UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E. COMMUNICATION SYSTEMS

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA9108	Applied Mathematics for Communication Engineers	3	1	0	4
2	AP9114	Statistical Signal Processing	3	0	0	3
3	CU9111	Advanced Radiation Systems	3	0	0	3
4	CU9112	Advanced Digital Communication Techniques	3	0	0	3
5	CU9113	Fiber Optic Networking	3	0	0	3
6	E1	Elective I	3	0	0	3
PRACTICAL						
7	CU9117	Communication System Design Laboratory	0	0	4	2
		TOTAL	**18**	**1**	**4**	**21**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CU9121	Wireless Networks	3	0	0	3
2	CU9122	RF System Design	3	0	0	3
3	E2	Elective II	3	0	0	3
4	E3	Elective III	3	0	0	3
5	E4	Elective IV	3	0	0	3
6	E5	Elective V	3	0	0	3
PRACTICAL						
7	CU9127	RF and Networks Laboratory	0	0	4	2
		TOTAL	**18**	**0**	**4**	**20**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E6	Elective VI	3	0	0	3
2	E7	Elective VII	3	0	0	3
3	E8	Elective VIII	3	0	0	3
PRACTICAL						
4	CU9135	Project Work – Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1	CU9141	Project Work – Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE = 68

UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO VI SEMESTERS (PART TIME)

M.E. COMMUNICATION SYSTEMS

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	MA9108	Applied Mathematics for Communication Engineers	3	1	0	4
2.	AP9114	Statistical Signal Processing	3	0	0	3
3.	CU9111	Advanced Radiation Systems	3	0	0	3
		TOTAL	**9**	**1**	**0**	**10**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	CU9122	RF System Design	3	0	0	3
2.	E1	Elective I	3	0	0	3
3.	E2	Elective II	3	0	0	3
		TOTAL	**9**	**0**	**0**	**9**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	CU9112	Advanced Digital Communication Techniques	3	0	0	3
2.	CU9113	Fiber Optic Networking	3	0	0	3
3.	E3	Elective III	3	0	0	3
PRACTICAL						
4.	CU9117	Communication System Design Laboratory	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	CU9121	Wireless Networks	3	0	0	3
2.	E4	Elective IV	3	0	0	3
3.	E5	Elective V	3	0	0	3
PRACTICAL						
4.	CU9127	RF and Networks Laboratory	0	0	4	2
		TOTAL	**9**	**0**	**4**	**11**

SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	E6	Elective VI	3	0	0	3
2.	E7	Elective VII	3	0	0	3
3.	E8	Elective VIII	3	0	0	3
PRACTICAL						
4.	CU9135	Project Work – Phase I	0	0	12	6
		TOTAL	**9**	**0**	**12**	**15**

SEMESTER VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	CU9141	Project Work – Phase II	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

LIST OF ELECTIVES FOR COMMUNICATION SYSTEMS

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	AP9155	Electromagnetic Interference and Compatibility in System Design	3	0	0	3
2	AP9164	High Speed Switching Architectures (E)	3	0	0	3
3	CU9151	Microwave Integrated Circuits(E)	3	0	0	3
4	CU9162	Multimedia Communication	3	0	0	3
5	CU9152	Satellite Communication	3	0	0	3
6	AP9122	Digital Image Processing	3	0	0	3
7	CU9153	Digital Communication Receivers	3	0	0	3
8	CU9154	Mobile AD-HOC Networks	3	0	0	3
9	CU9155	CDMA Engineering	3	0	0	3
10	CU9156	Wireless Communications And MIMO Systems	3	0	0	3
11	CU9157	Network Routing Algorithms	3	0	0	3
12	CU9158	Network Management	3	0	0	3
13	CU9159	Communication Network Security	3	0	0	3
14	CP9159	Soft Computing	3	0	0	3
15	CU9160	Telecommunication System Modeling and Simulation	3	0	0	3
16	CU9163	Wireless Sensor Networks	3	0	0	3
17	CU9161	Advanced Microwave Communication	3	0	0	3

MA9108	APPLIED MATHEMATICS FOR COMMUNICATION ENGINEERS	L T P C 3 1 0 4

UNIT I SPECIAL FUNCTIONS 9

Bessel's equation – Bessel function – Recurrence relations - Generating function and orthogonal property for Bessel functions of first kind – Fourier-Bessel expansion.

UNIT II MATRIX THEORY 9

Some important matrix factorizations – The Cholesky decomposition – QR factorization – Least squares method – Singular value decomposition - Toeplitz matrices and some applications.

UNIT III ONE DIMENSIONAL RANDOM VARIABLES 9

Random variables - Probability function – moments – moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a Random Variable.

UNIT IV TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and Conditional distributions – Functions of two dimensional random variables – Regression Curve – Correlation**.**

UNIT V QUEUEING MODELS 9

Poisson Process – Markovian queues – Single and Multi-server Models – Little's formula - Machine Interference Model – Steady State analysis – Self Service queue.

L +T: 45+15 = 60 PERIODS

REFERENCES

1. Grewal, B.S., Numerical methods in Engineering and Science, 40th edition, Khanna Publishers, 2007.
2. Moon, T.K., Sterling, W.C., Mathematical methods and algorithms for signal processing, Pearson Education, 2000.
3. Richard Johnson, Miller & Freund, Probability and Statistics for Engineers, 7th Edition, Prentice – Hall of India, Private Ltd., New Delhi (2007).
4. Taha, H.A., Operations Research, An introduction, 7th edition, Pearson education editions, Asia, New Delhi, 2002.
5. Donald Gross and Carl M. Harris, Fundamentals of Queueing theory, 2nd edition, John Wiley and Sons, New York (1985)

AP9114 STATISTICAL SIGNAL PROCESSING L T P C
3 0 0 3

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes- Ensemble Averages, Stationary processes, Bias and Estimation, Autocovariance, Autocorrelation, Parseval's theorem, Wiener-Khintchine relation, White noise, Power Spectral Density, Spectral factorization, Filtering Random Processes, Special types of Random Processes – ARMA, AR, MA – Yule-Walker equations.

UNIT II SPECTRAL ESTIMATION 9

Estimation of spectra from finite duration signals, Nonparametric methods – Periodogram, Modified periodogram, Bartlett, Welch and Blackman-Tukey methods, Parametric methods – ARMA, AR and MA model based spectral estimation, Solution using Levinson-Durbin algorithm

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction – Forward and Backward prediction, Solution of Prony's normal equations, Least mean-squared error criterion, Wiener filter for filtering and prediction, FIR and IIR Wiener filters, Discrete Kalman filter

UNIT III ADAPTIVE FILTERS 9

FIR adaptive filters – adaptive filter based on steepest descent method- Widrow-Hopf LMS algorithm, Normalized LMS algorithm, Adaptive channel equalization, Adaptive echo cancellation, Adaptive noise cancellation, RLS adaptive algorithm.

UNIT IV MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate – Interpolation and Decimation, Decimation by an integer factor, Interpolation by an integer factor, Sampling rate conversion by a rational factor, Polyphase filter structures, Multistage implementation of multirate system, Application to subband coding – Wavelet transform

TOTAL: 45 PERIODS

REFERENCES

1. Monson H. Hayes, 'Statistical Digital Signal Processing and Modeling", John Wiley and Sons, Inc, Singapore, 2002
2. John J. Proakis, Dimitris G. Manolakis, : Digital Signal Processing', Pearson Education, 2002
3. Rafael C. Gonzalez, Richard E. Woods, " Digital Image Processing", Pearson Education Inc.,Second Edition, 2004 (For Wavelet Transform Topic)

CU9111 ADVANCED RADIATION SYSTEMS L T P C
3 0 0 3

UNIT I ANTENNA FUNDAMENTALS 9

Antenna fundamental parameters , . Radiation integrals ,Radiation from surface and line current distributions – dipole, monopole, loop antenna; Mobile phone antenna-base station, hand set antenna; Image; Induction ,reciprocity theorem, Broadband antennas and matching techniques, Balance to unbalance transformer, Introduction to numerical techniques

UNIT II RADIATION FROM APERTURES: 9

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna; Reflector antenna, aperture blockage, and design consideration.

UNIT III ARRAY ANTENNA 9

Linear array –uniform array, end fire and broad side array, gain, beam width, side lobe level; Two dimensional uniform array; Phased array, beam scanning, grating lobe, feed network,; Linear array synthesis techniques – Binomial and Chebyshev distributions.

UNIT IV MICRO STRIP ANTENNA 9

Radiation Mechanism and Excitation techniques : Microstrip dipole; Patch ,Rectangular patch, Circular patch, and Ring antenna – radiation analysis from cavity model; input impedance of rectangular and circular patch antenna; Microstrip array and feed network; Application of microstrip array antenna.

UNIT V EMC ANTENNA AND ANTENNA MEASUREMENTS 9

Concept of EMC measuring antenna; Tx and Rx antenna factors; Log periodic dipole, Bi-conical, Ridge guide, Multi turn loop; Antenna measurement and instrumentation – Gain, Impedance and antenna factor measurement; Antenna test range Design.

TOTAL : 45 PERIODS

REFERENCES

1. Balanis.A, “Antenna Theory Analysis and Design”, John Wiley and Sons, New York, 1982.
2. Krauss.J.D, “Antennas”, II edition, John Wiley and sons, New York, 1997.
3. I.J. Bahl and P. Bhartia,” Microstrip Antennas”,Artech House,Inc.,1980
4. W.L.Stutzman and G.A.Thiele,”Antenna Theory and Design”, 2nd edition,John Wiley& Sons Inc.,1998.

CU9112 ADVANCED DIGITAL COMMUNICATION TECHNIQUES L T P C
3 0 0 3

UNIT I CONSTANT ENVELOPE MODULATION 9

Advantages of Constant Envelope Modulation; Binary Frequency Shift Keying-Coherent and Non-coherent Detection of BFSK; Minimum Shift Keying-; Gaussian Minimum Shift Keying; M-ary Phase Shift Keying; M-ary Quadrature Amplitude Modulation; M-ary Frequency Shift Keying.

UNIT II OFDM 9

Generation of sub-carriers using the IFFT; Guard Time and Cyclic Extension; Windowing; OFDM signal processing; Peak Power Problem: PAP reduction schemes-Clipping, Filtering, Coding and Scrambling.

UNIT III TRELLIS CODED MODULATION 9

Coded modulation for bandwidth-constrained channels-Trellis coded modulation; Set Partitioning, Four –state Trellis-coded modulation with 8-PSK signal constellation, Eight-state Trellis code for coded 8-PSK modulation, Eight-state Trellis for rectangular QAM signal constellations.

UNIT IV TURBO CODING 9

Introduction-Turbo Encoder, Turbo Decoder, Iterative Turbo Decoding Principles; Modifications of the MAP Algorithm-The Soft-Output Viterbi Algorithm(SOVA); Turbo Coded BPSK Performance over Gaussian channels, Turbo Coding Performance over Rayleigh Channels.

UNIT V SPACE-TIME CODING 9

Maximum Ratio combining; Space-time Block codes; Space-time Trellis codes-The 4-state, 4-PSK Space-time Trellis Encoder, The 4-state,4-PSK Space-time Trellis Decoder, MIMO-OFDM Systems.

TOTAL : 45 PERIODS

REFERENCES

1. Bernard Sklar., 'Digital Communications', second edition, Pearson Education,2001.
2. John G. Proakis., 'Digital Communication', 4 th edition, Mc Graw Hill Publication, 2001
3. Theodore S.Rappaport., 'Wireless Communications', 2nd edition, Pearson Education, 2002.
4. Stephen G. Wilson., 'Digital Modulation and Coding', First Indian Reprint ,Pearson Education, 2003.
5. Richard Van Nee & Ramjee Prasad., 'OFDM for Multimedia Communications' Artech House Publication,2001.

CU9113 FIBER OPTIC NETWORKING L T P C
3 0 0 3

UNIT I OPTICAL SYSTEM COMPONENTS AND NETWORK DESIGN 9

Optical System Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters; Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion; Wavelength stabilization ; Overall design considerations.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture ; Broadcast and Select Networks – Topologies, Media-Access Control Protocols and Testbeds; Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9

WDM Network Elements; WDM Network Design - Cost tradeoffs, Virtual Topology Design, Routing and wavelength assignment, Statistical Dimensioning Models.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronisation, Header Processing, Buffering, Burst Switching, Testbeds; Access Networks.

UNIT V NETWORK MANAGEMENT AND SURVIVABILITY 9

Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface; network Survivability- Protection in SONET / SDH and IP Networks, Optical layer Protection, Interworking between layers.

TOTAL : 45 PERIODS

REFERENCES

1. Rajiv Ramaswami and Kumar N. Sivarajan, “Optical Networks : A Practical Perspective”, Harcourt Asia Pte Ltd., Second Edition 2006.
2. C. Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks : Concept, Design and Algorithms”, Prentice Hall of India, Ist Edition, 2002.
3. P.E. Green, Jr., “Fiber Optic Networks”, Prentice Hall, NJ, 1993.
4. Biswanath Mukherjee, “Optical WDM Networks”, Springer, 2006.

CU9117 COMMUNICATION SYSTEM DESIGN LABORATORY L T P C
0 0 4 2

LIST OF EXPERIMENTS

1. Design and performance analysis of error control encoder and decoder (CRC, Convolutional Codes)
2. Determination of Maximum bit rate of a digital fiber optic link
3. Signal transmission and reception using WDM and spectral characterization
4. Wireless Channel emulation and characterization
5. Design and analysis of digital communication techniques on an SDR platform
6. OFDM transceiver design using MATLAB
7. Channel equalizer design using MATLAB (LMS, RLS)
8. Design and Analysis of Spectrum Estimators (Borlett , Welch)
9. Simulation of MIMO systems
10. Simulation of Turbo coding and SOVA

CU9121 WIRELESS NETWORKS L T P C
3 0 0 3

UNIT I WIRELESS LOCAL AREA NETWORKS 9

Introduction to wireless LANs - IEEE 802.11 WLANs - Physical Layer- MAC sublayer- MAC Management Sublayer- Wireless ATM - HIPERLAN- HIPERLAN-2, WiMax

UNIT II 3G OVERVIEW & 2.5G EVOLUTION 9

Migration path to UMTS, UMTS Basics, Air Interface, 3GPP Network Architecture, CDMA2000 overview- Radio and Network components, Network structure, Radio network, TD-CDMA, TD-SCDMA.

UNIT III ADHOC & SENSOR NETWORKS 9

Characteristics of MANETs, Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols, Wireless Sensor networks- Classification, MAC and Routing protocols.

UNIT IV INTERWORKING BETWEEN WLANS AND 3G WWANS 9

Interworking objectives and requirements, Schemes to connect WLANs and 3G Networks, Session Mobility, Interworking Architectures for WLAN and GPRS, System Descripltion, Local Multipoint Distribution Service, Multichannel Multipoint Distribution system.

UNIT V 4G & BEYOND 9

4G features and challenges, Technology path, IMS Architecture, Convergent Devices, 4G technologies, Advanced Broadband Wireless Access and Services, Multimedia, MVNO.

TOTAL : 45 PERIODS

REFERENCES

1. Clint Smith. P.E., and Daniel Collins, “3G Wireless Networks”, 2nd Edition, Tata McGraw Hill, 2007.
2. Vijay. K. Garg, “Wireless Communication and Networking”, Morgan Kaufmann Publishers, http://books.elsevier.com/9780123735805:, 2007.
3. Kaveth Pahlavan,. K. Prashanth Krishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. William Stallings, "Wireless Communications and networks" Pearson / Prentice Hall of India, 2nd Ed., 2007.
5. Dharma Prakash Agrawal & Qing-An Zeng, “Introduction to Wireless and Mobile Systems”, Thomson India Edition, 2nd Ed., 2007.
6. Gary. S. Rogers & John Edwards, “An Introduction to Wireless Technology”, Pearson Education, 2007.
7. Sumit Kasera and Nishit Narang, “ 3G Networks – Architecture, Protocols and Procedures”, Tata McGraw Hill, 2007.

CU9122	RF SYSTEM DESIGN	L	T	P	C
		3	0	0	3

UNIT I CMOS PHYSICS, TRANSCEIVER SPECIFICATIONS AND ARCHITECTURES 9

CMOS: Introduction to MOSFET Physics – Noise: Thermal, shot, flicker, popcorn noise Transceiver Specifications: Two port Noise theory, Noise Figure, THD, IP2, IP3, Sensitivity, SFDR, Phase noise - Specification distribution over a communication link Transceiver Architectures: Receiver: Homodyne, Heterodyne, Image reject, Low IF Architectures – Transmitter: Direct upconversion, Two step upconversion

UNIT II IMPEDANCE MATCHING AND AMPLIFIERS 9

S-parameters with Smith chart – Passive IC components - Impedance matching networks Amplifiers: Common Gate, Common Source Amplifiers – OC Time constants in bandwidth estimation and enhancement – High frequency amplifier design Low Noise Amplifiers: Power match and Noise match – Single ended and Differential LNAs – Terminated with Resistors and Source Degeneration LNAs.

UNIT III FEEDBACK SYSTEMS AND POWER AMPLIFIERS 9

Feedback Systems: Stability of feedback systems: Gain and phase margin, Root-locus techniques – Time and Frequency domain considerations – Compensation Power Amplifiers: General model – Class A, AB, B, C, D, E and F amplifiers – Linearisation Techniques – Efficiency boosting techniques – ACPR metric – Design considerations

UNIT IV PLL AND FREQUENCY SYNTHESIZERS 9

PLL: Linearised Model – Noise properties – Phase detectors – Loop filters and Charge pumps Frequency Synthesizers: Integer-N frequency synthesizers – Direct Digital Frequency synthesizers

UNIT V MIXERS AND OSCILLATORS 9

Mixer: characteristics – Non-linear based mixers: Quadratic mixers – Multiplier based mixers: Single balanced and double balanced mixers – subsampling mixers Oscillators: Describing Functions, Colpitts oscillators – Resonators – Tuned Oscillators – Negative resistance oscillators – Phase noise

TOTAL : 45 PERIODS

TEXT BOOKS

1. T.Lee, “Design of CMOS RF Integrated Circuits”, Cambridge, 2004
2. B.Razavi, “RF Microelectronics”, Pearson Education, 1997
3. Jan Crols, Michiel Steyaert, “CMOS Wireless Transceiver Design”, Kluwer Academic Publishers, 1997
4. B.Razavi, “Design of Analog CMOS Integrated Circuits”, McGraw Hill, 2001.

CU9127	RF AND NETWORKS LABORATORY	L T P C 0 0 4 2

LIST OF EXPERIMENTS

1. Transmission line parameters – Measurement using Network Analyser
2. Design and characterization of Antennas using ADS/IE3D/HFSS
3. Spectral Characterisation of communication signals (using Spectrum Analyzer)
4. LNA / Mixer / VCO design and characterization using ADS/IE3D/HFSS
5. Design and budget analysis of communication links using ADS/IE3D/HFSS
6. Study of a RF link
7. Simulation and performance evaluation of entity mobility models using GLOMOSIM / NS2
   (Random walk, Random way point)
8. Simulation and performance evaluation of Ad-hoc routing protocols using GLOMOSIM / NS2
   (DSR, AODV, ZRP)
9. Simulation and performance evaluation of Wireless MAC protocols using GLOMOSIM / NS2
10. Simulation and performance evaluation of Wi –Fi LAN
11. Study of ZIGBEE /Bluetooth

AP9155	ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN	L T P C 3 0 0 3

UNIT I EMI/EMC CONCEPTS 8

EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.

UNIT II EMI COUPLING PRINCIPLES 10

Conducted, radiated and transient coupling; Common ground impedance coupling ; Common mode and ground loop coupling ; Differential mode coupling ; Near field cable to cable coupling, cross talk ; Field to cable coupling ; Power mains and Power supply coupling.

UNIT III EMI CONTROL TECHNIQUES 9

Shielding, Filtering, Grounding, Bonding, Isolation transformer, Transient suppressors, Cable routing, Signal control.

UNIT IV EMC DESIGN OF PCBS 8

Component selection and mounting; PCB trace impedance; Routing; Cross talk control; Power distribution decoupling; Zoning; Grounding; Vias connection; Terminations.

UNIT V EMI MEASUREMENTS AND STANDARDS 10

Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Tx /Rx Antennas, Sensors, Injectors / Couplers, and coupling factors; EMI Rx and spectrum analyzer; Civilian standards-CISPR, FCC, IEC, EN; Military standards-MIL461E/462.

TOTAL : 45 PERIODS

REFERENCES

1. V.P.Kodali, “Engineering EMC Principles, Measurements and Technologies”, IEEE Press, New York, 1996.
2. Henry W.Ott., ”Noise Reduction Techniques in Electronic Systems”, A Wiley Inter Science Publications, John Wiley and Sons, New York, 1988.
3. Bemhard Keiser, “Principles of Electromagnetic Compatibility”, 3rd Ed, Artech hourse, Norwood, 1986.
4. C.R.Paul,”Introduction to Electromagnetic Compatibility” , John Wiley and Sons, Inc, 1992.
5. Don R.J.White Consultant Incorporate, “Handbook of EMI/EMC”, Vol I-V, 1988.

AP9164 HIGH SPEED SWITCHING ARCHITECTURES **L T P C**
3 0 0 3

UNIT I LAN SWITCHING TECHNOLOGY **9**

Switching Concepts, switch forwarding techniques, switch path control, LAN Switching, cut through forwarding, store and forward, virtual LANs.

UNIT II ATM SWITCHING ARCHITECTURE **9**

Blocking networks - basic - and- enhanced banyan networks, sorting networks - merge sorting, re-arrangable networks - full-and- partial connection networks, non blocking networks - Recursive network construction, comparison of non-blocking network, Switching with deflection routing - shuffle switch, tandem banyan switch.

UNIT III QUEUES IN ATM SWITCHES **9**

Internal Queueing -Input, output and shared queueing, multiple queueing networks – combined Input, output and shared queueing - performance analysis of Queued switches.

UNIT IV PACKET SWITCHING ARCHITECTURES **9**

Architectures of Internet Switches and Routers- Bufferless and buffered Crossbar switches, Multi-stage switching, Optical Packet switching; Switching fabric on a chip; Internally buffered Crossbars.

UNIT V IP SWITCHING **9**

Addressing model, IP Switching types - flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting, Ipv6 over ATM.

TOTAL : 45 PERIODS

REFERENCES

1. Achille Pattavina, “Switching Theory: Architectures and performance in Broadband ATM networks ",John Wiley & Sons Ltd, New York. 1998
2. Elhanany M. Hamdi, “High Performance Packet Switching architectures”, Springer Publications, 2007.
3. Christopher Y Metz, “Switching protocols & Architectures”, McGraw - Hill Professional Publishing, NewYork.1998.
4. Rainer Handel, Manfred N Huber, Stefan Schroder, “ATM Networks - Concepts Protocols, Applications”, 3rd Edition, Addison Wesley, New York. 1999.

CU9151 MICROWAVE INTEGRATED CIRCUITS L T P C

2 0 2 3

UNIT I INTRODUCTION TO MICROWAVE INTEGRATED CIRCUITS 4

MMIC- technology, advantages and applications, Active device technologies, design approaches, multichip module technology, substrates.

UNIT II PASSIVE COMPONENTS 7

Inductors, capacitors, resistors, microstrip components, coplanar circuits, multilayer techniques, micromachined passive components, switches & attenuators, filter design.

UNIT III AMPLIFIERS 7

Stability & gain analysis, matching techniques, reactively matched amplifier design, , LNA

UNIT IV OSCILLATORS 6

Design principles, active device CAD techniques for large signal oscillators design, phase noise, MMIC_VCO, mixers.

UNIT V INTEGRATED ANTENNAS AND MEASUREMENT TECHNIQUES 6

Integrates antenna selection, photonic band gap antennas, micro machined antenna, micro electro mechanical system antennas, test fixture measurements, probe station measurements, thermal and cryogenic measurements, experimental field probing techniques.

THEORY	30
LABORATORY	30

(using ADS / IE3D / HFSS)

1. Design of Phase shifters
2. Design of Directional couplers
3. Design of Filters
4. Design of Impedance matching Networks
5. Design of Branch line couplers
6. Stability analysis using ZY Smith chart
7. Photonic and Electronic band gap antennas design-basics

L +T: 45+15 = 60 PERIODS

REFERENCES

1. Ravender Goyal, “Monolithic MIC; Technology & Design”, Artech House, 1989.
2. Gupta K.C. and Amarjit Singh, “ Microwave Integrated Circuits”, John Wiley, New York, 1975.
3. Hoffman R.K. “Handbook of Microwave Integrated Circuits”, Artech House, Boston, 1987.
4. Ulrich L. Rohde and David P.N., “ RF / Microwave Circuit Design for Wireless Applications”, John Wiley, 2000.
5. C. Gentili, “ Microwave Amplifiers and Oscillators”, North Oxford Academic, 1986.

6. Annapurna Das and Sisir K Das, " Microwave Engineering", Tata McGraw-Hill Pub. Co. Ltd., 2004.
7. Samuel. Y. Liao, " Microwave Circuit Analysis and Amplifier Design", Prentice Hall. Inc., 1987.
8. Mathew N.O. Sadiku, "Numerical techniques in Electromagnetics", CRC Press, 2001.

CU9162 MULTIMEDIA COMMUNICATION L T P C
3 0 0 3

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNITII AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding, MP3; Video compression – principles-H.261-H.263-MPEG 1, 2, 4.

UNIT III LOSSLESS COMPRESSION 9

Compression principles-source encoders and destination encoders--entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel Ziv-Welch Compression.

UNIT IV VoIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service-CODEC Methods-VOIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL : 45 PERIODS

REFERENCES

1. Fred Halshall, "Multimedia communication - applications, networks, protocols and standards", Pearson education, 2007.
2. Tay Vaughan, "Multimedia: Making it work", 7/e, TMH, 2007.
3. Kurose and W.Ross, "Computer Networking –A top down approach" ,Pearson education, 3rd ed, 2005.
4. Marcus Gonzalves, "Voice over IP Networks", McGraw Hill,
5. KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education 2007
6. R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education, First ed, 1995.
7. Ranjan Parekh, "Principles of Multimedia", TMH, 2006

CU9152 SATELLITE COMMUNICATION L T P C
3 0 0 3

UNIT I ELEMENTS OF SATELLITE COMMUNICATION 8

Satellite Systems, Orbital description and Orbital mechanics of LEO, MEO and GSO, Placement of a Satellite in a GSO, Satellite – description of different Communication subsystems, Bandwidth allocation.

UNIT II TRANSMISSION, MULTIPLEXING, MODULATION, MULTIPLE ACCESS AND CODING 12

Different modulation and Multiplexing Schemes, Multiple Access Techniques – FDMA, TDMA, CDMA, and DAMA, Coding Schemes.

UNIT III SATELLITE LINK DESIGN 9

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV SATELLITE NAVIGATION AND GLOBAL POSITIONING SYSTEM 8

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Receiver Operation and Differential GPS

UNIT V APPLICATIONS 8

Satellite Packet Communications , Intelsat series – INSAT series –VSAT, mobile satellite services, INMARSAT, Satellite and Cable Television, DBS (DTH), VSAT, Satellite Phones.

TOTAL : 45 PERIODS

REFERENCES

1. Wilbur L. Pritchard, H.G. Suyderhoud ,Robert A.Nelson, Satellite Communication Systems Engineering, Prentice Hall, New Jersey, 2006.
2. Timothy Pratt and Charles W.Bostain, Satellite Communications, John Wiley and Sons, 2003.
3. D.Roddy, Satellite Communication, McGrawHill, 2006.
4. Tri T Ha, Digital Satellite Communication, McGrawHill,1990.
5. B.N.Agarwal, Design of Geosynchronous Spacecraft, Prentice Hall, 1993.

AP9122 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS 9

1D DFT, 2D transforms – DFT, DCT, Discrete Sine, Walsh, Hadamard, Slant, Haar, KLT, SVD, Wavelet transform.

UNIT III IMAGE ENHANCEMENT AND RESTORATION 7

Histogram modification , Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic and Y_p mean filters. Image restoration - degradation model, Unconstrained and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations, Gray-Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 11

Image segmentation – Edge detection, Edge linking and boundary detection, Region growing, Region splitting and Merging, Image Recognition **–** Patterns and pattern classes, Matching by minimum distance classifier, Matching by correlation., Neural networks-Backpropagation network and training, Neural network to recognize shapes.

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Block Truncation Coding, Transform coding, JPEG standard, JPEG 2000, SPIHT, MPEG.

TOTAL : 45 PERIODS

REFERENCES

1. Rafael C. Gonzalez, Richard E. Woods, ' Digital Image Processing', Pearson Education, Inc., Second Edition, 2004
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. Anil K. Jain, ' Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002.
4. D.E. Dudgeon and R.M. Mersereau, 'Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
5. William K. Pratt, ' Digital Image Processing', John Wiley, NewYork, 2002.
6. Milan Sonka et al, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,
7. Sid Ahmed, M.A., 'Image Processing Theory, Algorithms and Architectures', McGrawHill, 1995.

CU9153 DIGITAL COMMUNICATION RECEIVERS L T P C
3 0 0 3

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Base band and band pass communication; signal space representation, linear and nonlinear modulation techniques, and Spectral characteristics of digital modulation

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter , maximum likelihood sequence detector, optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading,, diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and signal synchronization, carrier phase estimation-PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, adaptive decision-feedback equalizer and Equalization of Trellis-coded signals. Kalman algorithm, blind equalizers and stochastic gradient algorithm.

TOTAL : 45 PERIODS

REFERENCES

1. Heinrich Meyer, Mare Moeneclacy, Stefan.A.Fechtel, " Digital communication receivers ",Vol I & Vol II, John Wiley, New York, 1997.
2. John.G.Proakis, “Digital communication “4th Edition, McGraw-Hill, New York, 2001.
3. E.A.Lee and D.G. Messerschmitt, “Digital communication ", 2nd Edition, Allied Publishers, New Delhi, 1994.
4. Simon Marvin, “Digital communication over fading channel; An unified approach to performance Analysis ", John Wiley, New York, 2000.

CU9154 MOBILE AD HOC NETWORKS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNITIV END -TO - END DELIVERY AND SECURITY 9

Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNITV CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G 9

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:- Architecture, methods of co-operation, co-operative antennas, Integration of ad hoc network with other wired and wireless networks.

TOTAL : 45 PERIODS

REFERENCES

1. C.Siva Ram Murthy and B.S.Manoj, “Ad hoc Wireless Networks Architectures and protocols”, 2nd edition, Pearson Education. 2007
2. Charles E. Perkins, “Ad hoc Networking”, Addison – Wesley, 2000
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, “Mobile adhoc networking”, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, “The handbook of adhoc wireless networks”, CRC press, 2002.
5. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad Hoc Network Research,” Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , “A survey of integrating IP mobility protocols and Mobile Ad hoc networks”, IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”, Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, ” ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”, World Wireless cong., San Francisco, CA,May 2004.

9. V.Kawadia and P.P.Kumar,"A cautionary perspective on Cross-Layer designs", IEEE Wireless commn. vol 12, no 1,2005.
10. J. N. Laneman, D. N. C. Tse, and G. W. Wornell, "Cooperative Diversity in Wireless Networks: Efficient Protocols and Outage Behavior," IEEE Trans. Info. Theory, April 2003.
11. J. N. Laneman, "Cooperative Diversity in Wireless Networks: Algorithms and Architectures", Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA, August 2002.

CU9155 **CDMA SYSTEMS** **L T P C**
3 0 0 3

UNIT I BASIC CONCEPTS OF CDMA 9

Spread spectrum communication techniques (DS-CDMA, FH-CDMA), Synchronization in CDMA system, Detection and False alarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

UNIT II IS-95 CDMA TECHNIQUES 9

Spreading Codes , Power control, Handover techniques, Physical and logical channels and processing (Forward and reverse links)

UNIT III WCDMA / CDMA 2000 9

Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation & demodulation process , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS 9

Multicarrier CDMA, System design , Performance parameters – BER lower bound ,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA 9

Prime Codes and it's properties, Generalized and Extended Prime Codes, Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multiwavelength Optical CDMA networks.

TOTAL : 45 PERIODS

REFERENCES

1. John G.Proakis, "Digital Communications", McGraw Hill International Ltd, 4th ed., Singapore, 2000.
2. Andrew J. Viterbi, " CDMA: Principles of Spread Spectrum Communication",Addison- Wesley, 1st ed. , 1995.
3. Kaveth Pahlavan,. K. Prashanth Krishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, "IS –95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation", Pearson Education , 2st ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, " OFDM for Wireless Multimedia Communication" , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, "Wireless Communication", Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, "GSM CDMA One and 3G Systems", Wiley India, 2004.
8. Guu-Chang Yang, "Prime Codes with Application to Optical and Wireless Networks", Artech House, Inc., 2002.

CU9156 WIRELESS COMMUNICATIONS AND MIMO SYSTEMS L T P C
3 0 0 3

UNIT I INTRODUCTION 7

Current wireless systems, . the wireless spectrum and allocation to existing systems, radio propagation models, path loss calculation, ray tracing methods, empirical path loss models, discrete time and space time channel models, capacity of AWGN, flat fading, and frequency selective fading channels.

UNIT II DIGITAL MODULATION, DETECTION AND PERFORMANCE 10

AWGN channels and error probabilities, fading, outage and average error probabilities, Doppler spread and ISI, transmit and receiver diversity, moment generating functions in diversity, linear block codes, probability of error for hard decision and soft decision decoding, convolution codes, Viterbi algorithm and error probabilities of convolution codes, concatenated codes and Turbo codes, low denity parity check codes, coding and interleaving for fading channel, joint source and channel coding, adaptive modulation, variable rate, power and coding techniques.

UNIT III MULTIPLE ANTENNA SYSTEMS 10

Narrow band MIMO model, MIMO channel capacity, MIMO Diversity and beam forming, diversity multiplexing tradeoff, space time modulation and coding, frequency selective fading MIMO channels , smart anetnnas.

UNIT IV EQUALIZATION AND MULTICARRIER MODULATION 12

Equalizer noise enhancement and types, folded spectrum and ISI free transmission, linear equalization and MLSE, DFE and adaptive equelizers, data transmission using multiple carriers and, mitigation of subcarrier fading, discrete implementation of multicarrier systems, matrix rpreentation of OFDM, PAPR and frequency and timing offset.

UNIT V SPREAD SPECTRUM AND MULTI USER DETECTION 6

DSSS, FHSS and multiuser versions of these, random access, power control, downlink channel capacity, uplik channel capacity, multiuser diversity, MIMO diversity.

TOTAL : 45 PERIODS

TEXT BOOK

1. Wireless Communication , Andrea Goldsmith, Cambridge Univ. Press, 2006.

CU9157 NETWORK ROUTING ALGORITHMS L T P C
3 0 0 3

UNIT I INTRODUCTION 7

ISO OSI Layer Architecture, TCP/IP Layer Architecture, Functions of Network layer, General Classification of routing, Routing in telephone networks, Dynamic Non hierarchical Routing (DNHR), Trunk status map routing (TSMR), real-time network routing (RTNR), Distance vector routing, Link state routing, Hierarchical routing.

UNIT II INTERNET ROUTING 10

Interior protocol : Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Bellman Ford Distance Vector Routing. Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast Routing: Pros and cons of Multicast and Multiple Unicast Routing, Distance Vector Multicast Routing Protocol (DVMRP), Multicast Open Shortest Path First (MOSPF), MBONE, Core Based Tree Routing.

UNIT III ROUTING IN OPTICAL WDM NETWORKS 10

Classification of RWA algorithms, RWA algorithms, Fairness and Admission Control, Distributed Control Protocols, Permanent Routing and Wavelength Requirements, Wavelength Rerouting- Benefits and Issues, Lightpath Migration, Rerouting Schemes, Algorithms- AG, MWPG.

UNIT IV MOBILE - IP NETWORKS 9

Macro-mobility Protocols, Micro-mobility protocol: Tunnel based : Hierarchical Mobile IP, Intra domain Mobility Management, Routing based: Cellular IP, Handoff Wireless Access Internet Infrastructure (HAWAII).

UNIT V MOBILE AD –HOC NETWORKS 9

Internet-based mobile ad-hoc networking communication strategies, Routing algorithms – Proactive routing: destination sequenced Distance Vector Routing (DSDV), Reactive routing: Dynamic Source Routing (DSR), Ad hoc On-Demand Distance Vector Routing (AODV), Hybrid Routing: Zone Based Routing (ZRP).

TOTAL : 45 PERIODS

REFERENCES

1. William Stallings, ' High speed networks and Internets Performance and Quality of Service', IInd Edition, Pearson Education Asia. Reprint India 2002
2. M. Steen Strub, ' Routing in Communication network, Prentice –Hall International, Newyork,1995.
3. S. Keshav, 'An engineering approach to computer networking' Addison Wesley 1999.
4. William Stallings, 'High speed Networks TCP/IP and ATM Design Principles, Prentice- Hall, New York, 1995
5. C.E Perkins, 'Ad Hoc Networking', Addison – Wesley, 2001
6. Ian F. Akyildiz, Jiang Xie and Shantidev Mohanty, " A Survey of mobility Management in Next generation All IP- Based Wireless Systems", IEEE Wireless Communications Aug.2004, pp 16-27.

7. A.T Campbell et al., " Comparison of IP Micromobility Protocols," IEEE Wireless Communications Feb.2002, pp 72-82.
8. C.Siva Rama Murthy and Mohan Gurusamy, " WDM Optical Networks – Concepts, Design and Algorithms", Prentice Hall of India Pvt. Ltd, New Delhi –2002.

CU9158 NETWORK MANAGEMENT L T P C
3 0 0 3

UNIT I FUNDAMENTALS OF COMPUTER NETWORK TECHNOLOGY 9

Network Topology, LAN, Network node components- Hubs, Bridges, Routers, Gateways, Switches, WAN, ISDN Transmission Technology, Communications protocols and standards

UNIT II OSI NETWORK MANAGEMENT 9

OSI Network management model-Organizational model-Information model, communication model. Abstract Syntax Notation - Encoding structure, Macros Functional model CMIP/CMIS

UNIT III INTERNET MANAGEMENT(SNMP) 9

SNMP-Organizational model-System Overview, The information model, communication model-Functional model, SNMP proxy server, Management information, protocol remote monitoring

UNIT IV BROADBAND NETWORK MANAGEMENT 9

Broadband network s and services, ATM Technology-VP,VC,ATM Packet, Integrated service, ATMLAN emulation, Virtual Lan. ATM Network Management-ATM Network reference model, integrated local management Interface. ATM Management Information base, Role of SNMD and ILMI in ATM Management, M1, M2, M3, M4 Interface. ATM Digital Exchange Interface Management

UNIT V NETWORK MANAGEMENT APPLICATIONS 9

Configuration management, Fault management, performance management, Event Correlation Techniques security Management, Accounting management, Report Management, Policy Based Management Service Level Management

TOTAL : 45 PERIODS

REFERENCES

1. Mani Subramanian, "Network Management Principles and Practice ", Addison Wesley New York, 2000.
2. Salah Aiidarous, Thomas Plevayk, "Telecommunications Network Management Technologies and Implementations ", Eastern Economy Edition IEEE press, New Delhi, 1998.
3. Lakshmi G. Raman, "Fundamentals of Telecommunication Network Management ", Eastern Economy Edition IEEE Press, New Delhi, 1999.

CU9159 COMMUNICATION NETWORK SECURITY L T P C
3 0 0 3

UNIT I INTRODUCTION ON SECURITY 9

Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality, attacks on Integrity and availability. Security services and mechanisms, Techniques : Cryptography, Steganography , Revision on Mathematics for Cryptography.

UNIT II SYMMETRIC & ASYMMETRIC KEY ALGORITHMS 9

Substitutional Ciphers, Transposition Ciphers, Stream and Block Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4, principle of asymmetric key algorithms, RSA Cryptosystem

UNIT III INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT 9

Message Integrity, Hash functions : SHA, Digital signatures : Digital signature standards. Authentication : Entity Authentication: Biometrics, Key management Techniques.

UNIT IV NETWORK SECURITY , FIREWALLS AND WEB SECURITY 9

Introduction on Firewalls, Types of Firewalls, Firewall Configuration and Limitation of Firewall. IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management. Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature

UNIT V WIRELESS NETWORK SECURITY 9

Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS. WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network

TOTAL : 45 PERIODS

REFERENCES

1. Behrouz A. Fourcuzan ," Cryptography and Network security" Tata McGraw- Hill, 2008
2. William Stallings,"Cryptography and Network security: principles and practice",2nd Edition,Prentice Hall of India,New Delhi,2002
3. Atul Kahate ," Cryptography and Network security", 2nd Edition, Tata McGraw-
   Hill, 2008
4. R.K.Nichols and P.C. Lekkas ," Wireless Security"
5. H. Yang et al., Security in Mobile Ad Hoc Networks: Challenges and Solution, IEEE Wireless Communications, Feb. 2004.
6. Securing Ad Hoc Networks," IEEE Network Magazine, vol. 13, no. 6, pp. 24-30, December 1999.
7. "Security of Wireless Ad Hoc Networks," http://www.cs.umd.edu/~aram/wireless/survey.pdf.
8. David Boel et.al (Jan 2008) "Securing Wireless Sensor Networks – Security Architecture " Journal of networks , Vol.3. No. 1. pp. 65 -76.
9. Perrig, A., Stankovic, J., Wagner, D. (2004), "Security in Wireless Sensor Networks", *Communications of the ACM*, 47(6), 53-57.

CP9159	SOFT COMPUTING	L T P C 3 0 0 3

UNIT I ARTIFICIAL NEURAL NETWORKS 9

Basic-concepts-single layer perception-Multi layer perception-Supervised and un supervised learning ,Back propagation networks, Application

UNIT II FUZZY IOGIC 9

Fuzzy sets and Fuzzy reasoning- Fuzzy matrices-Fuzzy functions-decomposition-Fuzzy automata and languages- Fuzzy control methods-Fuzzy decision making, Applications

UNIT III NEURO-FUZZY MODELLING 9

Adaptive networks based Fuzzy interfaces-Classification and Representation trees-Data dustemp algorithm –Rule based structure identification-Neuro-Fuzzy controls

UNIT IV GENETIC ALGORITHM 9

Survival of the fittest-Fitness computations-crossover- mutation-reproduction-rank method-rank space method, Applications

UNIT V SOFT COMPUTING AND CONVENTIONAL AI 9

AI Search algorithm-Predicate calculus - rules of interface - Semantic networks-frames-objects-Hybrid models applications

TOTAL : 45 PERIODS

REFERENCES

1. Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998
2. Timothy J.Ross:Fuzzy Logic Engineering Applications. McGraw Hill,NewYork,1997.
3. Laurene Fauseett: Fundamentals of Neural Networks. Prentice Hall India, New Delhi,1994.
4. George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic, Prentice Hall Inc., New Jersey,1995
5. Nih.J. Ndssen Artificial Intelligence, Harcourt Asia Ltd.,Singapore,1998.

CU9160	TELECOMMUNICATION SYSTEM MODELING AND SIMULATION	L T P C 3 0 0 3

UNIT I SIMULATION METHODOLOGY 8

Introduction, Aspects of methodology, Performance Estimation, Simulation sampling frequency, Low pass equivalent simulation models for bandpass signals, Multicarrier signals, Non-linear and time-varying systems, Post processing – Basic graphical techniques and estimations.

UNIT II RANDOM SIGNAL GENERATION & PROCESSING 8

Uniform random number generation, Mapping uniform random variables to an arbitrary pdf, Correlated and Uncorrelated Gaussian random number generation, PN sequence generation, Random signal processing, Testing of random number generators.

UNIT III MONTE CARLO SIMULATION 9

Fundamental concepts, Application to communication systems, Monte Carlo integration, Semianalytic techniques, Case study: Performance estimation of a wireless system.

UNIT IV ADVANCED MODELS & SIMULATION TECHNIQUES 10

Modeling and simulation of non-linearities : Types, Memoryless non-linearities, Non-linearities with memory, Modeling and simulation of Time varying systems : Random process models, Tapped delay line model, Modelling and simulation of waveform channels, Discrete memoryless channel models, Markov model for discrete channels with memory.

UNIT V EFFICIENT SIMULATION TECHNIQUES 10

Tail extrapolation, pdf estimators, Importance Sampling methods, Case study: Simulation of a Cellular Radio System.

TOTAL : 45 PERIODS

REFERENCES

1. William.H.Tranter, K. Sam Shanmugam, Theodore. S. Rappaport, Kurt L. Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore) Pvt. Ltd, 2004.
2. M.C. Jeruchim, P.Balaban and K. Sam Shanmugam, Simulation of Communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.
3. Averill.M.Law and W. David Kelton, Simulation Modeling and Analysis, McGraw Hill Inc., 2000.
4. Geoffrey Gorden, System Simulation, Prentice Hall of India, 2nd Edition, 1992.
5. Jerry Banks and John S. Carson, Discrete Event System Simulation, Prentice Hall of India, 1984.

CU9163 WIRELESS SENSOR NETWORKS L T P C
3 0 0 3

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 8

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks- Enabling Technologies for Wireless Sensor Networks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING OF SENSORS 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TOTAL : 45 PERIODS

REFERENCES

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, And Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.
5. Bhaskar Krishnamachari, ”Networking Wireless Sensors”, Cambridge Press,2005.
6. Mohammad Ilyas And Imad Mahgaob,”Handbook Of Sensor Networks: Compact Wireless And Wired Sensing Systems”, CRC Press,2005.
7. Wayne Tomasi, “Introduction To Data Communication And Networking”, Pearson Education, 2007.

CU9161 ADVANCED MICROWAVE COMMUNICATION L T P C
3 0 0 3

UNIT I MICROWAVE AMPLIFIERS AND OSCILLATORS 10

Klystron Amplifier – Reflex Klystron Amplifier –Travelling wave tube Amplifier – Magnetron Oscillator and Modulator-Varactor diode – Parametric amplifier and applications – diode detector and mixer – GUNN, Tunnel IMPATT diode oscillators – Masers and lasers.

UNIT II MICROWAVE PASSIVE COMPONENTS 6

Scattering parameters-S-Matrix – Attenuator –Phase shifters – T Junctions – Hybrid T Junctions – Directional couplers – Isolater, Properties of ferrite devices – Faraday rotation – Gyrator – Circulator – Scattering parameter measurement.

UNIT III MICROWAVE RESONATORS AND FILTERS 7

Review of resonant circuits – principle of Microwave resonators – field analysis of cavity resonators – Characteristics of filters – Narrow and wide band filters – Filter and resonant applications – Frequency multiplier and frequency Discrimination.

UNIT IV MICROWAVE ANTENNAS 6

Characteristics of Microwave Antennas – Half Wave Dipole –Array – Horn – Paraboloidal Reflector – feeds – Lens and slot Antennas – Leaky and surface wave Antennas – Broad band Antennas – Micro strip Antennas – Antenna measurements.

UNIT V MICROWAVE RADIO SYSTEM 9

Types of propagation – Line of sight transmission – Radio horizon – Microwave links- Repeaters – Diversity – frequency and space diversity systems – Fading – System gain and path losses - Noise and Absorption in Microwave links**.**

UNIT VI SATELLITE LINKS 7

Frequency ranges – Orbits – Earth station – Up links – Transponders- Down links – Satellite system parameters – Multiple access.

TOTAL : 45 PERIODS

REFERENCES

1. Roddy.D., “Microwave Technology” Reston Publications.1986.
2. Chatterjee R. “Microwave Engineering “East West Press. 1988.
3. Rizzi.P.”Microwave Engineering Passive circuits”. Prentice Hall.1987
4. Tomasi.W “Advanced Electronic communication systems “Prentice Hall.1987.
5. Clock.P.N. “Microwave Principles and Systems” Prentice Hall.1986.
6. Combes, Graffewil and Sauterean “Microwave Components, Devices and Active Circuits”. John wiley.1987.
7. Annapurana Das.Sisir.K.Das,”Microwave Engineering” Tata Mc Graw Hill, 2000.