SONET/SDH and ATM Communication Network for Next Millennium", PHI , 2000.
8. C.SivaRam Murthy and Mohan Gurusamy, " WDM Optical Networks: Concepts, Design and Algorithms" PHI , India, 2002.

EC936 - SPECIAL COMMUNICATION NETWORKS

UNIT – I: Overview of Computer Networks and Architecture 8 Hours

Reference Models: OSI and TCP/IP reference models. Comparison of the models. Relative merits. Example networks: Novell NetWare, ARPANET, NSFNET, INTERNET, Gigabit test beds. Example data communication services: SMDS, X.25 networks, frame relay, broadband ISDN and ATM. Comparison of services.

UNIT – II: Data Link and MAC layer 8 Hours

Design issues in data link layer. Example data link layer protocols: HDLC, data link layer in internet and ATM. Overview of MAC layer protocols in MANs and LANs, ethernet, token bus, token ring and DQDB. Bridges: transparent bridges, source routing bridges, remote bridges. Comparison of remote bridges. High speed LANs: FDDI, fast ethernet, HIPPI fiber channel. An overview of network layer design issues.

Unit – III: Network Layer 8 Hours

Internetworking: Concatenated VCs, connectionless internetworking, tunneling, internet work routing, fragmentation, firewalls, network layer in the internet and ATM networks.

Unit – IV: Elements of Transport Layer Protocols 8 Hours

Internet transport protocols. TCP service model, TCP protocol, TCP segment header, TCP connection management, transmission policy, congestion control, and timer management, UDP, wireless TCP and UDP. The AAL layer protocols. Structure of the AAL: AALI, AAL2, AAL3/4, AAL5. Comparision of AAL protocols. Service specific connection oriented protocol.

UNIT - V: Application Layer 8 Hours

E-mail: Architecture and services. User agents, message formats, message transfer, email privacy. USENET: Implementation, user view of USENET. World Wide Web: Client side, server side, writing a web page in HTML, Java, locating information on the web. Multimedia: Audio, video, data compression, video and demand; multicast backbone.

Reference Books:

1. T.N. Saadavi, M.H.Ammar and Al. Halleem, "Fundamentals of Telecommunication. Networks", Wiley and Sons.
2. J.K.Buford, "Multimedia Systems", Addison Wesely, 1994.
3. W.Stallings, "Local and Metropolitan Area Networks" PHI, 1997.

EC926 DIGITAL LOGIC DESIGN WITH VHDL

UNIT I 8 Hours

Design Concepts: Digital Hardware: Standard chips programmable logic devices-custom – design chip – design process – design of digital hardware - basic design loop – design of digital hardware – introduction to CAD tools – design entry synthesis - functional simulation – introduction to VHDL – Representation of digital signals in VHDL – writing sample VHDL codes – how not to write VHDL codes.

UNIT II 8 Hours

Implementation technology: Transistor switches – NMOS logic gates – CMOS logic gates – Negative logic system – standard chips – programmable logic devices – custom chips, standard cells and gate arrays – practical aspect- MOSFET fabrication and behavior – MOSFET on resistance – transmission gates – implementation details for SPLDS, CPLDS and FPGAs – implementation in FPGAs – optimize implementation of logic functions: Karnaugh Map – Multilevel synthesis – Analysis of Multilevel Circuits – Cubical Representation – Minimization using Cubical representation – Practical consideration – CAD tools.

UNIT III 8 Hours

Combinational circuits building blocks: Multiplexers – decoders – encoders – code converters – arithmetic comparison circuits – VHDL for combinational circuits – Flip-flops, Registers and Counters: basic latch- gated SR latch, gated SR latch with NAND gate – gated D latch – Master slave and edge – triggered D flip-flops – T flip-flop, JK flip-flop – summary of terminology – resistors – counters – using storage elements with CAD tools – using registers and counters with CAD tools – design examples.

UNIT IV 8 Hours

Sequential circuits: Synchronous sequential circuits: Basic design step – state assignment problems – Mealy state model – design of FSM using CAD tools VHDL code for Moore type FSMs – synthesis of VHDL codes – simulating and testing the circuits - serial adder example – state minimization – counter design – FSM as an arbiter circuit – ASM charts – Asynchronous sequential circuits: Asynchronous behavior – analysis and synthesis of asynchronous circuits – state reduction – state assignment – hazards – design examples – Vending machine.

UNIT V 8 Hours

Digital system design: Building block circuits: Flip-flops and registers with enable inputs, shift registers with enable inputs, SRAM, SRAM blocks in PLDs – design examples: Bit-counting circuit, ASM chart implied timing information, shift and add multiplier, divider, arithmetic mean, sort operation - clock synchronization: clock skew, flip-flop timing parameter, asynchronous input – switch debouncing testing of logic circuits: fault model – design for testability – build-in self test – random test – testing PCBs.

Text books:

Stephen Brown and Zvonko Vranesic, "Fundamental of digital logic with VHDL design", Tata McGraw Hill Edi., 2001

Reference Books:

1. Navabi, "VHDL Modeling", McGraw Hill, 1997
2. J. Bhaskar, "VHDL Primer", Pearson Education, 1999

EC939 WIRELESS SECURITY

UNIT I 8 Hours

Introduction: Attacks – Services – Mechanisms – Conventional Encryption – Classical and Modern Techniques – Encryption Algorithms – Confidentiality.

UNIT II 8 Hours

Public Key Encryption: RSA – Elliptic Curve cryptography – Number Theory Concepts.

UNIT III 8 Hours

Message Authentication: Hash Functions – Digest Functions – Digital Signatures – Authentication Protocols.

UNIT IV 8 Hours

Network Security Practice: Authentication, Applications – Electronic Mail Security-IP Security –Web Security.

UNIT V 8 Hours

System Security: Fire Walls – Current standards.

Text Book:

1. Stallings,"cryptography and Network Security – Principles & Practice", Prentice Hall, 1998.

Reference Books:

1. Bruce, Schneier, "Applied Cryptography" , 2nd Edition, Toha Wiley & Sons,1996
2. Douglas R.Stinson , "Cryptography – Theory and practice" , CRC Press,1995.

EC935 SENSOR NETWORKS

UNIT – I 8 Hours

Introduction - Sensor Networks - architectures – Design factors – Sensor Network Topology – Protocols.

UNIT – II 8 Hours

Physical layer in Sensor Networks – Frequency selection – signal detection – modulation – M-ary Modulation.

Introduction to UWB - UWB Base band transmission – Radio resource sharing – protocol.

UNIT – III 8 Hours

Data Link Layer for Sensor Networks – MAC for Sensor Network – SMACS and EAR algorithm – CSMA – Hybrid TDMA / FDMA – Error control.

UNIT – IV 8 Hours

Network layer – Security mechanisms – Security in Wireless Sensor Ad Hoc Networks – Search Techniques – Security management Techniques.

UNIT – V 8 Hours

Clustered Sensor Networks – fault tolerance mechanisms – Detection of failure – Recovery schemes.

Reference Books:

1. I. F. Akyildiz, Weilian Su, "A Survey on Sensor Networks", IEEE Communication Magazine, August 2002.
2. www.UWB.org

EC932 OFDM FOR WIRELESS COMMUNICATION

UNIT – I 8 Hours

OFDM Basics: Introduction to Wireless OFDM – OFDM principles, system model – Generation of sub carrier using IFFT, Guard time and cyclic extension, windowing, choice of OFDM parameters, OFDM signal processing.

UNIT – II 8 Hours

Coding and Modulation: Introduction – Forward error correcting coding – Interleaving – Quadrature Amplitude modulation – Coded modulation – Synchronization – sensitivity to phase noise and frequency offset and timing errors – Synchronization using cyclic extension and special training symbols.

UNIT – III 8 Hours

Channel estimation for OFDM system: Coherent and Differential Detection – Coherent detection – one and two dimensional channel estimators, special training symbols, Decision directed channel estimation – Differential detection – Differential detection in the time and frequency domain – Differential amplitude and phase shift keying.

UNIT – IV 8 Hours

Orthogonal Frequency Division Multiple Access: Frequency hopping in OFDMA, Difference between OFDMA and MC-CDMA. OFDMA system description – channel coding, modulation, Time and Frequency synchronization, Initial modulation timing and frequency offset synchronization accuracy, power control, Random frequency hopping operation – Dynamic channel allocation (simple and fast) – capacity of OFDMA.

UNIT – V 8 Hours

Application of OFDMA: Digital Audio Broadcasting – Front end Impairments in the OFDM modem – system simulation tools – Analysis and simulation of the main front end effects – Terrestrial digital video broadcasting – Magic wand (Wireless ATM project).

IEEE 802.11, Hyper LAN/ 2 and MMAC, Wireless LAN standards – OFDM parameters, channelization, OFDM signal processing, Training, Difference between IEEE 802.11, Hyper LAN/ 2 and MMAC.

Reference Books:

1. Richard Van Nee and Ranjee Prasad, "OFDM for Wireless Multimedia Communication", Artech House, 2000.
2. Mare Engels, "Wireless OFDM systems", Klumer Academic publishers, 2002.

Prasad. R, "Universal Wireless Personnel Communications", Artech House, 1998.

EC924 CDMA TECHNOLOGY

UNIT I 8 Hours

The CDMA concept: Need for spread spectrum communication – Spreading codes – Direct sequence and Frequency hopping spread spectrum communication system – Spread spectrum performance – Basic DS CDMA – Elements – RAKE receiver – Power control – Soft handover – Inter frequency handover – Multi user detection – Capacity – Effects of loading, sectorisation and voice activity.

UNIT II 8 Hours

Link structure and Call processing: Asymmetric links - Forward link – Pilot channel – Sync channel – Paging channel – Traffic channel – Modulator – Reversing access channel – Traffic channel – Call processing states – Initialization state – Idle state – Access state – Traffic channel state.

UNIT III 8 Hours

CDMA Design Engineering: Forward Link analysis – Pilot channel – Traffic channel – Reverse link – Traffic channel – Reverse link rise – Frequency reuse factor - PN offset planning – Short PN sequence – Co PN offset – Adjacent PN offset.

UNIT IV 8 Hours

CDMA Performance and Traffic engineering: Channel supervision-Power control parameters - Search window sizes - Field optimization – Traffic intensity – Loads – Grade of service – Earlang–B Model - Earlang–C Model – CDMA applications – Soft and hard blocking.

UNIT V 8 Hours

Next Generation CDMA: Physical channel – Multirate design – Spreading technique – Advanced error control techniques – Coherent detection – Inter operability in next generation CDMA – Multicarrier CDMA option – Forward link – Reverse link.

Reference Books:

1. Samuel C Yang, "CDMA RF System Engineering", - Artech House Mobile Communication Library , 1998.
2. John B.. Groe and Lawrence E. Larson, " CDMA Mobile Radio Design", Artech house 2000.
3. Kamil SH.Zingangirav, "Theory of Code Division Multiple Access Communication", IEEE press – Wiley Interscience, 2004.

EC928 - IMAGE PROCESSING

UNIT-I: Review of 2-D Systems 8 Hours

Linearity and space-variance, point-spread function and 2-D convolution, 2-D Fourier transforms. DISCRETE IMAGES AND IMAGE TRANSFORMS: 2-D sampling, reconstruction from samples. Nyquist rate, aliasing, sampling of random fields, practical limitations in sampling and reconstruction. Image quantization: Optimum mean-square (Lloyd-Max) quantizer. 2-D orthogonal and unitary transforms - Seperability. 2-D discrete fourier, cosine, sine, hadamard, haar, slant and K-L transforms, their properties and applications. Outer product expansion and singular value decomposition (SVD). properties of SVD.

UNIT-II: Image Enhancement 8 Hours

Histogram modeling, equalization and modification. Image smoothing - Neighborhood averaging and median filtering. Image crispening, spatial low pass, high pass and band pass filtering. Replication and zooming. Generalized spectrum and homomorphic filtering.

UNIT-III: Image Restoration 8 Hours

Image observation models. Inverse and Weiner filtering. FIR Wiener filters, filtering-using image transforms. Constrained least-squares restoration. Generalized inverse, SVD and interactive methods. Recursive filtering. Maximum entropy restoration. Bayesian methods.

UNIT-IV: Image Data Compression 8 Hours

Need for compression of image data. Sub sampling, coarse quantization and frame repetition. Pixel coding - PCM, entropy coding, Run length coding, Bit-plane coding. Predictive coding - feedback and feed forward prediction. DPCM-1-D and 2-D. transform coding of images, tradeoffs. Zonal versus threshold coding. Fast KL transforms coding. Adaptive transform coding. Hybrid coding and vector DPCM. Interframe hybrid coding. Adaptive hybrid coding.

UNIT- V: Image Analysis 8 Hours

Applications of image analysis- Computer vision. Spatial features. Transform features. Edge detection methods. Boundary extraction, representation and matching. AR models. Properties of AR features. Region representation. Moments as features. Image structure. Morphological operations - Erosion and dilation; their properties. Morphological transforms. Shape features. Image texture. Random models for texture. Scene matching and detection. Image segmentation. Basic ideas of image classification techniques.

Reference Books:

1. Anil.K.Jain, "Fundamentals of Digital Image Processing" E.E.Edn. of PHI, 1995.
2. R.C.Gonzalez and R.E. Woods, "Digital Image Processing", Addision Wesley Publishing Co., 1993.

EC937 WIRELESS LAN AND PAN

UNIT I 8 Hours

Basic of Networks: Telephone, Computer, cable television and wireless networks, networking principles, digitization: service integration, network services and layered architecture, traffic characterization and QoS, network services: network elements and network mechanisms.

UNIT II 8 Hours

Packet switched networks: OSI and IP models: Ethernet (IEEE 802.3); token ring (IEEE 802.5), FDDI, DQDB frame relay: SMDS, internet working with SMDS.

UNIT III 8 Hours

Internet and TCP/IP Networks: Overview – Internet protocols – TCP and VDP, performance of TCP/IP networks circuits – switched networks: SONET, DWDM, Fiber to the home, DSL, Intelligent networks, CATV.

UNIT IV 8 Hours

ATM and Wireless Networks: Main features – addressing signaling and routing; ATM header structure – adaptation layer, management and control; BISDN; interworking with ATM, wireless channel, link level design, channel access; Network design and wireless networks.

UNIT V 8 Hours

Optical Networks and switching: optical links – WDM systems, cross-connects, optical LANs, optical paths and networks; TDS and SDS: modular switch designs – packet switching, distributed, shared, input and output buffers.

Text Book:

1. Jean Warland and Pravin Varaiya, "High Performance Communication Networks", 2nd Edition, Harcourt and Morgan Kauffman, London, 2000.

Reference Books:

1. Leon Garcia, Widjaja, "Communication Networks", Tata McGraw Hill, New Delhi, 2000.
2. Sumit Kasera, Pankaj Sethi, "ATM Networks", Tata McGraw Hill, New Delhi, 2000.
3. Behrouz A. Forouzan, "Data Communication and Networking", Tata McGraw Hill, New Delhi, 2000.

EC934 RF MEMS FOR WIRELESS COMMUNICATIONS

UNIT I 8 Hours

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 8 Hours

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 8 Hours

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.

UNIT IV 8 Hours

Novel RF MEMS – Enabled circuits – reconfigurable circuits – the resonant MEMS switch, capacitors, inductors, tunable CPW resonator, MEMS microswitch 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 V 8 Hours

RF MEMS based circuit design – 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 Book:

1. 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.

EC930 MICROWAVE CIRCUIT ANALYSIS AND DESIGN

UNIT-I: S- Parameters and Microwave Transistor 8 Hours

Definitions and use of S Parameters with passive and active devices - Noise analysis in linear two port networks - Modeling of microwave bipolar transistor - Microwave FET-DC biasing- Impedance matching - S-parameter matrix and properties of S-parameters.

UNIT-II: Amplifier Design 8 Hours

Unilateral and non-unilateral design - One stage and multistage design - Low-noise amplifiers - High-power amplifiers - Balanced amplifiers - Feedback - Design examples - Small-signal distributed amplifiers.

UNIT- III: Oscillator Design 8 Hours

Resonators – Dielectric resonators – YIG resonators – Varactor resonators – Resonator measurements – Two-port oscillator design – Noise Lesson's oscillator model – Low-noise design. Non-linear oscillator model

UNIT-IV: Mixer Design 8 Hours

Diode mixer theory - Single diode mixers - Single-balanced mixers - Double balanced mixers - FET mixer theory - Balanced FET Mixers - Spectral mixer circuits - Image rejection mixer - single side band modulator performance - Simple sub harmonically pumped mixer circuit configuration.

UNIT-V: MIC Design 8 Hours

Integrated microwave workstation approach - Non-linear tools - Field drivers design -Designing non-linear circuits using the harmonic balanced method - programmable microwave tuning system - Introduction to MMIC considering layout effects - Microwave integrated circuit components.

Reference Books:

1. George.D.Vandelin, Anthony M.Pavis and Ulrich L.Rohde, "Microwave circuits design using linear and non linear techniques", John Wiley and sons 1990.
2. Samuel T.Liao, "Microwave Circuits and analysis and amplifier design", PHI, 1987.
3. Jeffrey Frey and Kul.Bhasin, "Microwave Integrated Circuits", Artech House, 1985.

EC933 OPTICAL COMPUTERS

UNIT – I: Introduction 8 Hours

Basic elements of optical systems - Mirrors-Gratings-lenses -transducers-Spatial light modulators - Holographic elements-fundamental limitations on dynamic range-hybrid optical/electronic systems-dependence between optics and electronics.

UNIT - II: Optical Image and Signal Processing 8 Hours

Spectral analysis and filtering - Pattern recognitions - picture deblurring - synthetic aperture radar imaging - radio signal analysis - Simple arithmetic-matrix operations-Differentiation and integration- analog solution of practical differential equations.

UNIT – III: Non-linear Optics 8 Hours

Non-linear effects – Optical bistability – Hybrid polarization devices-Optical phase conjugation-uses of optical phase conjugation

UNIT – IV: Digital Optical Computers 8 Hours

Internal representations – Implementations of binary logic elements – Implementation of arithmetic units – Memory – Interconnection and communication – architectures.

UNIT – V: Feasibility and Technology 8 Hours

Thin film wave guides - Passive integrated optic devices-active integrated optic devices-properties and limitations.

Reference Books:

1. Dror G.Feitelsor, " Optical Computing", MIT Press, 1987.
2. A.Yariv, Optical Electronics, "Holt-Saunders International Edition" , 1985
3. "Digital Optical Computing", Proc. IEEE, Vol.72, 1984.

EC938 - WIRELESS NETWORKS AND MOBILE COMPUTING

UNIT -1: Introduction 8 Hours

Introduction to wireless networks and mobile computing-Challenges of mobile computing-Mobile channel characteristics-Folding and shadowing communication issues-Review of cellular schemes, model and methodology.

UNIT-II: Medium Access Control 8 Hours

Hidden /Exposed terminals-Near / Far terminals-SDMA, FDMA, TDMA and CDMA.

Wireless LANS:

Infrared radio transmission, infrastructure Vs Ad hoc Networks, IEEE 802.11: Architecture. MAC layer- Synchronization, power management, roaming-IEEE 802.11b, 802.11a, new developments. Blue tooth overview.

UNIT -III: Mobile IP 8 Hours

Overview, network elements, packet delivery agent discovery, registration - Tunneling and encapsuplation optimization, IPv6, IP micro mobility support, DHCP and mobile IP, mobile transport layer- Traditional TCP and implications on mobility, indirect and snooping TCP - TCP over 2.5G/3G networks- Performance enhancing process.

UNIT IV: Mobile Computing 8 Hours

File systems and WWW architectures for mobile computing - WAP-Architecture, protocols wireless applications, environment WML, push architecture, push/pull services, WAP 1.72 stacks, I-mode, WAP 2.0 - J2ME- BREW.

UNIT V: Wireless Security 8 Hours

Public key infrastructure and certification authorities- wireless public key infrastructure- Characteristics of SIM - Security protocols- Authentication.

Text Book:

1. "Mobile Communication", John Schiller, Addison Wesley-2003.

Reference Books:

1. "Principles of Wireless Networks - A Unified Approach ",K.Pahlvanand P.Krishnamurthy", Pearson Education , 2004.
2. "Introduction to Wireless and Mobile Systems", D.P.Agarwal and Qing.An Zeng, Thamson- Brooks.cole, 2003.
3. "Wireless Network Evolution: 2G to 3G",V.K.Garg - Prentice Hall , 2002 ..
4. "Mobile and Wireless Networks",V.Blook - Prentice Hall , 1996.
5. "Mobile IP Design-Principles and practice",C.E.Perkins - Addison Wesley ,1998.
6. "Ad Hoc Wireless Networks- Architectures and Protocols", Siva Ram Murthy and B.S.Manoj Prentice Hall , 2004.
7. "Wireless Personal Communication Systems", DJ.Goodman-Addisson Wesley, 1997.