JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech (WIRELESS AND MOBILE COMMUNICATIONS)
COURSE STRUCTURE AND SYLLABUS

I Year – I Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course I	Advanced Data Communications	25	75	4	--	4
Core Course II	Coding Theory and Techniques	25	75	4	--	4
Core Course III	Spread Spectrum Communication	25	75	4	--	4
Core Elective I	Detection and Estimation Theory Random Processes and Time Series Analysis RF Circuit Design	25	75	4	--	4
Core Elective II	Voice Over Internet Protocol Queueing Theory and Applications GPS Applications	25	75	4	--	4
Open Elective I	Image and Video Processing Internetworking Advanced Digital Signal Processing	25	75	4	--	4
Laboratory I	Advanced Communications Lab	25	75	--	4	2
Seminar I	Seminar	50	--	--	4	2
Total Credits				**24**	**8**	**28**

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced communications & Networks	25	75	4	--	4
Core Course V	Wireless Communications & Networks	25	75	4	--	4
Core Course VI	Wireless MIMO Communications	25	75	4	--	4
Core Elective III	Optical Communications Technology Wireless LANs and PANs Adhoc and Wireless Sensor Networks	25	75	4	--	4
Core Elective IV	Network Security and Cryptography Software Defined Radio 4G Technologies	25	75	4	--	4
Open Elective II	Embedded system Design Mobile Computing Technologies Scripting Languages	25	75	4	--	4
Laboratory II	Wireless Communications and Networks Lab	25	75	--	4	2
Seminar II	Seminar	50	--	--	4	2
Total Credits				**24**	**8**	**28**

II Year - I Semester

Course Title	Int. marks	Ext. marks	L	P	C
Comprehensive Viva-Voce	--	100	--	--	4
Project work Review I	50	--	--	24	12
Total Credits			--	24	**16**

II Year - II Semester

Course Title	Int. marks	Ext. marks	L	P	C
Project work Review II	50	--	--	8	4
Project Evaluation (Viva-Voce)	--	150	--	16	12
Total Credits			**--**	**24**	**16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

ADVANCED DATA COMMUNICATIONS

Unit I

Data Communications, Networks and Network Types, Internet History, Standards and Administration, Protocol Layering, TCP/IP protocol suite, OSI Model. Digital Data Transmission, DTE-DCE interface.

Data Link Layer

Introduction, Data Link Layer, Nodes and Links, Services, Categories of Links, sub layers, Link Layer Addressing, Address Resolution Protocol.

Unit II

Error Detection and Correction: Types of Errors, Redundancy, detection versus correction, Coding Block Coding: Error Detection, Vertical redundancy cheeks, longitudinal redundancy cheeks, Error Correction, Error correction single bit, Hamming code.

Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantage of Cyclic Codes, Checksum

Data Link Control: DLC Services, Data Link Layer Protocols, HDLC, Point to Point Protocol

Unit III

Switching: Introduction to Switching, Circuit Switched Networks, Packet Switching, Structure of switch

Multiplexing : Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing.

Connecting devices: Passive Hubs, Repeaters, Active Hubs, Bridges, Two Layer Switches, Routers, Three Layer Switches, Gateway, Backbone Networks.

Wired LANS: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Giga bit Ethernet

Unit IV

Media Access Control (MAC) Sub Layer

Random Access, ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA),Controlled Access- Reservation, Polling- Token Passing, Channelization - Frequency Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA).

Spectrum Spreading: Spread Spectrum-Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum.

Unit V

Networks Layer: Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPv4 Address, Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution(NATF), Forwarding of IP Packets, Forwarding based on Destination Address, Forwarding based on Label, Routing as Packet Switches.

Unicast Routing : Introduction, **Routing Algorithms**-Distance Vector Routing, Link State Routing, Path Vector Routing, **Unicast Routing Protocols**- Routing Information Protocol(RIP), Open Short Path First Version 4.

TEXT BOOKS:

1. Data Communications and Networking - B. A. Forouzan, 5th , 2013,TMH.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data Communications and Networking - B. A. Forouzan, 2nd , 2013, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

CODING THEORY AND TECHNIQUES

UNIT – I:

Coding for Reliable Digital Transmission and storage

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II:

Cyclic Codes : Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III:

Convolutional Codes : Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV:

Turbo Codes

LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V:

Space-Time Codes

Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS:

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

REFERENCE BOOKS:

1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw – Hill Publishing,19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

SPREAD SPECTRUM COMMUNICATION

UNIT -I:

Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.

Binary Shift Register Sequences for Spread Spectrum Systems:

Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT -II:

Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT -III:

Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT -IV:

Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity,

Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT -V:

Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS:

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - “Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff – “Introduction to CDMA Wireless Communications.” Elsevier Publications, 2008.

REFERENCE BOOKS:

1. George R. Cooper, Clare D. Mc Gillem - “Modern Communication and Spread Spectrum,” McGraw Hill, 1986.
2. Andrew j. Viterbi - “CDMA: Principles of spread spectrum communication,” Pearson Education, 1st Edition, 1995.
3. Kamilo Feher - “Wireless Digital Communications,” PHI, 2009.
4. Andrew Richardson - “WCDMA Design Handbook,” Cambridge University Press, 2005.
5. Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

DETECTION AND ESTIMATION THEORY

(Core Elective –I**)**

UNIT –I:

Random Processes: Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:

Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:

Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:

Statistics: Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:

Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:

1. Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCE BOOKS:

1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran, Viswanathan, 2003, PHI.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
6. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

RANDOM PROCESSES AND TIME SERIES ANALYSIS

(Core Elective –I**)**

UNIT -I:

Stationary Random Processes from a Probability Point of View: Probability Density and Probability Distribution Functions of a Random Variable, Expected Value of Random Variable, Markov and Chebyshev Inequalities, Computer Methods for Generating Random Variables, Multidimensional Random variables, Chi-square tests of hypotheses concerning distribution.

UNIT -II:

Random Processes Analyzed in the Time Domain: Continuous and Discrete Time, Stationarity, Auto Covariance and Auto Correlation functions, Continuity, differentiation, Integrals of Random Processes.

Some special cases: The Poisson process, the Normal (Gaussian) Process.

UNIT -III:

Random Processes Analyzed in the Frequency Domain: The Fourier Transform, Spectral Density, The Cross Power Spectral Density.

Linear Systems with random input: Impulse response, Transfer function, the relation between the spectral density for the input and for the output

UNIT -IV:

Markov Chains: Markov Processes: Discrete time Markov chains, state transition probability matrix, n-step state transition probability, transition diagrams, classification of states, limiting state probabilities, Continuous-time Markov chains, Gambler's ruin as a Markov chains

UNIT -V:

Basic Queuing Theory: Elements of a Queueing System, Little's Formula, M/M/1, Queue- Delay Distribution in M/M/1 System, M/M/1 System with Finite Capacity, M/G/1 Queueing system- Residual Service Time, Mean Delay in M/G/1 Systems.

TEXT BOOKS:

1. Probability, Random Variables, and Random Signal Principles – Peebles, P. Z (1993)- Third edition or later – New York – McGraw-Hill
2. Fundamentals of Applied Probability and Random Processes – Oliver C. Ibe, Elsevier, 2009
3. Probability and Random Processes for Electrical Engineering - Alberto Leon-Garcia, 2nd Ed, Pearson

REFERENCE BOOKS:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis, S. Unnikrishna Pillai – TMH, 2008
2. Probability and Random Processes with Applications to Signal Processing – Henry Stark, John W. Woods, 3rd Edition, Pearson
3. Probability and Stochastic Processes – A Friendly Introduction for Electrical and Computer Engineers – Roy D. Yates, David J. Goodman

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

RF CIRCUIT DESIGN

(Core Elective –I**)**

UNIT -I:

Introduction to RF Electronics: The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behavior of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.

UNIT -II:

Transmission Line Analysis: Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines.

Single And Multiport Networks: The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.

UNIT- III:

Matching and Biasing Networks: Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.

RF Passive & Active Components: Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.

UNIT -IV:

RF Transistor Amplifier Design: Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.

UNIT -V:

Oscillators: Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer.

RF Mixers: Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.

TEXT BOOKS:

1. RF Circuit design: Theory and applications by Reinhold Ludwing, Pavel Bretchko. Pearson Education Asia Publication, New Delhi 2001.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons

REFERENCE BOOKS:

1. Radio frequency and microwave electronics illustrated Mathew M.Radmangh, 2001, PE Asia Publication.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Design by Joseph Carr., 3rd Edition, Tab Electronics.
4. Complete Wireless Design by Cotter W. Sawyer, 2nd Edition, Mc-Graw Hill.
5. Practical RF Circuit Design for Modem Wireless Systems Vol.2 by Less Besser and Rowan Gilmore.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

VOICE OVER INTERNET PROTOCOL (VoIP)

(Core Elective –II**)**

UNIT –I:

Overview of IP Protocol Suite: The Internet Protocol, The Transmission Control Protocol(TCP), The User Datagram Protocol (UDP), The Real-time Transport Protocol (RTP), IP multicast, IP version 6 (IP v6), Interworking IPv4 and IPv6, The VoIP Market, VoIP Challenges.

UNIT -II:

H.323 and H.245 Standards: The H.323 Architecture, Call Signaling-Call Scenarios, H.245 Control Signaling Conference calls- The Decomposed Gateway.

UNIT –III:

The Session Initiation Protocol (SIP): SIP architecture- Overview of SIP Messaging Syntax- Examples of SIP Message sequences- Redirect Servers- Proxy Servers. The Session Description Protocol (SDP)- Usage of SDP With SIP.

UNIT -IV:

Quality of Service (QoS): Need for QOS – End-to-end QoS, Overview of QOS solutions- The Resource reservation Protocol (RSVP)- Diffserv- The Diffserv Architecture- Multi-protocol Label Switching (MPLS)- The MPLS Architecture- MPLS Traffic Engineering- Label Distribution Protocols and Constraint- Based Routing.

UNIT -V:

VoIP and SS7: The SS7 Protocol Suite- The Message Transfer Part (MTP), ISDN User Part (ISUP) and Signaling Connection Control Part (SCCP), SS7 Network Architecture- Signaling Points(SPs)- Single Transfer Point (STP), - Service Control Point(SCP)- Message Signal Units (MSUs)- SS7 Addressing, ISUP, Performance Requirements for SS7, Sigtran- Sigtran Architecture- SCTP- M3UA Operation- M2UA Operation- M2PA Operation- Interworking SS7 and VoIP Architectures- Interworking Soft switch and SS7- Interworking H.323 and SS7.

TEXT BOOK:

Carrier Grade Voice over IP – Daniel Collins, 2nd ed., TMH.

REFERENCE BOOKS:

1 Understanding Voice over IP Technology – Nicholas Wittenberg – Cengage, 1st Ed., 2010.
2 Voice Over WLANS – The Complete Guide – Michael, F. Finnevan, Elsevier, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

QUEUEING THEORY AND APPLICATIONS

(Core Elective –II**)**

Unit I

Review of probability, Stochastic Processes, random variables, distributions, generating functions; Poisson, Markov, renewal and semi-Markov processes, and Markov Chains, Birth-Death Process

Unit II

Basic Queueing Theory

An Introduction to Queues and Queueing Theory ,Characteristics of queueing systems, M/M/1 queuing system, Littles law, Reversibility and Burke's theorm, Markovian and non-Markovian queueing systems, embedded Markov chain applications to M/G/1, G/M/1 and related queueing systems;

Unit III

Queueing Networks

Fundamentals of Queueing Networks, Networks of queues, Open and Closed Queueing Networks, Open Networks of M/M/m type queues and Jackson's Theorem, MVA and Convolution Algorithm for Closed Networks, Approximate Models for Open and Closed Queueing Networks, Queues with vacations, priority queues, queues with modulated arrival process,

Unit IV

Discrete time queuing Systems-Introduction, Discrete time queuing systems, discrete time arrival process, Geome/Geom/m/N queuing system, Queuing on a Space division packet switch, Queuing on a single buffered banyan network

Unit V

Network traffic Modeling - Introduction, Continuous time models, Discrete time Models Solution methods, Burstiness , self similar traffic

Text books:

1. D. Gross and C. Harris, *Fundamentals of Queueing Theory, 3rd Edition,* Wiley, 1998. (WSE Edition, 2004).
2. . T.G. Robertazzi , Computer Networks and Systems - Queuei ng Theory and PeformanceEvaluaion, Springer 2000.

Reference Books:

1. L. Kleinrock, *Queueing Systems, Vol. 1: Theory,* Wiley, 1975.
2. E. Gelenbe and G. Pujolle, *Introduction to Queueing Networks, 2nd Edition,* Wiley, 1998.
3. J. Medhi, *Stochastic Models in Queueing Theory, 2nd Edition,* Academic Press, 2003. (Elsevier India Edition, 2006).
4. L. Kl ei nrock, Queuei ng Systems Vol ume 1 :Theory, Wi l ey 1975.
5. R. Nelson, *Probability, Stochastic Processes, and Queueing Theory: The Mathematics of Computer Performance Modelling,* Springer, 1995.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

GPS AND APPLICATIONS

(Core Elective –II**)**

UNIT I
INTRODUCTION

Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geoaugmented navigation (GAGAN) architecture.

UNIT II
SIGNAL CHARACTERISTICS

GPS signal components, purpose, properties and power level, signal acquisition and tracking , Navigation information extraction, pseudorange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT III,
GPS RECEIVERS & DATA ERRORS

Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, Methods of multipath mitigation, Ephemeris data errors, clock errors.

UNIT IV
DIFFERENTIAL GPS

Introduction, LADGPS, WADGPS, Wide Area Augmentation systems , GEO Uplink subsystem , GEO downlink systems , Geo Orbit determination , Geometric analysis , covariance analysis , GPS /INS Integration Architectures

UNIT V
GPS APPLICATIONS

GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system.
GPS orbital parameters, description of receiver independent exchange format (RINEX) , Observation data and navigation message data parameters, GPS position determination, least squares method

TEXT BOOKS

1. Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, "*Global positioning systems , Inertial Navigation and Integration*", John Wiley & sons, 2007.
2. *Global* Navigation Satellite *System*, Gottapu Sasibhuhsana Rao , McGraw-Hill Education, 2010.

REFERENCES

1. E.D.Kaplan, Christopher J. Hegarty, "*Understanding GPS Principles and Applications*", Artech House Boston 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

IMAGE AND VIDEO PROCESSING
(OPEN ELECTIVE - I)

UNIT –I:

Fundamentals of Image Processing and Image Transforms: Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

Image Segmentation: Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT –II:

Image Enhancement: Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT –III:

Image Compression: Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, , Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT -IV:

Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT –V:

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

REFRENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International.
3. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4. Multidimentional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5. Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

INTERNETWORKING

(Open Elective –I**)**

UNIT -I:

Internetworking Concepts: Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.

IP Address: Classful Addressing: Introduction, Classful Addressing, Other Issues, Sub-netting and Super-netting

Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router.

ARP and RARP: ARP, ARP Package, RARP.

UNIT -II:

Internet Protocol (IP): Datagram, Fragmentation, Options, Checksum, IP V.6.

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.

Stream Control Transmission Protocol (SCTP): SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.

Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP.

Classical TCP Improvements: Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT -III:

Unicast Routing Protocols (RIP, OSPF, and BGP: Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

Multicasting and Multicast Routing Protocols: Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.

UNIT -IV:

Domain Name System (DNS): Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet.

Remote Login TELNET: Concept, Network Virtual Terminal (NVT).

File Transfer FTP and TFTP: File Transfer Protocol (FTP).

Electronic Mail: SMTP and POP.

Network Management-SNMP: Concept, Management Components, World Wide Web- HTTP Architecture.

UNIT -V:

Multimedia: Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.

TEXT BOOKS:

1. TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2. Internetworking with TCP/IP Comer 6th Edition PHI, Volume -1.

REFERENCE BOOKS:

1. Mobile Communications, Jochen Schiller, 2nd edition, Pearson Education 2003.
2. Data Communications & Networking – B.A. Forouzan – 4nd Edition – TMH
3. High Speed Networks and Internets- William Stallings, Pearson Education, 2002.
4. Data and Computer Communications, William Stallings, 7th Edition., PEI.
5. The Internet and Its Protocols – Adrin Farrel, Elsevier, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

ADVANCED DIGITAL SIGNAL PROCESSING
(OPEN ELECTIVE - I)

UNIT –I:

Review of DFT, FFT, IIR Filters and FIR Filters:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.

UNIT –II:

Applications of Multi Rate Signal Processing: Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

UNIT -III:

Non-Parametric Methods of Power Spectral Estimation: of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT –IV:

Implementation of Digital Filters: Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT –V:

Parametric Methods of Power Spectrum Estimation: Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis & D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

REFERENCE BOOKS:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH.
4. Digital Spectral Analysis – Jr. Marple

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – I Sem. (WMC)

ADVANCED COMMUNICATIONS LAB

Note:

A. Minimum of 10 Experiments have to be conducted
B. All Experiments may be Simulated using MATLAB and to be verified using related training kits.

1. Determination of output of convolutional Encoder for a given sequence
2. Determination of output of convolutional Decoder for a given sequence
3. Efficiency of DS Spread- Spectrum Technique
4. Simulation of Frequency Hopping (FH) Spread- Spectrum
5. Implementation of Matched Filters.
6. Optimum receiver for the AWGN channel.
7. Measurement of effect of Inter Symbol Interference..
8. Simulation of PSK system with M=4
9. Simulation of DPSK system with M=4
10. Design of FSK system
11. BPSK Modulation and Demodulation techniques
12. QPSK Modulation and Demodulation techniques
13. DQPSK Modulation and Demodulation techniques
14. 8-QAM Modulation and Demodulation techniques
15. OFDM Transceiver design
16. Performance evaluation of simulated CDMA system

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech (WIRELESS AND MOBILE COMMUNICATIONS)
COURSE STRUCTURE AND SYLLABUS

I Year – II Semester

Category	Course Title	Int. marks	Ext. marks	L	P	C
Core Course IV	Advanced communications & Networks	25	75	4	--	4
Core Course V	Wireless Communications & Networks	25	75	4	--	4
Core Course VI	Wireless MIMO Communications	25	75	4	--	4
Core Elective III	Optical Communications Technology Wireless LANs and PANs Adhoc and Wireless Sensor Networks	25	75	4	--	4
Core Elective IV	Network Security and Cryptography Software Defined Radio 4G Technologies	25	75	4	--	4
Open Elective II	Embedded system Design Mobile Computing Technologies Scripting Languages	25	75	4	--	4
Laboratory II	Wireless Communications and Networks Lab	25	75	--	4	2
Seminar II	Seminar	50	--	--	4	2
Total Credits				**24**	**8**	**28**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

ADVANCED COMMUNICATIONS AND NETWORKS

UNIT I

Spread Spectrum Communications

Spreading sequences- Properties of Spreading Sequences, Pseudo- noise sequence, Gold sequences, Kasami sequences, Walsh Sequences, Orthogonal Variable Spreading Factor Sequences, Barker Sequence, Complementary Codes

Direct sequence spread spectrum – DS-CDMA Model, Conventional receiver, Rake Receiver, Synchronization in CDMA, Power Control, Soft handoff, Multiuser detection – Optimum multiuser detector, Liner multiuser detection.

UNIT II

Orthogonal Frequency Division Multiplexing

Basic Principles of Orthogonality, Single vs Multicarrier Systems, OFDM Block Diagram and Its Explanation, OFDM Signal Mathematical Representation, Selection parameter for Modulation, Pulse shaping in OFDM Signal and Spectral Efficiency, Window in OFDM Signal and Spectrum, Synchronization in OFDM, Pilot Insert in OFDM Transmission and Channel Estimation, Amplitude Limitations in OFDM, FFT Point Selection Constraints in OFDM, CDMA vs OFDM, Hybrid OFDM.

UNIT III

MIMO Systems

Introduction, Space Diversity and System Based on Space Diversity, Smart Antenna system and MIMO, MIMO Based System Architecture, MIMO Exploits Multipath, Space – Time Processing, Antenna Consideration for MIMO, MIMO Channel Modelling, MIMO Channel Measurement, MIMO Channel Capacity, Cyclic Delay Diversity (CDD), Space Time Coding, Advantages and Applications of MIMO in Present Context, MIMO Applications in 3G Wireless System and Beyond, MIMO-OFDM

UNIT IV

Wireless LANs/IEEE 802.11x: Introduction to IEEE802.11x Technologies, Evolution of wireless LANs, IEEE 802.11 Design Issues, IEEE 802.11 Services, IEEE 802.11 MAC Layer operations, IEEE 802.11 Layer1, IEEE 802.11 a/b/g Higher Rate Standards, Wireless LAN Security, Computing Wireless Technologies, Typical WLAN Hardware

UNIT V

Wireless PANs/IEEE 802.15x: Introduction to IEEE 802.15x Technologies,

Wireless PAN Applications and Architecture, IEEE 802.15.1 Physical Layer Details, Bluetooth Link Controllers Basics, Bluetooth Link Controllers Operational States, IEEE 802.15.1 Protocols and Host Control Interface. Evaluation of IEEE 802.15 Standards

Broad Band Wireless MANs/IEEE 802.16x

Introduction to WMAN/IEEE 802.16x Technology, IEEE 802.16Wireless MANs, IEEE 802.16 MAC Layer Details, IEEE 802.16 Physical Layer Details, IEEE 802.16 Physical Layer Details for 2-11 GHz, IEEE 802.16 Common System Operations.

TEXT BOOKS

1. Introduction to Wireless Telecommunications Systems and Networks – Gary J. Mullett, CENGAGE
2. Wireless Communication-Upena Dalal, Oxford University Press, 2009

REFERENCES

1. Wireless Communication System –Ke-Lin Du & M N S Swamy, Cambridge University Press, 2010
2. Mobile Cellular Communication - Gottapu Sasibhusan Rao, PEARSON

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

WIRELESS COMMUNICATIONS AND NETWORKS

UNIT -I:

The Cellular Concept-System Design Fundamentals: Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:

Mobile Radio Propagation: Large-Scale Path Loss: Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III:

Mobile Radio Propagation: Small –Scale Fading and Multipath: Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:

Equalization and Diversity: Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:

Wireless Networks: Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE.
2. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – Upen Dalal, Oxford Univ. Press.
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

WIRELESS MIMO COMMUNICATIONS

UNIT I :

Fading Channels and Diversity Techniques

Wireless channels – Error/Outage probability over fading channels – Diversity techniques – Channel coding as a means of time diversity – Multiple antennas in wireless communications.

UNIT II

Capacity and Information Rates of MIMO Channels

Capacity and Information rates of noisy, AWGN and fading channels – Capacity of MIMO channels– Capacity of non-coherent MIMO channels – Constrained signaling for MIMO communications.

UNIT III

Space-Time Block and Trellis Codes

Transmit diversity with two antennas: The Alamouti scheme – Orthogonal and Quasi-orthogonal space-time block codes – Linear dispersion codes – Generic space-time trellis codes – Basic space-time code design principles – Representation of space-time trellis codes for PSK constellation – Performance analysis for space-time trellis codes – Comparison of space-time block and trellis codes.

UNIT IV

Concatenated Codes and Iterative Decoding

Development of concatenated codes – Concatenated codes for AWGN and MIMO channels – Turbo coded modulation for MIMO channels – Concatenated space-time block coding.

UNIT V

Space-Time Coding for Frequency Selective Fading Channels

MIMO frequency-selective channels – Capacity and Information rates of MIMO FS fading channels – Space-time coding and Channel detection for MIMO FS channels – MIMO OFDM systems.

TEXT BOOKS

1. Tolga M. Duman and Ali Ghrayeb, *"Coding for MIMO Communication systems",* John Wiley & Sons, West Sussex, England, 2007.
2. A.B. Gershman and N.D. Sidiropoulus, *"Space-time processing for MIMO communications",* Wiley, Hoboken, NJ, USA, 2005.

REFERENCES

1. E.G. Larsson and P. Stoica, *"Space-time block coding for Wireless communications",* Cambridge University Press, 2003.
2. M. Janakiraman, *"Space-time codes and MIMO systems"*, Artech House, 2004.
3. H. Jafarkhani, *"Space-time coding: Theory & Practice"*, Cambridge University Press, 2005.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

OPTICAL COMMUNICATIONS TECHNOLOGY

(Core Elective –III**)**

UNIT –I:

Signal Propagation in Optical Fibers: Geometrical Optics approach and Wave Theory approach, Loss and Bandwidth, Chromatic Dispersion, Non Linear effects- Stimulated Brillouin and Stimulated Raman Scattering, Propagation in a Non-Linear Medium, Self Phase Modulation and Cross Phase Modulation, Four Wave Mixing, Principle of Solitons.

UNIT –II:

Fiber Optic Components for Communication & Networking: Couplers, Isolators and Circulators, Multiplexers, Bragg Gratings, Fabry-Perot Filters, Mach Zender Interferometers, Arrayed Waveguide Grating, Tunable Filters, High Channel Count Multiplexer Architectures, Optical Amplifiers, Direct and External Modulation Transmitters, Pump Sources for Amplifiers, Optical Switches and Wavelength Converters.

UNIT –III:

Modulation and Demodulation: Signal formats for Modulation, Subcarrier Modulation and Multiplexing, Optical Modulations – Duobinary, Single Side Band and Multilevel Schemes, Ideal and Practical receivers for Demodulation, Bit Error Rates, Timing Recovery and Equalization, Reed-Solomon Codes for Error Detection and Correction.

UNIT -IV:

Transmission System Engineering: System Model, Power Penalty in Transmitter and Receiver, Optical Amplifiers, Crosstalk and Reduction of Crosstalk, Cascaded Filters, Dispersion Limitations and Compensation Techniques.

UNIT –V:

Fiber Non-linearities and System Design Considerations: Limitation in High Speed and WDM Systems due to Non-linearities in Fibers, Wavelength Stabilization against Temperature Variations, Overall System Design considerations – Fiber Dispersion, Modulation, Non-Linear Effects, Wavelengths, All Optical Networks.

TEXT BOOKS:

1. Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2nd Ed., 2004, Elsevier Morgan Kaufmann Publishers.
2. Optical Fiber Communications – Gerd Keiser, 3rd Ed., 2000, McGraw Hill.

REFERENCE BOOKS:

1. Optical Fiber Communications: Principles and Practice – John.M.Senior, 2nd Ed., 2000, PE.
2. Fiber Optics Communication – Harold Kolimbris, 2nd Ed., 2004, PEI
3. Optical Networks: Third Generation Transport Systems – Uyless Black, 2nd Ed., 2009, PEI.
4. Optical Fiber Communications – Govind Agarwal, 2nd Ed., 2004, TMH.
5. Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

WIRELESS LANS AND PANS

(Core Elective –III**)**

UNIT –I:

Wireless System & Random Access Protocols: Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems, The Wireless Spectrum; Random Access Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).

UNIT –II:

Wireless LANs: Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology

UNIT –III:

The IEEE 802.11 Standard for Wireless LANs: Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol

UNIT –IV:

Wireless PANs: Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatternet formation.

UNIT –V:

The IEEE 802.15 working Group for WPANs: The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks - Carlos de Morais Cordeiro and Dharma Prakash Agrawal, World Scientific, 2011.
2. Wireless Communications and Networking - Vijay K.Garg, Morgan Kaufmann Publishers, 2009.

REFERENCE BOOKS

1. Wireless Networks - Kaveh Pahlaram, Prashant Krishnamurthy, PHI, 2002.
2. Wireless Communication- Marks Ciampor, Jeorge Olenewa, Cengage Learning, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

ADHOC AND WIRELESS SENSOR NETWORKS

(Core Elective –III**)**

UNIT –I:

Wireless Local Area Networks

Introduction, wireless LAN Topologies, Wireless LAN Requirements,

Physical Layer- Infrared Physical Layer, Microwave based Physical Layer Alternatives, Medium Access Control Layer- HIPERLAN 1 Sublayer, IEEE 802.11 MAC Sublayer and Latest Developments-802.11a, 802.11b, 802.11g

Personal Area Networks: Introduction to PAN technology and Applications, Bluetooth - specifications, Radio Channel, Piconets and Scatternets, Inquiry, Paging and Link Establishment, Packet Format, Link Types, Power Management, Security, Home RF -Physical and MAC Layer

UNIT -II:

Ad-Hoc Wireless Networks: Introduction; Cellular and Ad-Hoc Wireless Networks; Issues in Ad-Hoc Wireless Networks: Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Quality of Service Provisioning, Energy Management, Scalability

UNIT -III:

Medium Access Control Protocols: Introduction; Issues in Designing a MAC protocol: Bandwidth efficiency, Quality of Service support, Synchronization, Hidden and exposed terminal problems, Error prone shared broadcast channel, mobility nodes; Design goals of a MAC protocol; Classification of MAC protocols; Contention-based protocols: MACAW, Floor acquisition multiple access protocol, Busy tone multiple access protocols, MACA by invitation, Media access with reduced handshake; Contention-based protocols with reservation mechanisms; Contention-based MAC protocols with scheduling mechanisms; MAC protocols that use directional antennas

UNIT -IV:

Routing and Transport Layer Protocols: Introduction, issues in designing a routing protocol, Classification of routing protocols, Table-driven protocols, On-demand routing protocols, Hybrid routing protocols, Routing with efficient flooding mechanisms, Hierarchical routing protocols, Power-aware routing protocols; Introduction to transport layer protocols, design issues and goals of transport layer protocol, Classification of transport layer solutions

UNIT -V:

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data gathering, MAC protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network

TEXT BOOKS:

1. Ad Hoc Wireless Networks - C. Siva Ram Murthy, 2004, Pearson Education.
2. Wireless Networks -P Nicopolitidis and M S Obaidat, Wiley India Edition 2003.

REFERENCE BOOKS:

1. Ad-Hoc Mobile Wireless Networks: Protocols and Systems - C.K. Toh, 1st Edn, Pearson Education.
2. Ad Hoc and Sensor Networks - Carlos de Morais Cordeiro and Dharma Prakash Agrawal, 2011, World Scientific.
3. Wireless Sensor Networks - Kazen Sohraby, Daniel Minoli, Taieb Znati, 1991, Wiley Student Edition
4. Wireless Sensor Networks - C.S. Raghavendra, Krishna M. SivaLingam, 2004, Springer.
5. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

NETWORK SECURITY AND CRYPTOGRAPHY

(Core Elective –IV**)**

UNIT -I:

Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security.

Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.

UNIT -II:

Encryption Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers.

Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT -III:

Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT -IV:

Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

Authentication Applications: Kerberos, X.509 directory Authentication service.

Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT –V:

IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) - William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security - Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World - Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security - Whitman, Thomson.
4. Network Security: The complete reference - Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography - Buchmann, Springer.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

SOFTWARE DEFINED RADIO

(Core Elective –IV**)**

UNIT -I:

Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II:

Profile and Radio Resource Management : Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile , Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure, XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Classmarks, Dynamic Classmarks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

UNIT -III:

Radio Resource Management in Heterogeneous Networks : Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks, Measuring Gain in the Upper Bound Due to JRRM, Circuit-Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

UNIT -IV:

Reconfiguration of the Network Elements : Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks, Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimised Reconfiguration, Optimisation Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

UNIT -V:

Object – Oriented Representation of Radios and Network Resources: Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.

Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY 2003
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger, Kambiz Madani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Enginering – Joseph Mitola, III, 2000, John Wiley & Sons.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

4G TECHNOLOGIES

(Core Elective –IV**)**

UNIT I:

2G and 3G technology

Second Generation (2G) - Overview, Enhancements over 1G Systems, Integration with Existing 1G Systems, GSM, IS-136 System Description, IS-95 System Description, iDEN (Integrated Dispatch Enhanced Network), CDPD

Third Generation (3G)- Overview, Introduction, Universal Mobile Telecommunications Service (UMTS), UMTS Services, The UMTS Air Interface, Overview of the 3GPP Release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5 All-IP Network Architecture, Overview CDMA2000, Commonality Between, DMA/CDMA2000/CDM

UNIT II:

The Evolution Generation (2.5G)

What Is 2.5G?,Enhancements over 2G, Technology Platforms, General Packet Radio Service, (GPRS), Enhanced Data Rates for Global Evolution (EDGE),High-Speed Circuit Switched Data (HSCSD), CDMA2000 (1XRTT), WAP, Migration Path from 2G to 2.5G to 3G,

UNIT III:

OFDM

Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

UNIT IV:

UWB:

UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train.

UNIT V:

4G Cellular technology

4G evolution, objectives of the projected 4G, advantages of 4G network technology over 3G, applications of 4G, 4G technologies, Smart antenna techniques, 4G software, New technologies in cellular data networks.

TEXT BOOKS:

1. 3G Wireless Networks, 2nd ed., Clint Smith, P.E , Daniel Collins
2. Mobile Cellular Communication, Gottapu Sasibhuhsana Rao, PEARSON, 2013

REFERENCE BOOKS:

1. 3G Networks Architecture, Protocols and Procedures, Sumith Kaseara, Nishit Narang
2. Wireless Networking complete by Zheng ISBN 9789351071563, First Indian reprint 2014., Elsevier publication
3. Towards 4G Technologies: Services with Initiative by Hendrik Berndt John Wiley & Sons
4. Advanced Wireless Networks: 4G Technologies By Savo G. Glisic John Wiley & Sons

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

EMBEDDED SYSTEM DESIGN
(Open Elective -II)

UNIT -I:

Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:

Typical Embedded System:

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:

Embedded Firmware:

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:

RTOS Based Embedded System Design:

Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOK:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech – I Year – II Sem. (WMC)

MOBILE COMPUTING TECHNOLOGIES
(Open Elective –II)

UNIT –I:

Introduction to Mobile Computing Architecture: Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.

UNIT –II:

Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G: Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – Is-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

UNIT –III:

Wireless Application Protocol (WAP) and Wireless LAN: WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN

Intelligent Networks and Interworking : Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signaling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN

UNIT –IV:

Client Programming, Palm OS, Symbian OS, Win CE Architecture: Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture

J2ME: JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages

UNIT –V:

Voice Over Internet Protocol and Convergence: Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP

Security Issues in Mobile Computing: Introduction – Information Security – Security Techniques and Algorithms – Security Protocols – Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment

TEXT BOOKS:

1. Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2. Mobile Communications – Jochen Schiller – 2nd Edition – Pearson Education

REFERENCE BOOKS:

1. The CDMA 2000 System for Mobile Communications – Vieri Vaughi, Alexander Damn Jaonvic – Pearson
2. Adalestein : Fundamentals of Mobile & Parvasive Computing, 2008, TMH

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M. Tech – I Year – II Sem. (WMC)

SCRIPTING LANGUAGES
(Open Elective II)

UNIT -I:

Introduction to Scripts and Scripting:

Characteristics and uses of scripting languages, Introduction to PERL, Names and values, Variables and assignment, Scalar expressions, Control structures, Built-in functions, Collections of Data, Working with arrays, Lists and hashes, Simple input and output, Strings, Patterns and regular expressions, Subroutines, Scripts with arguments.

UNIT -II:

Advanced PERL:

Finer points of Looping, Subroutines, Using Pack and Unpack, Working with files, Navigating the file system, Type globs, Eval, References, Data structures, Packages, Libraries and modules, Objects, Objects and modules in action, Tied variables, Interfacing to the operating systems, Security issues.

UNIT -III:

TCL:

The TCL phenomena, Philosophy, Structure, Syntax, Parser, Variables and data in TCL, Control flow, Data structures, Simple input/output, Procedures, Working with Strings, Patterns, Files and Pipes, Example code.

UNIT -IV:

Advanced TCL:

The eval, source, exec and up-level commands, Libraries and packages, Namespaces, Trapping errors, Event-driven programs, Making applications 'Internet-aware', 'Nuts-and-bolts' internet programming, Security issues, running untrusted code, The C interface.

UNIT -V:

TK and JavaScript:

Visual tool kits, Fundamental concepts of TK, TK by example, Events and bindings, Geometry managers, PERL-TK.

JavaScript – Object models, Design Philosophy, Versions of JavaScript, The Java Script core language, Basic concepts of Pythan.

Object Oriented Programming Concepts (Qualitative Concepts Only): Objects, Classes, Encapsulation, Data Hierarchy.

TEXT BOOKS:

1. The World of Scripting Languages- David Barron, Wiley Student Edition, 2010.
2. Practical Programming in Tcl and Tk - Brent Welch, Ken Jones and Jeff Hobbs., Fourth edition.
3. Java the Complete Reference - Herbert Schildt, 7th Edition, TMH.

REFERENCE BOOKS:

1. Tcl/Tk: A Developer's Guide- Clif Flynt, 2003, Morgan Kaufmann SerieS.
2. Tcl and the Tk Toolkit- John Ousterhout, 2nd Edition, 2009, Kindel Edition.
3. Tcl 8.5 Network Programming book- Wojciech Kocjan and Piotr Beltowski, Packt Publishing.
4. Tcl/Tk 8.5 Programming Cookbook- Bert Wheeler

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M. Tech – I Year – II Sem. (WMC)

WIRELESS COMMUNICATIONS AND NETWORKS LAB

Note:

A. Minimum of 10 Experiments have to be conducted
B. All the Experiments may be Conducted using Network Simulation software like NS-2/ NSG-2.1/ WireSHARK/ SDR etc..

Note: For Experiments 1 to 7 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Evaluate the performance of various LAN Topologies
2. Evaluate the performance of Drop Tail and RED queue management schemes
3. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
4. Evaluate the performance of TCP and UDP Protocols
5. Evaluate the performance of TCP, New Reno and Vegas
6. Evaluate the performance of AODV, DSR and DSDV routing protocols
7. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
8. Capturing and Analysis of TCP and IP Packets
9. Simulation and Analysis of ICMP and IGMP Packets
10. Analyze the Protocols SCTP , ARP, NetBIOS, IPX VINES
11. Analysis of HTTP ,DNS and DHCP Protocols
12. Analysis of OFDM Spectrum
13. Analysis CDMA Downlink