JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. TECH. IN WIRELESS AND MOBILE COMMUNICATIONS.
EFFECTIVE FROM ACADEMIC YEAR 2017- 18 ADMITTED BATCH

COURSE STRUCTURE AND SYLLABUS

I Semester

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-1	Wireless Communications & Networks	25	75	4	0	0	4
PC-2	Random Processes and Time Series Analysis	25	75	4	0	0	4
PC-3	Advanced Data Communications	25	75	4	0	0	4
PE-1	Detection and Estimation Theory Radio Navigational Aids Coding Theory and Techniques	25	75	**3**	0	0	3
PE-2	Voice over Internet Protocol Queuing Theory and Applications TCP/IP Internetworking	25	75	**3**	0	0	3
OE-1	***Open Elective – I**	25	75	3	0	0	3
Laboratory I	Wireless Communications and Networks Lab	25	75	0	0	3	2
Seminar I	Seminar - I	100	0	0	0	3	2
	Total	**275**	**525**	**21**	**0**	**6**	**25**

II Semester

Category	Course Title	Int. marks	Ext. marks	L	T	P	C
PC-4	Advanced Communication Systems	25	75	4	0	0	4
PC-5	Spread Spectrum Communications	25	75	4	0	0	4
PC-6	Adhoc Wireless Networks	25	75	4	0	0	4
PE-3	Optical Communications and Networks Wireless LANs and PANs Wireless Sensor Networks	25	75	**3**	0	0	3
PE4	Network Security and Cryptography Software Defined Radio 3G Networks	25	75	**3**	0	0	3
OE-2	***Open Elective – II**	25	75	3	0	0	3
Laboratory II	Advanced Communications Lab	25	75	0	0	3	2
Seminar II	Seminar - II	100	0	0	0	3	2
	Total	**275**	**525**	**21**	**0**	**6**	**25**

III Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Technical Paper Writing	100	0	0	3	0	2
Comprehensive Viva-Voce	0	100	0	0	0	4
Project work Review II	100	0	0	0	22	8
Total	**200**	**100**	**0**	**3**	**22**	**14**

IV Semester

Course Title	Int. marks	Ext. marks	L	T	P	C
Project work Review III	100	0	0	0	24	8
Project Evaluation (Viva-Voce)	0	100	0	0	0	16
Total	**100**	**100**	**0**	**0**	**24**	**24**

*Open Elective subjects must be chosen from the list of open electives offered by OTHER departments.

 # For Project review I, please refer 7.10 in R17 Academic Regulations.

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M. TECH. I YEAR II SEMESTER WIRELESS AND MOBILE COMMUNICATIONS

ADVANCED COMMUNICATION SYSTEMS (PC - 4)

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
SONET/SDH: Architecture, SONET Layers, SONET Frames, STS Multiplexing, SONET Networks, Virtual Tributaries.
ATM: Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control, Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols.

UNIT - V
ATM Traffic and congestion Control: Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation, ATM Service Categories, Traffic and Congestion Control Framework, Traffic Control, Congestion Control

TEXT BOOKS:
1. Gary J. Mullett, "Introduction to Wireless Telecommunications Systems and Networks", CENGAGE
2. Upena Dalal, "Wireless Communication", Oxford University Press, 2009
3. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM" Prentice Hall, 4th edition

REFERENCE BOOKS:
1. Ke-Lin Du & M N S Swamy, "Wireless Communication System", Cambridge University Press, 2010
2. Behrouz A Forouzan, "Data Communications and Networking", 4th Edition, McGraw Hill.
3. Gottapu Sasibhusan Rao, "Mobile Cellular Communication", PEARSON

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SPREAD SPECTRUM COMMUNICATIONS (PC - 5)

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.

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ADHOC WIRELESS NETWORKS (PC - 6)

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
MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT - III
Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT – IV
Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – V
Quality of Service in Ad Hoc Wireless Networks: Introduction, Real Time Traffic Support in Ad Hoc Wireless Networks, QoS Parameters in Ad Hoc Wireless Network, Issues and Challenges in providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions: MAC Layer Solutions, Cluster TDMA, IEEE 802.11e, DBASE, Network Layer Solutions, QoS Routing Protocols, Ticket Based QoS Routing Protocol, Predictive Location Based QoS routing protocol, Trigger Based Distributed QoS Routing Protocol, QoS enabled AODV Routing Protocol, Bandwidth QoS Routing Protocol, On Demand QoS Routing Protocol, On Demand Link-State Multipath QoS Routing Protocol, Asynchronous Slot Allocation Strategies. QoS Frameworks for Ad Hoc Wireless Networks.

TEXT BOOKS:
1. C. Siva Ram Murthy and B.S.Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", 2004, PHI.
2. P Nicopolitidis and M S Obaidat, "Wireless Networks", Wiley India Edition 2003.

REFERENCE BOOKS:
1. Roy Blake, "Wireless Communication Technology", CENGAGE, 2012
2. Jagannathan Sarangapani, "Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control" CRC Press.

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OPTICAL COMMUNICATIONS AND NETWORKS (PE - 3)

UNIT - I
Optical Fibers: Structures, waveguiding and Fabrication: Nature of Light, Basic optical laws and definitions, Single mode fibers, Graded index fiber structure, Attenuation, Signal Dispersion in fibers.
Optical Sources- LEDs, Laser Diodes, Line Coding.

UNIT - II
Photodetectors: Photo detector Noise, Detector Response Time, Avalanche Multiplication Noise.
Optical Receiver Operation: Fundamental receiver operation, Digital receiver performance, Eye diagrams.
WDM Concepts and Components: Passive optical Couplers, Isolators and Circulators

UNIT - III
Digital Links: Point to point links, power penalties, error control, Coherent detection, Differential Quadrature Phase Shift Keying.
Analog Links: Carrier to noise ration, Multichannel Transmission Techniques, RF over Fiber, Radio over fiber links, Microwave Photonics.

UNIT - IV
Optical Networks: Network Concepts, Network Topologies, SONET/SDH, High speed lightwave links, Optical add/ Drop Multiplexing, Optical Switching, WDM Network, Passive Optical Networks, IP Over DWDM, Optical Ethernet, Mitigation of Transmission Impairments

UNIT - V
Performance Measurement and Monitoring: Measurement standards, Basic Test Equipment, Optical power measurement, Optical fiber characterization, Eye diagram tests, optical time domain reflectometer, optical performance monitoring, and optical fiber system performance measurements.

TEXTBOOK:
1. Gerd Keiser, "Optical Fiber Communications", 5th Edition, Mc Graw Hill.

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WIRELESS LANS AND PANS (PE - 3)

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

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

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WIRELESS SENSOR NETWORKS (PE - 3)

UNIT - I
Introduction: Components of a wireless sensor node, Motivation for a Network of Wireless Sensor Nodes, Classification of sensor networks, Characteristics of wireless sensor networks, Challenges of wireless sensor networks, Comparison between wireless sensor networks and wireless mesh networks, Limitations in wireless sensor networks, Design challenges, Hardware architecture, Applications : Structural Health Monitoring, Traffic Control, Health Care, .Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining
Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes. **Operating Systems:** Functional Aspects, Nonfunctional Aspects, Prototypes, Evaluation

UNIT - II
Basic Architectural Framework: Physical Layer, Basic Components, Source Encoding, Channel Encoding, Modulation
Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols

UNIT - III
Network Layer: Routing Metrics, Flooding and Gossiping, Data-Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols
Node and Network Management: Power Management, Local Power Management aspects, Dynamic Power Management, Conceptual Architecture

UNIT - IV
Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in Wireless Sensor Networks, Basics of Time Synchronization, Time Synchronization Protocols
Localization: Ranging Techniques, Range-Based Localization, Range-Free Localization, Event-Driven Localization

UNIT - V
Security: Fundamentals of Network Security, Challenges of Security in Wireless Sensor Networks , Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and Zig Bee Security

TEXT BOOKS:
1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley 2010
2. Mohammad S. Obaidat, Sudip Misra, "Principles of Wireless Sensor Networks", Cambridge, 2014

REFERENCE BOOKS:
1. Ian F. Akyildiz, Mehmet Can Vuran , "Wireless Sensor Networks", Wiley 2010
2. C S Raghavendra, K M Sivalingam, Taieb Znati, "Wireless Sensor Networks", Springer, 2010
3. C. Sivarm murthy & B.S. Manoj, "Adhoc Wireless Networks", PHI-2004
4. FEI HU., XIAOJUN CAO, "Wireless Sensor Networks", CRC Press, 2013
5. Feng ZHAO, Leonidas GUIBAS, " Wireless Sensor Networks", ELSEVIER , 2004

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NETWORK SECURITY AND CRYPTOGRAPHY (PE - 4)

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, Block Cipher Design Principles.

UNIT - II
Encryption Algorithms: Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block cifers.
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 Cryptograpy.
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.
Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.
Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT – V
IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, 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. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education.
2. William Stallings, "Network Security Essentials -Applications and Standards", Pearson Education.

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

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SOFTWARE DEFINED RADIO (PE - 4)

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

REFERENCE BOOKS:

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

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3G NETWORKS (PE - 4)

UNIT - I
GSM Fundamentals: General Architecture, Mobility Management, GSM Air Interface, Timing Advance, Initial Connection Procedure, Protocols and Signaling, GSM and Signaling Systems.
General Packet Radio Service: General Architecture, GPRS Network Elements, Network Interfaces, GPRS Air Interface, GPRS Protocols.

UNIT - II
Introduction: Second Generation Mobile Networks, 2.5 Generation Mobile Networks, International Mobile, Third Generation Partnership Program (3GPP)
Principles of WCDMA: Requirements for 3rd Generation Air Interface, Schemes for Radio Access, WCDMA Overview, Spreading and De-Spreading, Scrambling, Rake Receiver

UNIT - III
UMTS Network Architecture: Basic Structure of UMTS Network, Access Stratum and Non-access Stratum, Hierarchical Network Organization, Addresses and Identifiers, Service Aspects, Service Classification, Quality of Service (QoS) Architecture, UMTS QoS Classes.
User Equipment: Components of User Equipment, Interfaces of User Equipment, UE Functions, UE Protocols, Classification of UE.
Access Network: Access Network Entities, Network Interfaces, Radio Interface Protocol Architecture, UTRAN Protocol Architecture, Functions.

UNIT - IV
Core Network: Entities Common to CS and PS Domain, Entities Specific to CS Domain, Entities Specific to the PS Domain, Service Specific Entities of the Core Network, CS Domain Protocol Architecture, PS Domain Protocol Architecture, Core Network Functions.

UNIT - V
IP Applications for GPRS/UMTS : IP Protocol Suite Overview, IP Routing, TCP and Congestion Control, TCP Optimization for the Air, IP for GPRS and UMTS R99, IP based QoS for UMTS Networks.

TEXT BOOKS:
1. Jeffrey Bannister, Paul Mather, Sebastian Coope, "Convergence Technologies for 3G Networks-IP, UMTS, EGPRS and ATM", John Wiley & Sons.
2. Procedures Sumith Kaseara, Nishit Narang, "3G Networks Architecture, Protocols", Tata McGraw Hill

REFERENCE BOOKS:
1. Clint Smith, Daniel Collins, "3G wireless Networks", McGraw-Hill-2002.
2. Zheng, "Wireless Networking", complete by   ISBN 9789351071563, First Indian reprint 2014., Elsevier publication
3. Hendrik Berndt, "Towards 4G Technologies: Services with Initiative", John Wiley & Sons
4. Savo G. Glisic, "Advanced Wireless Networks: 4G Technologies", John Wiley & Sons

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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