UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI : : CHENNAI 600 025

REGULATIONS - 2009

CURRICULUM I TO IV SEMESTERS (FULL TIME)

M.E. COMMUNICATION AND NETWORKING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA9118	Applied Mathematics for Network Engineers	3	1	0	4
2	NE9113	Advanced Digital Signal Processing	3	0	0	3
3	NE9111	Advanced Communication Techniques	3	0	0	3
4	NE9112	High Performance Computer Networks	3	0	0	3
5	NE9114	VLSI for Signal Processing	3	0	0	3
6	E1	Elective I	3	0	0	3
PRACTICAL						
7	NE9115	Communication & Signal Processing Lab	0	0	4	2
		TOTAL	**18**	**1**	**4**	**21**

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	NE9121	Wireless Mobile Communication	3	0	0	3
2	NE9122	Optical Communication systems & Networking	3	0	0	3
3	NE9123	RF & Microwave Engineering	3	0	0	3
4	CU9121	Wireless Networks	3	0	0	3
5	E2	Elective II	3	0	0	3
6	E3	Elective III	3	0	0	3
PRACTICAL						
7	NE9127	Networking Lab	0	0	4	2
		TOTAL	**18**	**0**	**4**	**20**

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E4	Elective IV	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
PRACTICAL						
4	NE9135	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	NE9141	Project Work (Phase II)	0	0	24	12
		TOTAL	**0**	**0**	**24**	**12**

Total no. of 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 AND NETWORKING

SEMESTER I

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	MA9118	Applied Mathematics for Communication Engineers	3	1	0	4
2	NE9113	Advanced Digital Signal Processing	3	0	0	3
3	NE9111	Advanced Communication Techniques	3	0	0	3
PRACTICAL						
4	NE9115	Communication & Signal Processing Lab	0	0	4	2
		TOTAL	9	1	4	12

SEMESTER II

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	NE9121	Wireless Mobile Communication	3	0	0	3
2	NE9122	Optical Communication systems & Networking	3	0	0	3
3	NE9123	RF & Microwave Engineering	3	0	0	3
		TOTAL	9	0	0	9

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	NE9112	High Performance Computer Networks	3	0	0	3
2	NE9114	VLSI for Signal Processing	3	0	0	3
3	E1	Elective I	3	0	0	3
		TOTAL	9	0	0	9

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	CU9121	Wireless Networks	3	0	0	3

2	E2	Elective II	3	0	0	3
3	E3	Elective III	3	0	0	3
PRACTICAL						
4	NE9127	Networking Lab	0	0	3	2
		TOTAL	9	0	3	11

SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	E4	Elective IV	3	0	0	3
2	E5	Elective V	3	0	0	3
3	E6	Elective VI	3	0	0	3
PRACTICAL						
4	NE9135	Project (Phase I)	0	0	12	6
		TOTAL	9	0	12	15

SEMESTER – VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	NE9141	Project Work (Phase II)	0	0	24	12
		TOTAL	0	0	24	12

Total no. of credits to be earned for the award of Degree = 68

LIST OF ELECTIVES

M.E. COMMUNICATION AND NETWORKING

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	NE9151	Digital Switching & Transmission	3	0	0	3
2	NE9152	Broadband Access Technologies	3	0	0	3
3	CU9152	Satellite Communication	3	0	0	3
4	CU9122	RF System Design	3	0	0	3
5	NE9153	Optical Networks				
6	CP9162	ASIC Design	3	0	0	3
7	NE9154	Image Processing and Pattern Recognition	3	0	0	3
8	NE9155	Parallel Processing	3	0	0	3
9	NE9156	Real Time Embedded System	3	0	0	3
10	NE9157	Reconfigurable computing	3	0	0	3
11	NE9158	High Performance & Grid Computing	3	0	0	3
12	NE9159	Cryptography & Network Security	3	0	0	3
13	NE9160	Speech Recognition and Synthesis	3	0	0	3
14	NE9161	Advanced Operating System	3	0	0	3
15	NE9162	Communication Network Modeling and Simulation	3	0	0	3
16	NE9163	Internetworking Multimedia	3	0	0	3
17	NE9164	Microwaves and Radar	3	0	0	3
18	NE9165	Analysis and Design of CMOS Analog Integrated Circuits	3	0	0	3
19	NE9171	Wireless Sensor Networks	3	0	0	3
20	NE9166	Advanced Networks	3	0	0	3
21	NE9172	Space Time Wireless Communication System	3	0	0	3
22	NE9167	Detection and Estimation Theory	3	0	0	3
23	NE9168	Network Processor	3	0	0	3
24	NE9169	Electromagnetics for Communications				
25	CP9159	Soft Computing	3	0	0	3

MA9118 APPLIED MATHEMATICS FOR NETWORK ENGINEERS

L	T	P	C
3	1	0	4

UNIT I NUMERICAL INTEGRATION 9

Hermite's Interpolation - Cubic Spline Interpolation – Gaussian Quadrature Cubature.

UNIT II MATRIX THEORY 9

Special vectors and matrices – Matrix inversion lemma – least square normal equation - The Choleski decomposition – Singular value decomposition

UNIT III GRAPHS, PATHS AND CYCLES 9

Definitions and examples – sub graphs – Complements – Graph isomorphism – vertex degree Euler trials and circuits - Planar graphs – Hamiltonian paths and cycles.

UNIT IV RANDOM PROCESSES 9

Classification – Stationary random process – Auto correlation - Cross correlation - Markov process –Poisson process – Gaussian process - Markov chain .

UNIT V QUEUING THEORY 9

Single and Multiple server Markovian Queuing Models – Customer impatience – queuing applications.

L +T:45+15= 60

REFERENCES:

1. Froberg, C.E.Numerical Mathematics, The Benjamin/Cummings Publishing Co., Inc., 1985.

2. Jain, M.K. Iyengar, S.R.K., and Jain, "R. K., Numerical Methods for Scientific & Engineering computation", Wiley Eastern Ltd., 1987.

3. Bronson, R. Matrix Operations, "Schaurm's outline series", McGraw Hill, New York, 1989.

4. Taha, H.A., Operations, Research, An Introduction, Seventh edition, Pearson Education Edition, New Delhi, 2002.

5. Bondy, LA. And Murthy, U.S.R., "Graph Theory with Applications", Macmillan, 1977.

6. Medhi, J.Stochastic Processes, Wiley Eastern Ltd., 1994.

NE9113 ADVANCED DIGITAL SIGNAL PROCESSING

L T P C
3 0 0 3

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem, special types of random process – Signal modeling-Least Squares method, Pade approximation, Prony's method, iterative Prefiltering, Finite Data records, Stochastic Models.

UNIT II SPECTRUM ESTIMATION 9

Non-Parametric methods - Correlation method - Co-variance estimator - Performance analysis of estimators – Unbiased consistent estimators - Periodogram estimator - Barlett spectrum estimation - Welch estimation - Model based approach - AR, MA, ARMA Signal modeling - Parameter estimation using Yule-Walker method.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Maximum likelihood criterion - Efficiency of estimator - Least mean squared error criterion - Wiener filter - Discrete Wiener Hoff equations - Recursive estimators - Kalman filter - Linear prediction, Prediction error - Whitening filter, Inverse filter - Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.

UNIT IV ADAPTIVE FILTERS 9

FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Widrow Hoff LMS Adaptive algorithm - Adaptive channel equalization - Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters - Exponentially weighted RLS - Sliding window RLS - Simplified IIR LMS Adaptive filter.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation - Continuous time model - Direct digital domain approach - Decimation by integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Applications to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

L = 45

REFERENCES:

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons Inc., New York, 1996.
2. Sophoncles J. Orfanidis, "Optimum Signal Processing ", McGraw-Hill, 1990.
3. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Prentice Hall of India, New Delhi, 1995.
4. Simon Haykin, "Adaptive Filter Theory", Prentice Hall, Englehood Cliffs, NJ1986.
5. S. Kay," Modern spectrum Estimation theory and application", Prentice Hall, Englehood Cliffs, NJ1988.
6. P. P. Vaidyanathan, "Multirate Systems and Filter Banks", Prentice Hall, 1992.

NE9111 ADVANCED COMMUNICATION TECHNIQUES

L T P C
3 0 0 3

UNIT I SIGNALS & SPECTRA 5

Review of LTI Systems, Fourier Transform & Properties- Signal Transmission through Linear systems- Distortionless transmission- Random Process- Autocorrelation – Power Spectral Density.

UNIT II SOURCE CODING TECHNIQUES 12

Sampling- Low Pass & Band Pass- Quantization - PCM- DPCM – ADPCM- DM- ADM- LPC- Vector Quantizer – Transform Coding.

UNIT III BASEBAND & BAND PASS SIGNALLING 13

Base band Signaling -Line Coding schemes & their Power spectra- Eye pattern - Bit Synchronization- band pass Signaling - Geometric Representation of signals - coherent binary ASK, PSK, FSK & QPSK & Probability of error – Principles of CPFSK, OQPSK, MSK, GMSK & QAM– Carrier Synchronization -Structure of Non-Coherent Receivers – Principle of DPSK- Link Power budget .

UNIT IV CHANNEL CODING TECHNIQUES 9

Linear Block Codes – Error Detection & Correction capability- Cyclic Codes – Hamming codes – BCH codes- Convolutional codes – Viterbi Decoding algorithm – Turbo codes- TCM

UNIT V EQUALIZATION TECHNIQUES 6

Band Limited Channels- ISI – Nyquist Criterion- Controlled ISI-Partial Response signals- Equalization algorithms – Viterbi Algorithm – Linear equalizer – Decision feedback equalization – Adaptive Equalization algorithms.

L = 45

REFERENCES:

1. Sklar. B., “Digital communications”, Pearson education, 2006.
2. Barry, J.R.,Lee, E.A., and Messerschmitt, D.G., “Digital Communication”, Springer, 2006.
3. Haykin, S., “Communication Systems”, John Wiley, 2005.
4. Lathi, B.P., “Modern Digital and Analog Communication Systems”, Oxford University Press, 2002
5. Couch.L., “Modern communication system”, Pearson, 2001.
6. Rao, K.R., & J.J. Hwang, J.J., “Techniques & Standards for Image & Video Coding”, Prentice Hall, 2000.

NE9112 HIGH PERFORMANCE COMPUTER NETWORKS

L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Review of OSI, TCP/IP; Multiplexing, Modes of Communication, Switching, Routing SONET – DWDM – DSL – ISDN – BISDN,ATM.

UNIT II MULTIMEDIA NETWORKING APPLICATIONS 9

Streaming stored Audio and Video, Best effort service, protocols for real time interactive applications, Beyond best effort, scheduling and policing mechanism, integrated services, RSVP- differentiated services.

UNIT III ADVANCED NETWORKS CONCEPTS 10

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN.MPLS-operation, Routing, Tunneling and use of FEC, Traffic Engineering, and MPLS based VPN, overlay networks-P2P connections.

UNIT IV TRAFFIC MODELLING 7

Little's theorem, Need for modeling, Poisson modeling and its failure, Non- poisson models, Network performance evaluation.

UNIT V NETWORK SECURITY AND MANAGEMENT 10

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and counter measures – security in many layers. Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration – ASN.1

L=45

REFERENCES:

1. J.F. Kurose & K.W. Ross, "Computer Networking- A top down approach featuring the internet", Pearson, 2nd edition, 2003.
2. Walrand .J. Varatya, "High performance communication network", Margan Kanffman – Harcourt Asia Pvt. Ltd. 2nd Edition, 2000.
3. LEOM-GarCIA, WIDJAJA, "Communication networks", TMH seventh reprint 2002.
4. Aunurag Kumar, D. MAnjunath, Joy Kuri, "Communication Networking", Morgan Kaufmann Publishers, 1ed 2004.
5. Hersent Gurle & petit, "IP Telephony, packet Pored Multimedia communication Systems", Pearson education 2003.
6. Fred Halsall and Lingana Gouda Kulkarni, "Computer Networking and the Internet", fifth edition, Pearson education
7. Nader F.Mir, "Computer and Communication Networks", first edition.
8. Larry l.Peterson & Bruce S.David, "Computer Networks: A System Approach"- 1996

NE9114 VLSI FOR SIGNAL PROCESSING

L T P C
3 0 0 3

UNIT I INTRODUCTION 6

Overview of DSP – FPGA Technology – DSP Technology requirements – Design Implementation

UNIT II METHODS OF CRITICAL PATH REDUCTION 12

Binary Adders – Binary Multipliers – Multiply-Accumulator (MAC) and sum of product (SOP) – Pipelining and parallel processing – retiming – unfolding – systolic architecture design.

UNIT III ALGORITHMIC STRENGTH REDUCTION METHODS AND RECURSIVE FILTER DESIGN 9

Fast convolution-pipelined and parallel processing of recursive and adaptive filters – fast IIR filters design.

UNIT IV DESIGN OF PIPELINED DIGITAL FILTERS 9

Designing FIR filters – Digital lattice filter structures – bit level arithmetic architecture – redundant arithmetic – scaling and round-off noise.

UNIT V SYNCHRONOUS ASYNCHRONOUS PIPELINING AND PROGRAMMABLE DSP 9

Numeric strength reduction – synchronous – wave and asynchronous pipelines – low power design – programmable DSPs.

L= 45

REFERENCES:

1. Keshab K. Parhi, “VLSI Digital Signal processing systems, Design and Implementation”, Wiley, Interscience, 2003.
2. U.Meyer-Baese, “Digital signal processing with FPGAs”, Springer, 2003.
3. S.Y.Kuang, H.J. White house, T. Kailath, “VLSI and Modern Signal Processing”, Prentice Hall, 1995.

NE9115 COMMUNICATION AND SIGNAL PROCESSING LAB
(Using MATLAB and Code Composer Studio)

L T P C
0 0 4 2

1. Multi rate filters
2. Signal Estimation
3. LMS based Channel Equalization
4. ADPCM
5. Bit Synchronization
6. Digital transmission through fiber Optical Link
7. Performance Evaluation of digital modulation schemes
8. Transform based compression techniques
9. Cyclic codes
10. Carrier synchronization based on PLL

NE9121 WIRELESS MOBILE COMMUNICATION

L	T	P	C
3	0	0	3

UNIT I THE WIRELESS CHANNEL **10**

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels

UNIT II PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS **7**

Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Intersymbol Interference.

UNIT III DIVERSITY **9**

Realization of Independent Fading Paths – Receiver Diversity – Selection Combing – Threshold Combing – Maximal-Ratio Combing – Equal - Gain Combing – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme.

UNIT IV MULTICARRIER MODULATION **10**

Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Subchannels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio- Frequency and Timing offset – Case study IEEE 802.11a

UNIT V SPREAD SPECTRUM **9**

Spread Spectrum Principles – Direct Sequence Spread Spectrum – Spreading Codes- Synchronization- RAKE receivers- Frequency Hopping Spread Spectrum – Multi-user DSSS Systems – Multi-user FHSS Systems

L= 45

REFERENCES:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005
2. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
3. W.C.Y.Lee, “Mobile Communication Engineering”, Mc Graw Hill, 2000
4. A.Paulraj, R.Nabar, D.Gore, “Introduction to Space-Time Wireless Communication”, Cambridge University Press, 2003
5. T.S. Rappaport, “Wireless Communications:, Pearson Education, 2003

NE9122 OPTICAL COMMUNICATION AND NETWORKING

L T P C
3 0 0 3

UNIT I FIBER OPTIC WAVE GUIDES 9

Light wave generation systems, system components, optical fibers, SI, GI, fibers, modes, Dispersion in fibers, limitations due to dispersion, Fiber loss, non linear effects. Dispersion shifted and Dispersion flattened fibers.

UNIT II OPTICAL TRANSMITTERS, RECEIVERS AND AMPLIFIERS 9

Basic concepts, LED's structure, spectral distribution, semiconductor lasers, gain coefficients, modes, SLM and STM operation, Transmitter design, Receiver: PIN and APD design, noise sensitivity and degradation, Receiver amplifier design. Basic concepts of Semiconductor Optical amplifiers and EDFA operation

UNIT III LIGHT WAVE SYSTEM 9

Coherent, homodyne and heterodyne keying formats, BER in synchronous and asynchronous receivers, Multichannel, WDM, multiple access networks, WDM components, TDM, Subcarrier and Code division multiplexing.

UNIT IV DISPERSION COMPENSATION 9

Limitations, Post- and Pre- compensation techniques, Equalizing filters, fiber based gratings, Broad band compensation, soliton communication system, fiber soliton, Soliton based communication system design, High capacity and WDM soliton system.

UNIT V INTRODUCTION TO OPTICAL NETWORKS 9

First and second generation optical networks: system network evaluation. SONET / SDH, MAN layered architecture broadcast and select networks MAC protocols, test beds, wavelength routing networks.

L= 45

REFERENCES:

1. G.P. Agarwal, "Fiber optic communication systems", 2nd Ed, John Wiley & Sons, New York, 2002

2. G. Keiser, "Optical fiber communications", 4th ed Tata McGraw-Hill, New Delhi, 2008

3. Franz & Jain, Optical communication, Systems and components, Narosa Publications, New Delhi, 2000

4. Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective", Academic press, London, 2002

5. Arold Kolimbiris, Fiber Optic Communication, Education Asia, Delhi, 2004.

NE9123 RF & MICROWAVE ENGINEERING

L T P C
3 0 0 3

UNIT I NETWORKS AND MATRICES 8

Scattering and chain scattering matrices, Generalized scattering matrix, Analysis of two port networks, Interconnection of networks. Positive real concepts, scattering matrix, representation of microwave components (directional coupler, circulators, hybrids and isolators

UNIT II HIGH FREQUENCY CIRCUIT DESIGN 9

Tuned Circuits, Filter design- Butterworth filter, Chebyshev filter, impedance matching. High frequency amplifier, BJT and FET amplifier, Broadband Amplifiers RF Oscillators, Colpitts, Hartley Oscillators, PLL. High Frequency Integrated Circuits

UNIT III MICROWAVE AMPLIFIER DESIGN 9

Types of amplifiers, Power gain equations. Introduction to narrow band amplifiers basic concepts, Maximum gain design, Low noise design. High power design, Negative resistance, reflection amplifiers – various kinds – stability considerations, Microwave transistor amplifier design – input and output matching networks – constant noise figure circuits

UNIT IV MICROWAVE TRANSISTOR OSCILLATOR DESIGN 9

One port and two port negative resistance oscillators. Oscillator configurations, Oscillator design using large signal measurements, Introduction to Microwave CAD packages

UNIT V RF AND MICROWAVE ANTENNAS 10

Radiation from surface current and line current distribution, Basic Antenna parameters, Feeding structure-Patch Antenna, Ring Antenna, Micro strip dipole, Micro strip arrays, Traveling wave Antenna, Antenna System for Mobile Radio-Antenna Measurements and Instrumentation. Propagation characteristics of RF and Microwave signals

L = 45

REFERENCES:

1. Matthew M.Radmanesh, Radio Frequency and Microwave Electronics Illustrated, Pearson Education,2006
2. G.GONZALEZ: Microwave Transistors and Amplifiers: Analysis and Design, Prentice H all, New Jersy 1999
3. E.da Silva, High Frequency and Microwave engineering, Butterworth Heinmann Publications, Oxford 2001.
4. David.M.Pozar, Microwave Engineering, John Wiley and Sons
   Third edition, 2005
5. S.Y.LIAO: Microwave Amplifiers and Oscillators Design, Prentice H all, New Jersy 1999
6. Kraus.J.D, Marhefka.R.J. Khan.A.S. “Antennas for all applications, “III edition, Tata McGraw Hill, 2006.
7. Balanis. A, “Antenna theory Analysis and Design “- John Wiley and Sons, New York, Third Edition, 2005.

CU9121 WIRELESS NETWORKS

L T P C
3 0 0 3

UNIT I WIRELESS LANS, PANS AND MANS 9

Introduction, fundamentals of WLAN –technical issues, network architecture, IEEE 802.11-physical layer, Mac layer mechanism, CSMA/CA, Bluetooth- specification, transport layer, middleware protocol group, Bluetooth profiles, WLL –generic WLL architecture, technologies, broadband wireless access, IEEE 802.16 –differences between IEEE 802.11 and 802.16,physical layer, data link layer.

UNIT II WIRELESS INTERNET 9

Introduction –wireless internet, address mobility, inefficiency of transport layer and application layer protocol, mobile IP – simultaneous binding, route optimization, mobile IP variations, handoffs, IPv6 advancements, IP for wireless domain, security in mobile IP, TCP in wireless domain – TCP over wireless , TCPs -traditional, snoop, indirect, mobile, transaction- oriented, impact of mobility.

UNIT III AD-HOC WIRELESS NETWORK AND WIRELESS SENSOR NETWORK 9

Introduction, issues –medium access scheme, routing, multicasting, transport layer protocol, pricing scheme, QoS provisioning, self-organization, security, addressing, service discovery, energy management, deployment consideration, ad-hoc wireless internet.

UNIT IV WIRELESS SENSOR NETWORK 9

Introduction – applications of sensor network, comparisons with MANET, issues and design challenges, architecture – layered and clustered , data dissemination, data gathering, Mac protocols, location discovery, quality of sensor network – coverage and exposure, zigbee standard.

UNIT V RECENT ADVANCES IN WIRELESS NETWORK 9

UWB radio communication- operation of UWB systems, comparisons with other technologies, major issues, advantages and disadvantages, wi-fi systems- service provider models, issues, interoperability of wi-fi and WWAN, multimode 802.11 – IEEE 802.11a/b/g – software radio-based multimode system, meghadoot architecture -802.11 phone, fundamentals of UMTS.

L= 45

REFERENCES:

1. C.Siva Ram Murthy and B.S. Manoj, “Ad-hoc wireless networks-architecture and protocols”, Pearson education, 2nd, 2005.
2. Kaveh Pahlavan and Prashant Krishnamurthy, “Principle of Wireless network- A unified approach”, Prentice Hall, 2006.
3. Jochen Schiller, “Mobile Communication”, Pearson education, 2nd edition 2005.
4. WIlliam Stallings, “Wireless Communication and Networks”, Prentice Hall, 2nd edition, 2005.
5. Clint Smith and Daniel Collins, “3G wireless networks”, Tata Mcgraw Hill, 2nd edition, 2007.

NE9127 NETWORKING LABORATORY

(Experiments using NS2/matlab/Qualnet/Routers/Switches, etc.,)

L T P C

0 0 4 2

1. Wireless Access Point – configuring and enabling security
2. Wi-Fi based Data Acquisition
3. Routing protocols for IP network using routers
4. Configuration of VLAN using switches
5. PDA mobility analysis using layer 3 switches
6. Hidden and exposed terminal problem
7. Signaling in wireless networks (RTS, CTS, DATA and ACK)
8. AODV/DSR
9. RTP protocol of VoIP
10. Implementation of network security algorithms
11. Network performance analysis using packet sniffer
12. Mini project

NE9151 DIGITAL SWITCHING AND TRANSMISSION

L T P C
3 0 0 3

UNIT I INTRODUCTION 3

Series provided by the existing Voice and Data Networks – an overview.

UNIT II TRANSMISSON SYSTEMS 12

Subscriber Loop Transmission – Analog Telephony, xDSL, WILL, Trunk Transmission Line Coding / Framing / Multiplexing / Multiple Accessing over Coaxial, optical and Microwave links, Signaling, Synchronization.

UNIT III SWITCHING SYSTEMS 12

Space Switching, Time Switching and Combination switching – Blocking probabilities, Complexity and Path finding times, Photonic switching.

UNIT IV TELETRAFFIC THEORY 10

B-D modeling of networks, Arrival process characterization, Network blocking probabilities, Non - blocking networks- Queuing system and Mean delay estimates.

UNIT V EXAMPLE SYSTEMS 8

Switching and Transmission Systems used in Cellular Telephony, ISDN, Internet etc..,

L= 45

REFERENCES:

1. John Bellamy, Digital Telephony, Third edition, John Wiley and Sons, 2000.
2. T.Viswanathan, Telecommunication Switching Systems, Prentice Hall of India, 1992.
3. J.Ronayne, Introduction to Digital switching, Pitman, 1991.
4. R.G Winch, Telecommunication Transmission System, McGraw Hill, 1993.
5. W.D.Reeve, Subscriber Loop Signaling and Transmission Handbook, IEEE Press (Telecom Handbook Series)1995.
6. James Martin, Telecommunication and the computer, Third Edition, Prentice Hall of India, 1992**.**
7. Richard A Thompson, Telephone Switching Systems, Artech House, 2000.
8. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Second Edition,Artech House,2003.
9. Tarek N. Saadawi and Mostafa H.Ammar and Ahmed El Hakeem, Fundamentals of Telecommunication Networks, John Wiley and Sons,1994.

NE9152 BROAD BAND ACCESS TECHNOLOGIES

L T P C
3 0 0 3

UNIT I REVIEW OF ACCESS TECHNOLOGIES 5

Phone-Line modem, cable-access, ISDN, Emerging Broad band Technologies, Cable DSL, Fiber and Wireless

UNIT II DIGITAL SUBSCRIBER LINES 10

Asymmetric Digital subscriber lines (ADSL) – Rate Adaptive subscriber line (RADSL)-ISDN Digital subscriber line (IDSL) - High bit rate DSL (HDSL)-Single line DSL (SDSL)- very high bit rate DSL (VDSL)- Standards for XDSL & Comparison.

UNIT III CABLE MODEM 10

Cable Modem, DOCSIS – Physical Cabling, Dual Modem Operation, Hub Restriction, Upstream Operation – Downstream operation – Access control – framing Security sub layer – Data link layer – LLC & Higher layers – ATM centric VS IP – centric cable modem.

UNIT IV FIBER ACCESS TECHNOLOGIES 10

Optical Fiber in access networks, Architecture and Technologies- Hybrid fiber – Coax (HFC) system, Switched Digital Video (SDV) – Passive optical networks (PON) – FTTX (FTTH, FTTB, FTTC, FTT cab) comparison.

UNIT V BROAD BAND WIRELESS 10

Fixed Wireless, Direct Broadcast Satellite (DBS), Multi channel multi point distribution services (MMDS), Local multi point distribution services (LMDS), and Wideband integrated Digital Interactive Services (WIDIS), Mobile Wireless 3G – IMT 2000.

L=45

REFERENCES:

1. Niel Ransom and Albert A. Azzam, “Broadband Access Technologies: ADSL, VDSL Cable Modem, Fiber and LMDS, McGraw Hill 1999.
2. Gilbert Held, “Next Generation Modems: A Professional Guide to DSL and cable modems”, John Wiley & sons, 2000.
3. Walter j Woralski, “ADSL and DSL Technologies”, McGraw Hill computer Communication series, 1998.
4. William Webb, “Introduction to Wireless Local Loop broadband and narrow band system”, Artech House, 2000.
5. Martin P. Clarke, “Wireless Access Network: Fixed Wireless Access and WLL network Design and operation”, John Wiley & Sons 2000.

CU9152 SATELLITE COMMUNICATION

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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 15

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

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 5

Satellite and Cable Television, DBS (DTH), VSAT, Satellite Phones

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REFERENCES:

1. Wilbur L. Pritchard and Joseph A.Sciulli, Satellite Communication Systems Engineering, Prentice Hall, New Jersey, 1986.
2. Timothy Pratt and Charles W.Bostain, Satellite Communications, John Wiley and Sons, 1986.
3. Tri T Ha, Digital Satellite Communication, Macmillan Publishing Company, 1986.
4. William C.Y.Lee, Mobile Cellular Telecommunications, Analog and Digital Systems, Second Edition, McGraw Hill Book Company, Singapore, 1995.
5. Michel Mouly and Marie-Bernadette Pautet, The GSM system for Mobile communications, Cell and Sys, France, 1992.
6. Scott D.Elliot and Daniel J.Dailey, Wireless Communications for intelligent Transportation Systems, Artech House Inc. 1995.
7. Gunther C.G., Mobile communication: Advanced Systems and components, Springer- Verlag, 1994.

CU9122 RF SYSTEM DESIGN

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UNIT I CMOS PHYSICS, TRANSCEIVER SPECIFICATIONS AND ARCHITECTURES 9

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

UNIT II IMPEDANCE MATCHING AND AMPLIFIERS 9

S-parameters with Smith chart, Passive IC components, Impedance matching networks, Common Gate, Common Source Amplifiers, OC Time constants in bandwidth estimation and enhancement, High frequency amplifier design, 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

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

UNIT IV PLL AND FREQUENCY SYNTHESIZERS 9

Linearised Model, Noise properties, Phase detectors, Loop filters and Charge pumps, 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, sub sampling mixers, Oscillators describing Functions, Colpitts oscillators, Resonators, Tuned Oscillators, Negative resistance oscillators, Phase noise.

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REFERENCES:

1. Thomas Lee," The Design of Radio Frequency CMOS Integrated Circuits", Cambridge University Press, 2nd Ed,Cambridge, 2004.
2. Matthew M.Radmanesh," Radio frequency and Microwave Electronics illustrated", Pearson Education Inc, Delhi, 2006.
3. B.Razavi, "RF Microelectronics", Pearson Education, 1997.
4. Devendra.K. Misra," Radio frequency and Microwave communication circuits – analysis and Design", John Wiley and Sons,Newyork,2004.
5. B. Razavi, "Design of Analog COMS Integrated Circuits", McGraw Hill, 2001.

NE9153 OPTICAL NETWORKS

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UNIT I OPTICAL SYSTEM COMPONENTS 9

Light propagation in optical fibers-Loss& Bandwidth, System limitations, Non-Linear effect, Solitons, Optical Network \ Components- Couplers, Isolators & Circulators, Multiplexers & Filters Optical Amplifiers, Switches Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9

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

UNIT III WAVELENGTH ROUTING NETWORKS 9

The Optical layer, Node Designs, Optical layer cost tradeoff, Routing and Wavelength Assignment, Virtual Topology design, Wavelength Routing Test beds, Architectural variations

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9

Photonic Packet Switching – OTDM , Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch based networks; Access Networks- Network Architecture overview ,Future Access Networks, Optical Access Network Architectures; and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9

Transmission system Engineering-system model, Power penality-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network manage functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

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REFERENCES:

1. Rajiv Ramaswami and Kumar N.Sivarajan, “Optical Networks: A Practical Perspective”, Harcourt Asia Pvt Ltd., Second Edition 2004
2. C.Siva Ram Moorthy and Mohan Gurusamy, “WDM Optical Networks: Concept Design and Algorithms”, PHI 1st Edition 2002
3. P.E.Green, jr., Fiber Optical Networks, Prentice Hall, NJ, 1993.

CP9162 ASIC DESIGN

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UNIT I INTRODUCTION TO VLSI DESIGN 6

CMOS Transistors – CMOS Design rules – CMOS Logic and Digital Circuits.

UNIT II ASIC TECHNOLOGY 9

Types of ASICs – ASIC Library Design – Cell Design – Architecture – Gate array design– PLDs and FPGAs – ASIC Families

UNIT III DESIGN AUTOMATION TOOLS 12

CAD for ASIC Design – design entry – VHDL/Verilog – Net list extraction – functional simulation – synthesis – layout, placement, Floor planning – routing.

UNIT IV ALGORITHMS 9

Techniques for simulation, synthesis, layout, placement, positioning, floor planning, routing.

UNIT V TESTING 9

Design for Testability – Boundary scan test – Fault simulation – ATPG – Applications of ASICs – case studies

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REFERENCES:

1. M J Smith, “Application specific Integrated circuits”, Addison Wesley, 1999.
2. S.H.Gerez, “Algorithms for VLSI Design automation”, John Wiley. 1998.
3. S.D. Brown, R J Francis, J Rox, Z G Uranesic, “Field Programmable Gate Arrays”, Kluwer Academic Publishers, 1992

NE9154 IMAGE PROCESSING & PATTERN RECOGNITION

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UNIT I IMAGE REPRESENTATION 9

Principles of digital aerial photography- Sensors for aerial photography - camera mounts - Sampling, quantization, Image Basis Function, Two dimensional DFT, Discrete cosine Transform, Walsh- Hadamard transform, wavelet transform, principal component analysis.

UNIT II IMAGE ENHANCEMENT AND RESTORATION 9

Edge Detection, Thresholding, Half toning, Median filtering, Histogram Equalization, Homomorphic filtering, PSFs for Different forms of Blur- Defocused lens with circular aperture- Uniform Motion Blur, Long-Exposure atmospheric Blur.

UNIT III IMAGE COMPRESSION 9

Transform coding, Predictive compression methods, Vector quantization, Hierarchical and Progressive compression methods, JPEG, Video coding, Motion Estimation, MPEG- Lossless compression, Huffman coding, Run length coding and Arithmetic coding.

UNIT IV IMAGE ANALYSIS 9

Segmentation, Thresholding, Edge based and Region based – shape representation and description – contour based and Region based texture- statistical texture description – syntactic texture description.

UNIT V PATTERN RECOGNITION 9

Linear Discriminant Analysis- Baye's classifier – Neural net- Feed forward, unsupervised learning, Hopfield nets- fuzzy system-optimization techniques in Recognition-Genetic algorithm- Simulated annealing.

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REFERENCES:

1. Gonzalez R. C. and Woods R.E., "Digital Image Processing", Prentice Hall 2002.
2. Jain A.K., "Fundamentals of Digital Image Processing", Prentice Hall 1989.
3. William K. Pratt, "Digital Image Processing", John Wiley, 2001.
4. Sonka M, "Image Processing, Analysis and Machine vision", Vikas Publishing Home (Thomson) 2001.
5. Schalkoff R.J., "Digital Image Processing & Computer vision", John Wiley sons, 1989.
6. Dudar R.O., and Hart P.E.,"Pattern classification and scene Analysis", 2002.

NE9155 PARALLEL PROCESSING

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UNIT I THEORY OF PARALLELISM 9

Parallel computer models- the state of computing, Multiprocessors and multi computers and multivectors and SIMD computers, PRAM and VLSI models, Architecture development tracks Program and network properties

UNIT II PARALLEL PROCESSING APPLICATIONS 9

Conditions of parallelism, Program portioning and scheduling, Program flow mechanisms, system interconnect architectures. Principles of scalable performance, performance matrices and measures, Parallel Processing applications, speedup performance laws, scalability analysis and approaches

UNIT III HARDWARE TECHNOLOGIES 9

Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology, bus cache and shared memory, backplane bus systems, cache memory organizations, shared memory Organizations, sequential and weak consistency models.

UNIT IV PIPELINING AND SUPERSCALAR TECHNOLOGIES 9

Parallel and scalable architectures, multiprocessor and multicomputers, multivector and SIMD computers scalable, multithreaded and data flow architectures.

UNIT V SOFTWARE AND PARALLEL PROGRAMMING 9

Parallel models, Languages and compilers, Parallel program development and environments, UNIX, MACH and OSF/1 for parallel computers, multi issue architecture 6711.

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REFERENCES:

1. Kai Hwang, “Advanced Computer Architecture”, McGraw Hill International, 1993.
2. William Stallings, “Computer Organization and Architecture”, Macmillan Publishing Company, 1990.
3. V.Rajaraman, C.Siva Ram Murthy,”Parallel Computers” Architecture and Programming, Prentice- Hall of India Private Limited, 2006.
4. Hwang.K.Briggs F.A., “Computer Architecture and Parallel Processing”, Tata McGraw Hill, 1989.

NE9156 REAL TIME EMBEDDED SYSTEMS

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UNIT I INTRODUCTION 12

Real Time System – Embedded Systems – Architecture of Embedded System - Simple Programming for Embedded System – Process of Embedded System Development - Pervasive Computing – Information Access Devices – Smart Cards – PIC Microcontroller – ARM Processor.

UNIT II EMBEDDED/REAL TIME OPERATING SYSTEM 9

Operating System Concepts: Processes, Threads, Interrupts, Events - Real Time Scheduling Algorithms - Memory Management – Overview of Operating Systems for Embedded, Real Time, Handheld Devices – Target Image Creation – Programming in Linux, RTLinux, VxWorks, uC/Os-overview.

UNIT III CONNECTIVITY 9

Wireless Connectivity - Bluetooth – Other short Range Protocols – Wireless Application Environment – Service Discovery – Middleware

UNIT IV REAL TIME UML 6

Requirements Analysis – Object Identification Strategies – Object Behavior – Real Time Design Patterns

UNIT V SOFTWARE DEVELOPMENT AND CASE STUDY 9

Concurrency – Exceptions – Tools – Debugging Techniques – Optimization – Case Studies -Interfacing Digital Camera with USB port and Data Compressor.

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REFERENCES:

1. R.J.A.Buhr, D.L.Bailey, “An Introduction to Real-Time Systems”, Prentice-Hall International, 1999.
2. David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007. (UNIT– II)
3. C.M.Krishna, Kang G.Shin, “Real Time Systems”, Mc-Graw Hill, 1997. (UNIT- II)
4. B.P.Douglass, “Real Time UML 2nd Edition”, Addison-Wesley 2000. ((UNIT – IV)
5. J.Schiller, “Mobile Communication”, Addison-Wesley, 1999. (UNIT – III)
6. Dr.K.V.K.K.Prasad, “Embedded/Real Time Systems: Concepts, Design and Programming”, DreamTech press, Black Book, 2005. (UNIT – I)
7. R.Barnett, L.O.Cull, S.Cox, “Embedded C Programming and the Microchip PIC”, Thomason Learning 2004. (UNIT – I)
8. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, Mergen Kaufman Publisher, 2006.
9. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.

NE9157 RECONFIGURABLE COMPUTING

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UNIT I INTRODUCTION 9

Introduction to Adaptive/Reconfigurable Computing – Computing Requirements, area, and VLSI scaling – Instructions – Introduction to FPGA – Custom Computing Machine Overview – Comparing Computing Machines

UNIT II FPGA 9

FPGA Technology and Architectures – LUT devices and mapping (Look-up Table) ALU design – Placement and partitioning algorithms – Routing algorithms

UNIT III ARCHITECTURES 9

Spatial Computing Architectures – Systolic Architectures and Algorithms Systolic Structures – Bit Serial.

UNIT IV RECONFIGURABLE SYSTEMS 9

Adaptive Network Architectures – Static and Dynamic network – Routing/embedding Rearrangeable networks – Reconfigurable bus – Dynamic reconfiguration issues – Reconfiguration delay – Partial reconfiguration – OS support – Reconfigurable Operating Systems – Device and task models – Multitasking and runtime systems – Dynamically Reconfigurable Adaptive Viterbi Decoder.

UNIT V RECONFIGURABLE PROCESSORS 9

Reconfigurable Computing Architectures – Reconfigurable coprocessor based architectures – Compiler technology for coprocessor based architectures – Mapping/scheduling algorithm – Reconfigurable pipelines – Reconfigurable memories & caches – Reconfigurable Computing Applications**,** reconfigurability using Virtex T series**.**

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REFERENCES:

1. John V.Oldfield and Richard C. Dorf, “Field Programmable Gate Arrays: Reconfigurable Logic for Rapid Prototyping and Implementation of Digital Systems”, John Wiley & Sons, Inc., 1995.
2. Configware Reiner W. Hartenstein, Viktor K. Prasanna (Eds.): “Reconfigurable Architectures: High Performance”, IT press Verlag, 1997.
3. Wayne Wolf, “FPGA- based System Design”, Prentice Hall, 2004.
4. R.Vaidynathan and J. I., Trahan, “Dynamic Reconfiguration: Architectures and Algorithms”, Khuwer Academic/Plenum Publishers, New York, 2004.l

NE9158 HIGH PERFORMANCE AND GRID COMPUTING

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UNIT I ELEMENTARY PARALLEL ALGORITHMS 9

Matrix Multiplication – Sequential Matrix Multiplication, Algorithms for processor arrays, Algorithms for Multiprocessors, Algorithms for Multicomputers. The Fast Fourier transform – Introduction, The discrete Fourier Transform, Sorting – Enumeration sort, Lower bounds on parallel sorting, Odd –Even Transposition sort. Bitonic Merge, Quick sort – Based algorithms, Random Read and Random write. Dictionary operations

UNIT II GRAPH ALGORITHMS AND COMBINATIONAL SEARCH 9

Searching a graph, connected components, All- Pairs shortest path, Single-source shortest path, Minimum-cost spanning tree. Combinatorial search – Introduction, Divide and conquer, Branch and bound, Parallel Branch-and-Bound algorithms, Alpha –Beta Search, Parallel Alpha-Beta Search.

UNIT III CLUSTER COMPUTING 9

Challenges in clustering, Availability support for clustering, supporting for single system Image, single system imaging, Job Management in clusters, Cluster of Servers and Workstations – Cluster products and research projects- case studies, Message-passing paradigm, MPI, PVM.

UNIT IV GRID COMPUTING TECHNOLOGY 9

Overview – Definition and Scope of grid computing, Applications of Grid, Types of Grid – Desktop Grids, Cluster Grids, Computational Grids, Data Grids, Grid Standards- OGSA, WSRF.

UNIT V GRID SERVICES 9

Creating and Managing Grid services, Desktop Supercomputing: Native programming for Grids, Grid-Enabling software applications, Application Integration, Grid- enabling network services – Managing Grid Environment – Applications and Grid computing adoption in research and industry,blade servers.

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REFERENCES:

1. Michael J. Quinn, “Parallel computing: Theory and Practice”, McGraw-Hill, 1994.
2. Kai Hwang, Zhiwei Xu, “Scalable Parallel Computing: Technology, Architecture, Programming”, McGraw-Hill, 1998.
3. Ahmar Abbas, “Grid Computing: A practical Guide to Technology and Applications”, Firewall Media, 2004.
4. Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson/PHI PTR 2003.
5. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, “Grid Computing:Making the Global infrastructure a reality”, John Wiley and Sons, 2003.

NE9159 CRYPTOGRAPHY AND NETWORK SECURITY

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UNIT I INTRODUCTION AND NUMBER THEORY 9

Classic Cipher Techniques – Substitution Ciphers, Mono-alphabetic Substitution and Poly-alphabetic Substitution – Transposition Ciphers. Number Theory and Finite Arithmetic, Counting in Modulus ρ Arithmetic, Congruence Arithmetic, Fermat's Theorem and Euler's Theorem- Exponentiation.

UNIT II SINGLE AND PUBLIC KEY CIPHERS 9

DES - 3DES – AES – RSA Algorithm, ElGamal Algorithm – Key Management using Exponential Ciphers - Diffie-Hellman.

UNIT III MESSAGE AUTHENTICATION, DIGITAL SIGNATURES AND CERTIFICATES 9

Security Services and Mechanisms – Message Authentication (Integrity) – MAC – Hash Functions – Digital Signature: Digital Signature Standards (FIPS 186-2), DSA (ANSI X9.30), RSA (ANSI X9.31) – RSA Certification –PKI Certificates.

UNIT IV TRUSTED IDENTITY AND WIRELESS SECURITY 9

Security Concerns – Password System: Fixed and One time Passwords (S/Key) RFC 2289 – Callback Systems, Challenge and Response Systems – RADIUS – Kerberos v4 & v5 – Needham Schroeder Protocol – ITU-T X.509 – Authentication: Framework, Simple, Protected, Strong – PKI Life Cycle Management - Current Wireless Technology - Wireless Security WEP Issues.

UNIT V PROTOCOLS AND FIREWALLS 9

SSL/TLS - SSH - IPSec – Firewall Concepts, Architecture, Packet Filtering, Proxy Services and Bastion Hosts – Electronic Mail Security – PGP, S/MIME.

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REFERENCES:

1. William Stallings "Cryptography and Network Security: Principles and Practice", 3rd Edition, Pearson Education, 2002.
2. William Stallings "Network Security Essentials: Applications and Standards", 2nd Edition, Pearson Education, 2000.
3. Behrouz A.Forouzan, "Cryptography and Network Security", special edition, Tata McGraw Hill, 2007.
4. Bruce Scheneier, "Applied Cryptography", John Wiley & Sons, 1994.
5. Douglas R.Stinson, "Cryptography: Theory and Practice", CRC Press Series on Discrete Mathematics and its Applications, 1995.

NE9160 SPEECH RECOGNITION AND SYNTHESIS

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UNIT I BASIC CONCEPTS 8

Speech fundamentals: Articulatory phonetics- Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-time Fourier transform, Filter Bank and LPC Methods.

UNIT II SPEECH ANALYSIS 10

Features, Feature Extraction and Pattern Comparison Techniques; Spectral distortion measures- mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Liftering, Likelihood Distortions, Spectral Distortion using a Warped frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, multiple Time – Alignment Paths.

UNIT III SPEECH MODELLING 8

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi search, Baum – Welch Parameter Re-estimation, Implementation issues

UNIT IV SPEECH RECOGNITION 10

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary Continuous Speech Recognition system – acoustics and language models, Sub-word units-models for phonemes, syllables, triphones, Language models, n-grams, context dependent sub-word units.

UNIT V SPEECH SYNTHESIS 8

Text-to-speech synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody, Applications.

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REFERENCES:

1. Lawrence Rabiner and Biiing – Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education 2002.
3. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 1997.
4. Thomas F Quatieri, “ Discrete- Time Speech Signal Processing- Principles and Practice”, Pearson Education, 2004
5. Claudio Becchetti and Lucio Prina Ricotti, “ Speech Recognition”, John Wiley and Sons, 1999
6. Bengold & Neoban margom “ Speech and Audio signal processing- processing and perception of speech and music”, John Wiley and sons 2002
7. Donglos O shanhnessy “Speech Communication: Human and Machine “, 2nd Ed. University press 2001.
8. F. Jebinek,” Statistical methods for Speech Recognition”, MIT press ISDN 0-262-10066-5 1998.

NE9161 ADVANCED OPERATING SYSTEM

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UNIT I OPERATING SYSTEM 9

Introduction - operating systems and services – CPU Scheduling approaches – Process synchronization Semaphores – Deadlocks – Handling deadlocks – Multithreading.

UNIT II DISTRIBUTED SYSTEMS 9

Introduction - Advantages of distributed system over centralized system, Limitations of Distributed system; Communication in Distributed systems – ATM, Client-Server model.
Distributed operating system – Issues, Communication primitives – Message Passing Model, Remote Procedure Call

UNIT III SYNCHRONIZATION IN DISTRIBUTED SYSTEMS 9

Clock synchronization–Lamport's logical clock, Vector clock, Causal ordering of messages, Causal Ordering of Messages; Mutual exclusion – Non token based and token based algorithm; atomic transactions; Distributed deadlock detection and prevention

UNIT IV DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed file system – Trend, Design and Implementation; Distributed Shared Memory (DSM) – Memory coherence, Page based DSM, Shared variable DSM, Object based DSM; Distributed Scheduling.

UNIT V FAILURE RECOVERY AND FAULT TOLERANCE 9

Recovery – Classification, Backward and forward error recovery, Recovery in concurrent systems, synchronous checkpointing and recovery, Checkpointing for Distributed database system. Fault tolerant – commit protocols, Voting protocols, Dynamic vote reassignment protocol, Failure Resilient processes.

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REFERENCES:

1. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education Asia, 1995.
2. Mukesh singhal and Niranjan G. Shivarathri, "Advanced Concepts in Operating Systems", Tata McGraw Hill, 1994..
3. Silberschatz, Galvin, "Operating System Concepts", John Wiley, 2003.
4. Stallings, "Operating system", PHI, New Delhi, 2004.

NE9162 COMMUNICATION NETWORK MODELING AND SIMULATION

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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 aand simulation of waveform channels, Discrete memoryless channel models, Markov model for discrete channels with memory, Tail extrapolation, pdf estimators, Importance sampling methods.

UNIT V NETWORK AND TRAFFIC MODELLING 10

Queuing theory related to network modeling, Poissonian and NonPoissonian modeling of network traffic; Specific Examples.

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TEXT BOOK:

1. William.H.Tranter, K. Sam Shanmugam, Theodore. S. Rappaport, Kurt L. Kosbar, Principles of Communication Systems Simulation, Pearson Education (Singapore) Pvt. Ltd,2004.

REFERENCES:

1. M.C. Jeruchim, P.Balaban and K. Sam Shanmugam, Simulation of Communication Systems: Modeling, Methodology and Techniques, Plenum Press, New York, 2001.
2. Averill.M.Law and W. David Kelton, Simulation Modeling and Analysis, McGeaw Hill Inc., 2000.
3. Geoffrey Gorden, System Simulation, Prentice Hall of India, 2nd Edition, 1992.
4. Jerry Banks and John S. Carson, Discrete Event System Simulation, Prentice Hall of India, 1984.

NE9163 INTERNETWORKING MULTIMEDIA

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UNIT I INTRODUCTION 9

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/video transform, multimedia coding and compression for text, image, audio and video. Multimedia communication in wireless network

UNIT II SUBNETWORK TECHNOLOGY 9

Broadband services, ATM and IP , IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling and policing, throughput, delay and jitter performance.

UNIT III MULTICAST AND TRANSPORT PROTOCOL 9

Multicast over shared media network, multicast routing and addressing, scaping multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP.

UNIT IV MEDIA - ON – DEMAND 9

Storage and media servers, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control

UNIT V APPLICATIONS 9

MIME, Peer-to-peer computing, shared application, video conferencing, centralized and distributed conference control, distributed virtual reality, light weight session philosophy.

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REFERENCES:

1. Jon Crowcroft, Mark Handley, Ian Wakeman. “Internetworking Multimedia”, Harcourt Asia Pvt.Ltd.Singapore, 1998.
2. B.O. Szuprowicz, “Multimedia Networking”, McGraw Hill, NewYork. 1995
3. Tay Vaughan,Multimedia making it to work, 4ed,Tata McGrawHill, New Delhi,2000.
4. Ellen kayata wesel, Ellen Khayata, “Wireless Multimedia Communication: Networking Video, Voice and Data”, Addison Wesley Longman Publication, USA, 1998.

NE9164 MICROWAVES AND RADAR

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UNIT I MICROWAVE SOURCES 10

Passive waveguide components, Microstrip line structure and components, Simple theory and operating characteristics of Reflex klystrons, Two cavity Klystrons, Magnetrons, and TWTS - solid state source - TEDS, IMPATTS, TRAPATT, GaAs FETs and Tunnel diode.

UNIT II RADAR PRINCIPLES 8

Introduction to Radar – Radar range equation – Receiver noise and signal to noise ratio- Radar cross section (RCS) – Radar system – Radar Antennas

UNIT III TYPES OF RADARS 10

CW and FMCW radars-Tracking radars-MTI radar -Principles of coherent MTI radars - Digital MTI, Synthetic Aperture radar, Principles of Pulsed Doppler Radar, Low-, High-, and medium-PRF Mode.

UNIT IV RADAR SIGNAL PROCESSING 9

Radar requirements –Matched filters- The radar ambiguity function – Optimum waveforms for detection in clutter – Classes of waveforms – Digital representation of signals -Pulse compression

UNIT V TRACKING RADAR 8

Tracking with radar – Monopulse Tracking – conical scan and sequential lobing –limitations to tracking Accuracy- Kalman Tracker -Fundamentals of Airborne radar

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REFERENCES:

1. S.Y. Liao, Microwave Devices and Circuits, Prentice Hall, 1980.
2. M.I. Skolnik, Introduction to Radar System (Second Edition) McGraw Hill, 1980.
3. M.I. Skolnik, Radar Handbook (Second Edition) McGraw Hill, 1990.
4. Guy V. Morris, Linda L. Harkness, Airborne Pulsed Doppler Radar, Second Edition, Artech, House Publishers, 1996.
5. Blackman S.S., “Multiple target tracking with radar applications” Artech House 1986.
6. Fred E.Nathanson “ Radar design Principles “ Signal processing and the environment, Prentice Hall, 2004

NE9165 ANALYSIS AND DESIGN OF CMOS ANALOG INTEGRATED CIRCUITS

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UNIT I MODELS FOR IC ACTIVE DEVICES 9

Introduction- Large signal behaviour of MOS transistor- small signal behaviour of the MOS transistor – Short channel effect in MOS transistor – Weak inversion in MOS transistor – Large signal and small signal analysis of single stage MOS amplifiers (CS, CG and CD) - SPICE simulation for MOS circuits.

UNIT II CMOS OPERATIONAL TRANSCODUCTANCE AMPLIFIER 9

Introduction –Difference between opamp and OTA- Differential OTA – slew rate, PSRR, CMRR and Dynamic range of the OTA-Design of Telescopic cascode and Folded cascode OTAs.Design of two-stage amplifier- Miller compensation method for two-stage OTA- Noise in feedback OTAs- SPICE frequency simulation for CMOS OTA.

UNIT III CURRENT MIRROR AND REFERENCES 9

Introduction- Simple MOS current Mirror – Current Mirror with Degeneration – Cascode Current Mirror- Wilson Current Mirror – MOS Widlar current source – Supply insensitive biasing – Constant settling time biasing - Temperature insensitive biasing- Start-up circuit for biasing circuits - SPICE simulation for biasing circuits

UNIT IV ANALOG COMPARATORS AND OUTPUT STAGES 9

Introduction – OTA based comparator – Drawbacks of OTA based comparator – Regenerative latch comparator – Resistive divider comparator- Output stages - SPICE simulation for comparators and output stages

UNIT V ANALOG DESIGN WITH MOS TECHNOLOGY 6

Design of 8-bit flash type ADC- Design of 10-bit pipelined ADC- SPICE simulations for the above designs.

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REFERENCES:

1. Gray, Meyer, Lewis, Hurst, “Analysis and design of Analog IC’s”, 4th Edition, Willey International, 2002.
2. Behzad Razavi, “Principles of data conversion system design”, S.Chand and company ltd, 2000
3. Phillip E.Allen Douglas R. Holberg, “CMOS Analog Circuit Design”, Second Edition-Oxford University Press-2003
4. David A.Johns and Ken Martin, “Analog Integrated Circuit Design”. John Wiley International publications 2006

NE9171 WIRELESS SENSOR NETWORKS

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UNIT I INTRODUCTION 9

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks.

UNIT II PHYSICAL LAYER 9

Introduction, wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication, packet transmission and synchronization, quality of wireless channels and measures for improvement, physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management .

UNIT III DATA LINK LAYER 9

MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error control, framing, link management.

UNIT IV NETWORK LAYER 9

Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and multicast, geographic routing, mobile nodes, Data-centric routing – SPIN, Directed Diffusion, Energy aware routing, Gradient-based routing – COUGAR, ACQUIRE, Hierarchical Routing – LEACH, PEGASIS, Location Based Routing – GAF, GEAR, Data aggregation – Various aggregation techniques.

UNIT V CASE STUDY 9

Target detection tracking, Habitat monitoring, Environmental disaster monitoring, Practical implementation issues, IEEE 802.15.4 low rate WPAN, Operating System Design Issues, Introduction to TinyOS – NesC, Interfaces, modules, configuration, Programming in TinyOS using NesC, Emulator TOSSIM.

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REFERENCES:

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology- Protocols and Applications", John Wiley & Sons, 2007.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: an information processing approach", Else vier publication, 2004.
3. C.S.Raghavendra Krishna, M.Sivalingam and Tarib znati, "Wireless Sensor Networks", Springer publication, 2004.
4. Holger Karl , Andreas willig, "Protocol and Architecture for Wireless Sensor Networks", John wiley publication, Jan 2006.
5. K.Akkaya and M.Younis, " A Survey of routing protocols in wireless sensor networks", Elsevier Adhoc Network Journal, Vol.3, no.3,pp. 325-349, 2005.
6. Philip Levis, " TinyOS Programming", 2006 – www.tinyos.net.
7. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, "Wireless sensor networks: a survey", computer networks, Elsevier, 2002, 394 - 422.
8. Jamal N. Al-karaki, Ahmed E. Kamal, "Routing Techniques in Wireless sensor networks: A survey", IEEE wireless communication, December 2004, 6 – 28.

NE9166 ADVANCED NETWORKS

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UNIT I INTRODUCTION 9

Communicating in the New Era- IP Everywhere- Optical Anywhere- Wireless through the Air- Building Blocks for Next-Generation Networks- IP Networks- Multiservice Networks- VPNs- Optical, Wire line & Wireless Networks- Using Next-Generation Network Services- Network Infrastructure Convergence- Services Convergence- IP Networks

UNIT II LAYER 2 AND LAYER 3 VPN 9

Layer 2 Internetworking,VPN Service, Provisioning-Benefits of L2VPN,Inter-AS L2VPN,Supported IETF Standards-Technology Overview-Intranet Corporate-Internet Access-Scaling MPLS VPNs to Multi-AS, Multi-Provider, and Hierarchical Networks-Heterogeneous Networks-Managed Central Services

UNIT III WIRE LINE & WIRELESS NETWORKS 9

Narrowband–Squeezing Voice and Data-Residential Loop for Analog Transmission-Going Digital with PCM and TDM-Narrowband Aggregation for DS1 and E1-ISDN-Frame Relay-Narrowband Aggregation Layer and Digital Loop Carriers-Broadband–Pushing Technology to the Edge-DSL-DSLAM Broadband Aggregation Layer-Wireless Optics-Fixed Wireless-Satellite Wireless.

UNIT IV MULTISERVICE NETWORKS 9

Global IP Networks-Global Capacity-Globally Resilient IP- Beyond IP- Multiservice Networks-The Origins of Multiservice ATM-Next-Generation Multiservice Networks-Next-Generation Multiservice ATM Switching-Multiprotocol Label Switching Networks Multiservice Core and Edge Switching -Frame-Based & cell based MPLS -MPLS Benefits and Services -Next-Generation Multiservice Routers- -MSSP- Multiservice Transport Platform (MSTP)- MPLS Security

UNIT V MULTICAST AND NGN NETWORK MANAGEMENT 9

MPLS Multicast VPN -Multicast Security and Management Considerations-Network Management and Provisioning-Fault ,Configuration Accounting, Performance Management, and Security Management for MPLS-Aware ICMP Ping and LSP Ping/Trace Mechanisms-Dealing with Equal Cost Multipaths-Virtual Circuit Connection Verification and Bidirectional Forwarding Detection-Generic Failure Types-Interoperability of services and network in NGN- Numbering, naming and addressing of NGN.

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REFERENCES:

1. Azhar Sayeed, Monique Morrow “MPLS and Next-Generation Networks: Foundations for NGN and Enterprise Virtualization” Cisco Press, Paperback, and Published November 2006, 300 pages.
2. Jyh-Cheng Chen ,Tao Zhang “MPLS and IP-Based Next-Generation Wireless Networks:
3. Systems, Architectures, and Protocols” Hardcover. Year of Publication: 2003
4. Robert Wood “Next-Generation Network Services”, cisco press, Year of Publication Nov 2005

NE9172 SPACE TIME WIRELESS COMMUNICATION SYSTEM

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UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION 9

Wireless channel, Scattering model in macrocells, Channel as a ST random field, Scattering functions, Polarization and field diverse channels, Antenna array topology, Degenerate channels, reciprocity and its implications, Channel definitions, Physical scattering model, Extended channel models, Channel measurements, sampled signal model, ST multiuser and ST interference channels, ST channel estimation.

UNIT II CAPACITY OF MULTIPLE ANTENNA CHANNELS AND SPATIAL DIVERSITY 9

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter, Channel known to the transmitter, capacity of random MIMO channels, Influence of ricean fading, fading correlation, XPD and degeneracy on MIMO capacity, Capacity of frequency selective MIMO channels, Diversity gain, Receive antenna diversity, Transmit antenna diversity, Diversity order and channel variability, Diversity performance in extended channels, Combined space and path diversity ,Indirect transmit diversity, Diversity of a space-time-frequency selective fading channel.

UNIT III MULTIPLE ANTENNA CODING AND RECEIVERS 9

Coding and interleaving architecture, ST coding for frequency flat channels, ST coding for frequency selective channels, Receivers(SISO,SIMO,MIMO),Iterative MIMO receivers, Exploiting channel knowledge at the transmitter: linear pre-filtering, optimal pre-filtering for maximum rate, optimal pre-filtering for error rate minimization, selection at the transmitter, Exploiting imperfect channel knowledge.

UNIT IV ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 9

SISO-OFDM modulation, MIMO-OFDM modulation, Signaling and receivers for MIMO-OFDM,SISO-SS modulation, MIMO-SS modulation, Signaling and receivers for MIMO-SS.MIMO-MAC,MIMO-BC, Outage performance for MIMO-MU,MIMO-MU with OFDM,CDMA and multiple antennas

UNIT V ST CO-CHANNEL INTERFERENCE MITIGATION AND PERFORMANCE LIMITS IN MIMO CHANNELS 9

CCI characteristics, Signal models, CCI mitigation on receive for SIMO,CCI mitigating receivers for MIMO,CCI mitigation on transmit for MISO, Joint encoding and decoding, SS modulation, OFDM modulation, Interference diversity and multiple antennas, Error performance in fading channels, Signaling rate vs PER vs SNR, Spectral efficiency of ST doing/receiver techniques, System Design, Comments on capacity

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TEXTBOOK:

1. "Introduction to Space Time Wireless Communication Systems", A. Paulraj, Rohit Nabar, Dhananjay Gore., Cambridge University Press, 2003

REFERENCES:

1. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998

2. Andre Viterbi " Principles of Spread Spectrum Techniques" Addison Wesley 1995

NE9167 DETECTION AND ESTIMATION THEORY

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UNIT I REVEIW OF PROBABILITY AND STOCHASTIC PROCESS 9

Conditional Probability, Bayes' Theorem , Random Variables, Conditional Distributions and Densities, moments and distribution of random variables., Stationary Processes Cyclostationary Processes Averages and Ergodicity Autocorrelation Function Power Spectral Density Discrete-Time Stochastic Processes patial Stochastic Processes Random Signals, Relationship of Power Spectral Density and Autocorrelation Function

UNIT II SINGLE AND MULTIPLE SAMPLE DETECTION 9

Hypothesis Testing and the MAP Criterion, Bayes Criterion , Minimax Criterion, Neyman-Pearson Criterion, Sequential Detection, The Optimum Digital Detector in Additive Gaussian Noise , Performance of Binary Receivers in AWGN

UNIT III FUNDAMENTALS OF ESTIMATION THEORY 9

Formulation of the General Parameter Estimation Problem, Relationship between Detection and Estimation Theory, Types of Estimation Problems, Properties of Estimators, Bayes Estimation, Minimax Estimation, Maximum-Likelihood Estimation, Comparison of Estimators of Parameters

UNIT IV WIENER AND KALMAN FILTERS 9

Orthogonality Principle, Autoregressive Techniques, Discrete Wiener Filter, Continuous Wiener Filter, Generalization of Discrete and Continuous Filter Representations , Linear Least-Squares Methods, Minimum-Variance Weighted Least-Squares Methods, Minimum-Variance Least-Squares or Kalman Algorithm, Kalman Algorithm Computational Considerations, Kalman Algorithm for Signal Estimation, Continuous Kalman Filter, Extended Kalman Filter

UNIT V APPLICATIONS 9

Detector Structures in Non-Gaussian Noise , Examples of Noise Models, Receiver Structures, and Error-Rate Performance, Estimation of Non-Gaussian Noise Parameters Fading Multipath Channel Models, Receiver Structures with Known Channel Parameters, Receiver Structures without Knowledge of Phase, Receiver Structures without Knowledge of Amplitude or Phase, Receiver Structures and Performance with No Channel Knowledge.

REFERENCES:

1. Thomas Schonhoff," Detection and Estimation Theory", Prentice Hall, NewJersy,2007
2. Steven M. Kay," Fundamentals of Statistical Processing, Volume I: Estimation Theory", Prentice Hall Signal Processing Series, Prentice Hall, PTR,New Jersy,1993.
3. Harry L. Van Trees, Detection, Estimation, and Modulation Theory, Part I John Wiley and Sons, Newyork, 2001.

NE9168 NETWORK PROCESSOR

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UNIT I INTRODUCTION 9

Traditional protocol processing Systems – Network processing Hardware – Basic Packet Processing Algorithms and data Structures - Packet processing functions – Protocol Software – Hardware Architectures for Protocol processing – Classification and Forwarding – Switching Fabrics.

UNIT II NETWORK PROCESSOR TECHNOLOGY 9

Network Processors: Motivation and purpose - Complexity of Network Processor Design – Network Processor Architectures architectural variety, architectural characteristics Peripheral Chips supporting Network Processors: Storage processors, Classification Processors, Search Engines, Switch Fabrics, Traffic Managers.

UNIT III COMMERCIAL NETWORK PROCESSORS 9

Multi-Chip Pipeline, Augmented RISC processor, Embedded Processor plus Coprocessors, Pipelilne of Flomogeneous processors. Configurable Instruction set processors – Pipeline of Electrogeneous processors – Extensive and Diverse processors – Flexible RISC plus Coprocessors – Scalability issues – Design Tradeuffs and consequences.

UNIT IV NETWORK PROCESSOR: ARCHITECTURE AND PROGRAMMING CASE STUDY 9

Architecture: Intel Network Processor: Multiheaded Architecture Overview – Features – Embedded EISC processor - Packet Processor Hardware – Memory interfaces – System and Control Interface Components – Bus Interface. Programming Software Development Kit-IXP Instruction set – register formats – Micro Engine Programming – Intra thread and Inter-thread communication – thread synchronization – developing sample applications – control plane – ARM programming.

UNIT V IOS TECHNOLOGIES 9

CISCO COS – Connectilvity and scalability – high availability – IP routing – IP services – IPV6 – Mobile IP – MPLS – IP Multicast 0 Manageability – QoS – Security – Switching – Layer VPN2.

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REFERENCES:

1. Douglas E.Comer “Networks Systems Design using Network Processors” Prentice Hall JaN. 2003.
2. Panas C. Lekkas, “Network Processors: Architectgures, Protocols and Paradigms Telecom Engineering)”, McGraw Hill, Professional, 2003.
3. Patrick Crowley, M a Eranklin, H. Hadminglu, PZ Onfryk, “Network Processor Design, Issues and Practices Vol-1” Morgan Kaufman, 2002.
4. Patrick Crowley, M a Frankliln, H. Hadimioglyum PZ Onufryk, Network Processor Design, Issues and Prentices vol.II, Morgan Kaufman, 2003.
5. Erik, J.Johnson and Aaron R.Kunze, “IXP2400/2806 Programming: The Microengine Coding Grade” Intel Press.
6. Hill Carlson, “Intel Internet Exchange Architecture & Applications a Practical Guide to Intel’s network Processors” Intel press.
7. www.cisco.com

NE9169 ELECTROMAGNETICS FOR COMMUNICATIONS

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UNIT I FUNDAMENTALS OF ELECTROMAGNETIC THEORY REVISITED 9

Electric and magnetic fields; Maxwell's equations in integral form; Maxwell's equations in differential form; Boundary conditions; Poynting's vector and energy storage; Static fields and circuit elements; Quasistatic fields and frequency behaviour of circuit elements; Waves and the distributed circuit concept; Radiation

UNIT II ELECTROMAGNETIC COMPATIBILITY 9

EMC (Electromagnetic compatibility) and EMI (Electromagnetic interference) explained; Methods of solution of EMC problems; Capacitive and inductive couplings; Crosstalk on transmission lines; Common impedance coupling; Electromagnetic shielding; EMC standards

UNIT III ELECTROMAGNETICS FOR SATELLITE COMMUNICATIONS 9

Fundamental components of a satellite communication system; Overview of propagation effects; Tropospheric propagation effects; Ionospheric propagation effects; Propagation prediction models for satellite links

UNIT IV ELECTROMAGNETICS FOR MOBILE COMMUNICATIONS 9

The wireless communication system; The cellular concept; Mobile radio propagation; Large-scale path loss models; Small-scale fading and multipath models; antennas for wireless applications.

UNIT V ELECTROMAGNETICS FOR OPTICAL COMMUNICATIONS 9

Reflection and refraction of plane waves; Dielectric slab waveguide; Ray tracing and graded-index guide; Optical fiber; Pulse broadening in a dispersive medium; Interference and diffraction; Wave propagation in an anisotropic medium.

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REFERENCES:

1. Bemhard Keiser,"Principles of Electromagnetic Compatibility", Third Edition,Artech House,Norwood,1986.
2. N.N.Rao,"Elements of Electromagnetics for Engineering" ,Sixth Edition, Pearson Education,2006.
3. N.N.Rao,"Fundamentals of Electromagnetics for Engineering",Pearson Education,2008.
4. Dennis Roddy,"Satellite Communications",Fourth Edition,McGraw Hill,2006.
5. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.
6. G. Keiser, Optical fiber communications. 4th ed Tata McGraw-Hill, New Delhi, 2008.
7. John D Kraus,Ronald J Marhefka and Ahmad S Khan,"Antennas for all applications", Third Edition, Tata McGraw Hill,2006.

CP9159 SOFT COMPUTING

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UNIT I INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS 9

Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II GENETIC ALGORITHMS 9

Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning - Machine Learning Approach to Knowledge Acquisition

UNIT III NEURAL NETWORKS 9

Machine Learning Using Neural Network, Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks - Reinforcement Learning – Unsupervised Learning Neural Networks – Adaptive Resonance architectures – Advances in Neural networks.

UNIT IV FUZZY LOGIC 9

Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions- Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making

UNIT V NEURO-FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification and Regression Trees – Data Clustering Algorithms – Rulebase Structure Identification – Neuro-Fuzzy Control – Case studies.

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TEXT BOOKS:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”,Prentice Hall, 1995.
3. James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edn., 2003.

REFERENCES:

1. Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998
2. David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, 1997.
3. S. N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer, 2007.
4. S.N.Sivanandam · S.N.Deepa, “Introduction to Genetic Algorithms”, Springer, 2007.
5. Jacek M. Zurada, “Introduction to Artificial Neural Systems”, PWS Publishers, 1992.