

M.E. (Electronics & Telecommunication)
Communication Networks

Semester - I

Code.	Subject	Teaching Scheme		Examination Scheme					Credits
		Lectures	Practicals	Paper	Term Work	Oral	Practical	Total	
504601	Traffic Analysis and QoS	3	-	100	-	-	-	100	3
504182	Principles and Practices of IT Management	3	-	100	-	-	-	100	3
504602	Modeling and Simulation of Communication Networks	3	-	100	-	-	-	100	3
504603	Elective -I	3	-	100	-	-	-	100	3
504604	Elective -II	3	-	100	-	-	-	100	3
504605	Communication Network Design Practice-I	-	6	-	50	-	-	50	3
504606	Seminar I	-	4	-	50	-	-	50	2
Total		15	10	500	100	-	-	600	20

Semester - II

Code.	Subject	Teaching Scheme		Examination Scheme					Credits
		Lectures	Practicals	Paper	Term Work	Oral	Practical	Total	
504607	Signal Processing in Communication	3	-	100	-	-	-	100	3
504608	Wireless System Design	3	-	100	-	-	-	100	3
504609	Wired and Wireless Networks	3	-	100	-	-	-	100	3
504610	Elective -III	3	-	100	-	-	-	100	3
504611	Elective -IV	3	-	100	-	-	-	100	3
504612	Communication Network Design Practice-II	-	6	-	50	-	-	50	3
504613	Seminar II	-	4	-	50	-	-	50	2
Total		15	10	500	100	-	-	600	20

Semester - III

Sr. No.	Subject	Teaching Scheme		Examination Scheme					Credits
		Lectures	Practicals	Paper	Term Work	Oral	Practical	Total	
604601	Seminar III	-	4	-	50	-	-	50	2
604602	Project Stage - I	-	18	-	50	-	-	50	6
Total		-	22	-	100	-	-	100	8

Semester - IV

Sr. No.	Subject	Teaching Scheme		Examination Scheme					Credits
		Lectures	Practicals	Paper	Term Work	Oral	Practical	Total	
604603	Project Stage - II	-	18	-	150	50	-	200	12
Total		-	18	-	150	50	-	200	12

Elective I: Microwave and Antenna Theory
Wireless Sensor Networks
Ad-hoc Network

Elective II: Data Compression and Coding
Network Analysis, Architecture & Design
Computational Electromagnetics

Elective III: Cognitive Radio
Network Processors and Architectures
Mobile Computing

Elective IV: Network Security
RF MEMs
Neural Networks in Communication

Semester-I

504601 Traffic Analysis and QoS

Bandwidth allocation and traffic control, Statistical analysis and traffic engineering models for Real time traffic, Bases and conception of traffic management planning and its methodologies, Design issues to tackle management problems associated with running large footprint enterprise and service provider networks, Overview of Traffic management for High Speed network, Management of Multimedia on the Internet, LAN traffic Management, Definition of Quality of service (QoS) and Quality of perception (QoP), QoS-oriented communication architectures and protocols, adaptive communication protocol to provide an enhanced QoP.

Reference Books:

1. Planning Traffic Management - Bohlinger
2. Network Management - Mani Subramanian
3. Network management : Principles , Design and Implementation - Stephen Morris
4. Network Planning and management , NIIT
5. Traffic Management & Traffic Engineering for the future Internet - Valadas & Ruj
6. Traffic Management of High Speed Network - Kung & Mckay

504182 Principles and Practices for IT Management

1.Management Perspectives

Role and importance of management, process of management , planning, organizing, staffing, directing, controlling, Nature, purpose and principles of management, Business policy, tools and techniques of strategic management, business ethics and social responsibilities.

2. Preliminary planning of an IT Project

Gathering project Information, defining the project goals, establishing project priorities, requirements analysis, risk management, budgeting a project, creating a work breakdown structure, estimation.

3. Organizing an IT Project Organizing a Project Team

Assessing internal scales, creating a team, managing team issues, resources procurement Preparing and Implementing the project plan: -Defining the project schedule, project network diagram creation and analysis, project constraints, tracking project progress and financial obligations Revising the project plan:-need for revision, establishing change control, implementing the project changes, coping with project delays .

4. Group Dynamics and Team Management Theories of Group Formation ,Formal and Informal Groups and their interaction, Importance of teams ,Formation of teams , Team Work,

Leading the team, Team Meeting, Conflict Management, Traditional vis-à-vis Modern view of conflict, Conflict Process –Strategies for resolving destructive conflict, Stress management, employee welfare, energy management and energy audit.

5. Modern approaches to management

Concept of Knowledge management, change management, technology management, supply chain management, introduction to Intellectual property Rights (IPR), and cyber laws, process and project quality standards , six sigma, CMM, CMMI, PCMM, Impact of IT quality management systems, learning organizations.

6. Applications of IT in management

Application of IT in functions like finance and accounting, stores, purchase, product design and development, quality control, logistics, customer relationship, marketing, project management, health care, insurance, banking, agriculture and service sector.

Reference Books:

1. “IT Project Management”, Joseph Phillips, Tata McGraw-Hill 2003 Edition.
2. Management-Tasks, Responsibilities and practices, Peter Drucker.
3. Management Theory and Practice-Ernst Dale.
4. Management Information System, Javadekar.
5. Business Policy, Azhar Kazmi.
6. Industrial Energy Conservation, D.A.Ray, Pergamon Press.
7. Resisting Intellectual Property, Halbert, Taylor & Francis Ltd ,2007

504602 Modeling & Simulation of Communication Network

1. SIMULATION METHODOLOGY

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.

2. RANDOM SIGNAL GENERATION & PROCESSING

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

3. MONTE CARLO SIMULATION

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

4. ADVANCED MODELS & SIMULATION TECHNIQUES

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, Tail extrapolation, pdf estimators, Importance sampling methods.

5. NETWORK AND TRAFFIC MODELLING

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

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.

504603 Elective –I

1. Microwave and Antenna Theory

Microwave sources, Gunn, PIN diodes, HBT, MESFET, HEMT, MOSFET, Klystron, Magnetron, TWT. Passive devices, Isolator, Circulator, Directional coupler, filter. MMIC, Introduction to Monolithic Microwave Integrated Circuits (MMICs), Thick and Thin film technologies and materials, encapsulation and mounting of active devices, Planar transmission lines for MMICs, Method of conformal transformation for microstrip analysis, effective dielectric constant for microstrip, losses in microstrip, lumped elements. Microwave antennae, E-plane & H-plane sectoral horns, pyramidal horn, radiation & impedance properties of parabolic reflector antenna & cassegrain antenna, spillover loss, corner reflector, lens antenna, linear array with non-uniform current distribution, planar array, phased array, adaptive antenna array, basic characteristics of stacked, electromagnetic-coupled & aperture-coupled microstrip antennas, aperture-coupled stacked microstrip antennas.

Reference Books:

1. K.C. Gupta, "Microwave Integrated circuits".
2. C. A. Balanis, Harper, "Antenna Theory -Analysis & Design", Row Publishers.
3. Samuel Y. Liao, "Microwave Devices & Circuits".
4. K.C. Gupta, R. Garg. , I. Bahl, P. Bhartia, "Micro strip lines and Slot lines".
5. R. E. Collin, "Antennas & Radiowave Propagation", McGraw-Hill.
6. R. Garg, P. Bhartia, I. Bhal & A. Ittipiboon, "Microstrip Antenna Design Handbook".
7. B. Bhat, S. K. Koul, "Stripline-like Transmission lines for Microwave Integrated Circuits", Wiley Eastern Ltd.
8. Ivan Kneppo, J Fabian, P. Bezousek, "Microwave Integrated circuits".

2. Wireless Sensor Networks

Introduction to Wireless Sensor Networks, Applications and Motivation, Network Performance Objectives, The Development of Wireless Sensor Networks, Early Wireless Networks, Wireless Data Networks, Wireless Sensor and Related Networks, The Physical Layer, Some Physical Layer Examples, A Practical Physical Layer for Wireless Sensor Networks, The Data Link Layer, Medium Access Control Techniques, The Mediation Device, System Analysis and Simulation, The Network Layer, A Wireless Sensor Network Design Employing a Cluster Tree Architecture, Practical Implementation Issues, The Partitioning Decision, Transducer Interfaces, Time Base Accuracy and Average power Consumption, Power Management, Power Sources, Loads, Voltage Converters and Regulators, Power Management Strategy, Antennas and the Definition of RF Performance, Antennas, RF Performance Definition and Measurement, Electromagnetic Compatibility, EMC: The Problem Examples of Self-Interference, The Physics associated with EMC Problems Principles of Proper Layout , The Layout Process, Detective /Corrective Techniques, Electrostatic Discharge The Problem Physical Properties of the Electrostatic Discharge, The Effects of ESD on Integrated Circuits Modeling and Test Standards, Product Design to Minimize ESD Problems, Wireless Sensor Network, Standards, The IEEE 802.15.4 Low-Rate WPAN Standard, The Zig-Bee Alliance, The IEEE 1451.5 Wireless Smart Transducer Interface Standard, Opportunities for Future Development.

Reference Books:

1. Wireless Sensor Networks: Technology, Protocols, and Applications by Kazem Sohraby, Daniel Minoli, Taieb Znati
2. Wireless Sensor Networks: Architectures and Protocols by Edgar H. Callaway, Jr., Motorola Labs, Plantation, Florida, USA, Series: Internet and Communications, CRC Press

3. Wireless Sensor Networks: An Information Processing Approach, By Feng Zhao, Microsoft Research, Redmond, WA Leonidas Guibas, Geometric Computing Group, Stanford University, Stanford, CA

3. Ad hoc Networks

Ad hoc wireless networks, internet, Classification, Issues & design goals in MAC protocol. Other MAC protocols. Classification, Table driven, on demand, Hybrid, Hierarchical, Power aware routing protocol, Issues/ issues in designing routing/ multicast protocol, efficient flooding mechanisms, routing protocol. An architecture reference model, Classification, Tree based and Mesh based multicast routing protocol. Energy efficient multicasting, Quality of service Guarantees. Transport layer and security protocols, Issues in Designing, Design Goals, and Classification. TCP over Ad Hoc Wireless Networks, Other Transport Layer Protocols, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges, Network Security Attacks, Key Management, Secure Routing, QoS and Energy Management, Issues and Challenges, classifications, Solutions - MAC Layer, Network Layer. QoS Frameworks. Energy Management, Need, Classification of Energy Management Schemes.

References Books:

1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Education, 2004.
2. Hekmat Ramin, "Adhoc Networks: Fundamental properties & Network topologies" Springer Publications.
3. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Prentice Hall PTR, 2001
4. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000.

504604 Elective-II

1. Data Compression and Coding

Lossless versus Lossy compression, Motivating Lossless, Math Preliminaries for Lossless Methods, Huffman & Arithmetic coding, Audio compression, Modeling sound, Sampling, Nyquist, Quantization-Scalar quantization, Uniform quantizer, Non-uniform quantizer. Compression performance, Speech compression-Speech coders, Predictive approaches, Silence compression, Pulse code modulation (ADPCM), Music compression, Streaming audio, MIDI. Math Preliminaries for Lossy Methods, Random Processes and Their Models, Distortion Criteria/Measures, Info Theory for Lossy, Rate-Distortion Theory. Quantization-Optimal and Adaptive Quantization, Uniform and non-uniform Quantizer, Entropy Coded, Vector Math for Transforms, Sub-bands, and Wavelets, Matrices and Vectors, Eigenvectors Coding, Transform

coding Sub-band Coding-Intro and Multi-rate, Sub-band, Perfect Recon Filters. Wavelet Compression Methods, 2-D Wavelet for Image Compression, choice of wavelet for image compression, Embedded Image Coding Using Zero-trees, EZW charts, SPIHT Charts. Video compression, Analogue video, Digital video, Moving pictures, MPEG, Basic principles, Temporal compression algorithms, Group of pictures, Motion estimation, Work in different video formats.

Reference Books:

- 1 Jayanth N S and Noll P, "Digital Coding of Waveforms -Principles and Application to Speech and Video," Prentice Hall, 1984.
- 2 Kondo A M, "Digital Speech," John Wiley, 1994.
- 3 Gersho A and Gray R, "Vector Quantization and Signal Compression," Kluwer Acad Publication, 1992.
- 4 Hanzo L, Somerville F C A, Woodard J P, "Voice Compression and Communications," John Wiley, 2001
- 5 Yun Q. Shi, Huifang Sun "Image and Video Compression for Multimedia Engineering: Fundamentals, Algorithms, and Standards" CRC press
Ida Mengyi Pu, "Fundamental Data Compression", Elsevier Publications

2. Network Analysis, Architecture and Design

Overview of analysis, architecture, and design process, A System methodology, System description, Service characteristics, Performance characteristics, Network supportability, Requirement analysis concepts and process; Developing service metrics; Characterizing behavior, Developing RMA, Delay, capacity, supplemental performance, Environment-specific Thresholds and limits, requirements for predictable and guaranteed performance, Flow analysis, Flows, Identifying and developing flows, Data sources and sinks, Flow models, Flow prioritization, specifications, Network architecture and design, Component architecture and design, Reference architecture, Architectural models, System and network architectures, Addressing and routing architecture, addressing mechanisms, routing mechanisms, Addressing strategies, routing strategies, architectural considerations, Defining network management, Network management mechanism and architectural considerations, Performance architecture, Developing goals, Performance Mechanisms and architectural considerations, Security and private architecture and plan development, Administration, Mechanism, Architectural considerations, Selecting Technologies for network design and interconnecting technologies.

Reference Books:

1. JAMES D. McCABE, "Network Analysis, Architecture, and Design", Second Edition, Morgan Kaufmann Publishers

2. Michael Palmer, Robert Bruce Sinclair, Thomson, "A Guide to Designing and Implementing Local and Wide Area Networks", Vikas Publishing House.
3. William Stallings, "High Speed Networks TCP/IP and ATM Design Principles", Prentice- Hall International, Inc.

3. Computational Electromagnetics

Basic Principles of Electromagnetic theory -Maxwell's equations, Poynting's vector, Differential equations in Electromagnetics, Wave types , Interface conditions, Laplace and Poisson's equations. Mathematical frame work- orthogonality, Eigen function, vector space, delta function. Introduction to computational methods. Basic elements, stability and accuracy for numerical solutions, formulation for computational methods. Methods of finite difference-finite difference time domain analysis in 1 D and 2 D. Finite Element method, analysis in 1 D and 2 D, Methods of moments, Comparison of FDM, FDTD, FEM, and MoM, Hybrid computational methods. High frequency problems with finite element, Low frequency applications, time domain modeling of electromechanical devices.

Reference Books:

1. Analytical and Computation methods in Electromagnetics by Ramesh Garg,Artech house inc. 2008,ISBN -13-978-159693-385-9.
2. Computational methods of Electromagnetics and microwaves by Chari, S.J.Salon,John wiley 1992.
3. Numerical methods in Electromagnetism by M.V.K.Chari, S.J.salon,Academic press series.

Semester – II

504607 Signal Processing in Communication

Wireless Introduction Wireless Introduction, Wireless Standards Overview, Convergence of Wireless Services Statistics And Signal Processing Review, Bandpass Signals and Subsystems, Receiver Sensitivity Definition.

Modulation Theory Modulation Impairments, Modulation Scheme Migration, Modulation Scheme Comparison.

Wireless Multipath Channel AWGN, Rayleigh and Rician Multipath Fading Phenomenon, Frequency Selective Fading ManMade System Interference, Propagation Path Loss, Shadowing effect, Multipath Fading Simulation Models ,Multipath Birth/Death Discussion,

Modulation Detection Techniques

Difference between Practice And Theory , Coherent Detection, Noncoherent Detection of DQPSK , Non Coherent Detection of MSK, BER Performance Comparison, Mathematical BER Expressions.

Performance Improvement Techniques

Forward Error Correction Codes, Receive Spatial Antenna Diversity Combining Techniques, Transmit Spatial Antenna Diversity Techniques, Link Budget Discussion

. Receiver Digital Signal Processing

Temporal Equalization, Space Time Equalization, Frequency Domain Equalization, Symbol Timing Recovery, Channel Quality Estimation , Automatic Frequency Control, Overall Receiver Block

Wideband

Rake Receiver Principle, 2G IS 95 CDMA, Rake Finger Architecture and Performance, PN Code Properties, Capacity Improvement In Multipath Environment, Multimedia And Mobile TV Services, Mimo Techniques.

REFERENCES:

1. Joseph Boccuzzi, "Signal Processing For Wireless Communication.", McGraw Hill(2008). of India, New Delhi, 1995.
2. Tadeusz A. Wysocki, Bahram Honary, Beata J. Wysocki., "Signal Processing For Telecommunicatio And Multimedia" Springer.
3. Mohamed Ibnkahla., "Signal Processing For Mobile Communication", CRC.

504608 Wireless System Design

RF Amplifier Design: Characteristics of amplifiers, amplifier power relations, stability considerations, stability circles, unconditional stability, stabilization methods, unilateral design, unilateral figure of merit, bilateral design, operating and available power gain circles, noise figure circles, constant VSWR circles, broadband, high power and multistage amplifiers. RF oscillators: Basic oscillator model, negative resistance oscillator, feedback oscillator design, design steps, quartz oscillators. High frequency oscillators: Fixed frequency oscillators, dielectric resonator oscillators, YIG-Tuned oscillators, voltage controlled oscillators, Gunn element oscillators. Mixer Design: Concepts, frequency domain considerations, single-balanced mixer, double-balanced mixer. System performance: System degradation due to RF components, budget

profiles, propagation losses, link budget, cost versus performance issues, performances of different RF wireless system architectures.

Reference Books:

1. Reinhold Ludwig and Pavel Bretchko, “RF Circuit Design Theory and Applications”, Pearson Education.
2. Thomas Lee, “RFIC Design”, Oxford Press.
3. Calvin Plet, “Radio Frequency Integrated Circuit Design”, Artech House.
4. Radmanesh, “Radio Frequency & Microwave Electronics Illustrated”, Pearson Publications.
5. Dal Fabbro, Paulo Augusto, Kayal, Maher, “Linear CMOS RF Power Amplifiers for Wireless Applications”, Springer Publications.
6. Kiat Seng, Manh Anh Do, Chirn Chye Boon, “Design of CMOS RF Integrated Circuits and Systems”, World Scientific Publishing Company.

504609 Wired & Wireless Networks

ALOHA, CSMA-CD, LAN, WAN, IEEE Standards for LAN: Ethernet, Token Bus, Token Ring etc, bridges, routers, broadband network such as ATM, SONET etc, Introduction and overview of TCP/IP, Network topologies, Internet working concepts and architectural models , Internet addressing scheme like IPv4 and IPv6, sub netting and VLSMs, Internet protocols, Internet trends, Internet applications and network programming, Protocol layering, routing architecture, routing algorithms , private network interconnections such as VPN, NAT,VLAN etc. ARQ, multiple-access communication, Challenges Ahead of IP.

Reference Books:

1. Computer networks and internets- Douglas E Comer—Pearson –5 th edition.
2. Internetworking with TCP/IP -- Douglas E Comer—Pearson –5 th edition.
3. TCP/IP protocol suite- Behrouz Forouzen.
4. Data networks, IP and internet: protocol, design and operation- Martin P. Clark—Wiley publications.

504610 Elective-III

1. Cognitive Radio

Cognitive radio concepts & history, Benefits of Cognitive radio, Cognitive radio Forum, Ideal Cognitive radio architecture, Cognitive radio Based End-to-End Communication, Worldwide frequency band plans, Aim and requirements of the SCA, Architecture Overview, Functional View, Networking Overview, Core Framework, Real Time Operating Systems, Common Object

Request Broker Architecture (CORBA), SCA and JTRS compliance, Radio Frequency design, Baseband Signal Processing, Radios with intelligence, Smart antennas, Adaptive techniques, Phased array antennas, Applying Cognitive radio principles to antenna systems, Smart antenna architectures, Low Cost Cognitive radio Platform, Requirements and system architecture, Convergence between military and commercial systems, The Future of Software Defined Radio.

References Books:

1. Dillinger, Madani, Alonistioti (Eds.): Software Defined Radio, Architectures, Systems and Functions, Wiley 2003
2. Reed: Software Radio, Pearson.
3. Software Defined Radio for 3G, 2002, by Paul Burns.
4. Tafazolli (Ed.): Technologies for the Wireless Future, Wiley 2005.
5. Bard, Kovarik: Software Defined Radio, The Software Communications Architecture, Wiley 2007.

2. Network Processors and Architectures

The evolution of network technology; Distributed Computing and the convergence of network; Network processor justification; Packet processing; Network Processor architecture; IBM & intel network processor; AMCC family of network processor; NPU architectures; ARM-7 processor LPC 2378 for Ethernet based applications; NET ASICs and designing with IP cores; Peripheral chips supporting network processors; Storage network processors; Search engines; Classification processors; Switch fabrics; System engineering issues.

Reference Books:

1. Network Processor Design: issues and practices: By Mark A. Franklin, ELSEVIER Publication.
2. ARM 7 –LPC 2378 NXP-Data sheets.

3. Mobile Computing

1G to 4G mobile telephone technologies. Reference architectures for wireless LAN, WLAN GPRS, GSM and VOIP architecture, 4-G LTE network architecture and protocols Transmit diversity and MIMO spatial multiplexing, Applications of Mobile computing Business value behind mobile application development Best practices for the entire project life cycle. Case studies secure mobile application development Fundamentals of wireless Mark up language WML script applications.

Reference Books:

1. Introduction to Mobile Telephone Systems, 2nd Edition, 1G, 2G, 2.5G, and 3G Technologies and Services by Lawrence Harte
2. Wireless and Mobile Data Networks by Aftab Ahmad
3. Wireless and Mobile Network Architectures by Yi-Bing Lin and Imrich Chlamtac
4. Mobile Applications: Architecture, Design, and Development by Valentino Lee, Heather Schneider, and Robbie Schell
5. Mobile IP Technology and Applications by Stefan Raab and Madhavi W. Chandra
6. Mobile Application Security [Paperback] Himanshu Dwivedi (Author), Chris Clark , David Thiel
7. Beginning WAP: Wireless Markup Language & Wireless Markup Language Script by Soo Mee Foo, Ted Wugofski, Wei Meng Lee, and Foo Soo Mee
8. WML & WMLScript: A Beginner's Guide by Kris A. Jamsa

504611 Elective-IV

1. Network Security

Wireless Protocols: Wireless TCP, Session Mobility, MAC protocols for digital cellular systems such as GSM. IEEE 802.11 WLANs analysis, deployment of 802.11 infrastructures; Bluetooth, core protocols, MANETs and WSNs. Mobile Ad Hoc networks: MAC Protocols - classification, comparative analysis, reactive and proactive routing, power-aware routing. Wireless Sensor Networks: Data Dissemination, Data Gathering, MAC Protocols, Sensor Management, Localization. Conventional encryption, cipher-block, location of encryption devices, key distribution. Public key cryptography, RSA algorithm, diffie-hellman algorithms, message authentication, secure hash functions, HMAC, digital signatures, key management. Secrete Key Cryptography, DES, IDEA, AES. Network Security applications: Authentication applications email Security, PGP, SMIME IP Security, authentication on header, encapsulating security payload, combining security associations, key management. Web Security Requirements, SSL and TSL, SET.

Reference Books:

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall.
2. Jochen Schiller, "Mobile Communications", Addison Wesley, 2000.
3. Ramjee Prasad and Luis Munoz, "WLANs and WPANs towards 4G wireless", Artech House, 2003.
4. William Stallings, "Cryptography and Network Security", 3rd edition, Pearson Education
5. Evangelos Kranakis, "Primality and Cryptography", John Wiley & Sons
6. Rainer A. Ruppel, "Analysis and Design of Stream Ciphers", Springer Verlag

7. Douglas A. Stinson, "Cryptography, Theory and Practice", 2nd edition, Chapman & Hall, CRC Press Company, Washington

2. RF MEMS

General overview of MEMS and RF MEMS. MEMS materials and Fabrication techniques. Analysis of the fundamental mechanical and electromagnetic properties of MEMS structures. RF MEMS relays and switches. Switch parameters. Actuation mechanism. Bistable relays and micro actuators. Dynamics of switching operations. MEMS inductors and Capacitors. Micromachined inductor. Effect of inductor layout. Modeling and design issues of planar inductor. Gap tuning and area tuning capacitors. Dielectric tunable capacitors. Micromachined RF filters. Modeling of mechanical filters. Electrostatic comb drive. Micromechanical filters using comb drives. Electrostatic coupled beam structures. MEMS phase shifters. Types. Limitations. Switched delay lines. Micromachined transmission lines. Coplanar lines. Micromachined directional coupler and mixer. Micromachined antennas. Microstrip antennas – design parameters. Micromachining to improve performance. Reconfigurable antennas. One Detailed application of RF MEMS.

Reference Books:

1. Gabriel M Rebeiz, "RF MEMS – Theory , Design and Technology".
2. Hector J.de.los Santos, "RF MEMS circuit Design for Wireless Communication".
3. V.K.Varadhan & Jose, "RF MEMS and their Application".
4. Vijay varadan, Zoelzer, "RF MEMS and their Application".
5. Stephen Lveyszyn, "Advanced RF MEMS".

3. Neural Networks in Communications

Introduction to artificial neural networks, Learning rules, perceptron networks, feed forward networks, Feedback networks, Radial basis function networks, Associative memory networks, self organizing feature map, Adaptive resonance theory, Probabilistic neural networks, neo-cognitron, Optical neural networks, Simulated annealing, Support vector machines, Neuro-dynamic programming, Applications in Telecommunications, Efficient design of RF and wireless circuits, Neural networks for switching, ATM traffic control using neural networks, Neural model for adaptive congestion control in ATM networks, Neural network channel equalization, Static and Dynamic Channel assignment using simulated annealing, Traffic density determination using self organizing feature map, Automatic language identification, Neurocomputing approach to optimize the performance of a satellite communication networks.

Reference Books:

1. Fredric Ham and Ivica Kostanic, "Principles of Neurocomputing for science and Engineering", Tata McGraw Hill Publication
2. Simon Haykin, "Neural Networks: Comprehensive foundation", Prentice Hall Publication
3. S N Sivanandam, S Sumathi, S N Deepa, "Introduction to Neural Networks Using Matlab 6.0", Tata McGraw Hill Publication
4. Ben Yuhua and Nerwan Ansari, "Neural Networks in Telecommunications", Kluwer Academic publishers