GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. EC (Wireless Communication Technology) w.e.f. (28/2/2012)

PROPOSED TEACHING SCHEME (SEMESTER-II)

SUBJECT CODE	Subject	Teaching Scheme(Hours)			Credits
		Theory	Tutorial	Practical	
1720001	Principle of management	3	0	0	3
1722702	Adhoc Networks	4	0	2	5
1724401	High performance Communication Network	4	2	0	5
	Major Elective-II	3	2	0	4
	Major Elective-III	3	0	2	4
	Interdisciplinary subject-II	3	0	2	4
Total		**20**	**4**	**6**	**25**

Major Elective - II	
SUBJECT CODE	**Major Elective- II**
1722704	Global Positioning System
1724402	Recent trends in Wireless Communication
1722703	Radio Network planning and optimization

Major Elective - III	
SUBJECT CODE	**Major Elective- III**
1710413	RF microelectronics
1710411	RF and Microwave Engineering

Inter Disciplinary Elective - II	
SUBJECT CODE	**Inter Disciplinary Elective- II**
1710410	Introduction to Artificial Intelligence

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Wireless Communications Technology (EC)

M.E. Semester: II

Subject Code : **1722702**
Subject Name: **Ad hoc Networks**

Sr. No.	Course Content
1.	**FUNDAMENTALS:** Introduction – Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio Propagation Mechanisms – Characteristics of the Wireless Channel – IEEE 802.11a–b Standard – Origin of Ad hoc Packet Radio Networks – Technical Challenges – Architecture of PRNETs – Components of Packet Radios – Ad hoc Wireless Networks – What is an Ad Hoc Network Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless
2.	**AD HOC ROUTING PROTOCOLS :** Introduction – Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table–Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) – Source–Initiated On–Demand Approaches – Ad hoc On–Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) –Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) – Location–Aided Routing (LAR) – Power–Aware Routing (PAR) – Zone Routing Protocol (ZRP).
3.	**MULTICASTROUTING IN ADHOC NETWORKS:** Introduction – Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols – Classifications of Multicast Routing Protocols – Tree–Based Multicast Routing Protocols– Mesh–Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy–Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols
4.	**TRANSPORT LAYER– SECURITY 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 Protocols for Ad hoc Wireless Networks – Security in Ad Hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Key Management – Secure Routing in Ad hoc Wireless

5.	**QoS AND ENERGY MANAGEMENT:** Introduction – Issues and Challenges in Providing QoS in Ad hoc Wireless Networks – Classifications of QoS Solutions – MAC Layer Solutions – Network Layer Solutions – QoS Frameworks for Ad hoc Wireless Networks Energy Management in Ad hoc Wireless Networks – Introduction – Need for Energy Management in Ad hoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes – System Power
6.	Wireless Sensor Networks-Introduction. Sensor Network Architecture.

Text Book:

1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, PTR, 2004.

Reference Books:

1. C. K. Toh, "Ad Hoc Mobile Wireless Networks Protocols and Systems", Prentice Hall, PTR, 2001.
2. Charles E. Perkins, "Ad Hoc Networking", Addison Wesley, 2000

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Wireless Communications Technology (EC)
M.E. Semester: II

Subject code: 1724401

Subject Name**: High Performance Communication Networks**

Sr No	Subject Content
1.	**BASICS OF NETWORKS** Telephone, computer, Cable television and Wireless network, networking principles, Digitalization, Service integration, network services and layered architecture, traffic characterization and QOS, network services: network elements and network mechanisms
2.	**BASICS OF NETWORKS** Telephone, computer, Cable television and Wireless network, networking principles, Digitalization, Service integration, network services and layered architecture, traffic characterization and QOS, network services: network elements and network mechanisms
3.	**PACKET SWITCHED NETWORKS** OSI and IP models: Ethernet (IEEE 802.3); token ring (IEEE 802.5), FDDI, DQDB, frame relay, SMDS; Internet working with SMDS
4.	**INTERNET AND TCP/IP NETWORKS** Overview; internet protocol; TCP and UDP; performance of TCP/IP networks, circuit switched networks: SONET; DWDM, Fiber to home, DSL, Intelligent networks, CATV.
5.	**ATM AND WIRELESS NETWORKS** Main features-addressing, signaling and routing; ATM head restructure-adaptation layer, management and control; BISDN; Inter working with ATM ,Wireless channel, link level design, channel access; Network design and wireless networks
6.	**CONTROL OF NETWORKS:** Mathematical Background, Markov chains, Circuit-switched networks, Datagram networks and ATM networks
7.	**OPTICAL NETWORKS AND SWITCHING** Optical links- WDM systems, cross-connects, optical LAN's, optical paths and networks; TDS and SDS: modular switch designs-Packet switching, distributed, shared, input and output buffers
8.	**TOWARD A GLOBAL MULTIMEDIA NETWORK** Attributes of the Global network, Technology area and Challenges

References:

1. Jean walrand and Pravin Varaiya, " High Performance Communication Networks ", 2nd Edition, Harcourt and Morgan Kauffman, London, 2000.
2. Leon Gracia, Widjaja, " Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Sumit Kasera, Pankaj Sethi, " ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
4. Behrouz.a. Forouzan, " Data Communication and Networking ", Tata McGraw-Hill, New Delhi, 2000.

GUJARAT TECHNOLOGICAL UNIVERSITY

Wireless Communications Technology (EC)

M.E. Semester: II

Subject Code: **1722704**

Subject Name**: Global Positioning System (Major Elective - II)**

Sr. No.	Course Content
1.	**Introduction to GPS:** history, objectives, applications for 3D positioning; GPS reference system WGS84; basic principles of GPS operations: ranging from space; GPS constellation: its evolution and present state
2.	**Space, control and user segments;** GPS orbit, fundamentals of orbital dynamics; precise vs. predicted orbit; fundamental and derived frequencies, GPS time and clock characteristics; GPS satellite navigation message; GPS receiver: single vs. dual frequency receivers; navigation vs. geodetic quality; antenna types; primary equipment and software products
3.	**Basic types of GPS observable:** Pseudoranges (P-code, C/A-code), L1 and L2 phases; pseudoranging with minimum constellation of four satellites; over-determined case; concept of dilution of precision (PDOP, HDOP, VDOP etc.); point positioning and differential mode; velocity determination with Doppler observable
4.	**Differential processing of carrier phase measurements:** Single, double and triple differences; indifference mode; phase ambiguity and cycle slips
5.	**GPS error sources and error handling procedures:** Ionospheric and tropospheric effects, clock and orbital errors, multipath, anti-spoofing (AS) and selective availability (SA), inter-channel bias, antenna phase center drift, etc; interference and jamming; using dual frequency signal to eliminate ionosphere errors
6.	GPS applications

Reference Books:

1. GPS: Theory and Practice, B. Hofmann-Wellenhof, H. Lichtenegger and J.Collins, 5th Revised Edition, Springer, Wien, New York, 2001.
2. Understanding GPS: principles and applications - By Elliott D. Kaplan, Christopher J. Hegarty
3. Global Positioning System, Signals, Measurements and Performance, P. Misra and P. Enge, Ganga-Jamuna Press, 2001.
4. GPS: Theory and Applications, B. Parkinson, J. Spilker, Jr. (Eds), Vol. I & II, AIAA, Washington, 1996.
5. GPS Satellite Surveying, A. Leick, 2nd edition, John Wiley & Sons, 1995.
6. GPS for Geodesy, A. Kleusberg and P. Teunnisen (Eds), Springer-Verlag, 1996.
7. GPS – Guochang Xu, Springer

GUJARAT TECHNOLOGICAL UNIVERSITY

Wireless Communications Technology (EC)

M.E. Semester: II

Subject Code**: 1724402**

Subject Name**: Recent trends in Wireless Communication (Major Elective II)**

Course content
Recent upcoming technology in area of modern wireless communications are covered in subject.

Reference Books:

1. IEEE wireless Communication Magazine/conference/Journal papers.

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Wireless Communications Technology (EC)

M.E. Semester: II

Subject Code: **1722703**

Subject Name: **Radio Network Planning and Optimization (Major Elective II)**

Sr. No.	Course Content
1.	Introduction to Radio Network Planning and Optimization - Future Trends - Towards a Service driven Network Management - Wireless Local Area Networks (WLANs) - Next-generation Mobile Communication
2.	WCDMA Radio Network Planning: Dimensioning - Detailed Planning - Verification of Dimensioning with Static Simulations - Verification of Static Simulator with Dynamic Simulations - Optimization of the Radio Network Plan.
3.	WCDMA–GSM Co-planning Issues - Radio Frequency Issues - Radio Network Planning Issues; Coverage and Capacity Enhancement Methods - Techniques for Improving Coverage - Techniques for Improving Capacity .
4.	Radio Resource Utilization: Introduction to Radio Resource Management - Power Control - Handover Control - Congestion Control - Resource Management; RRU for High-speed Downlink Packet Access (HSDPA) - Impact of Radio Resource Utilization on Network Performance.
5.	Radio Network Optimization Process - Introduction to Radio Network Optimization Requirements - Introduction to the Telecom Management Network Model - Tools in Optimization; Advanced Analysis Methods and Radio Access Network Auto tuning - Advanced Analysis Methods for Cellular Networks - Automatic Optimization.

Reference Books:

1. "Radio Network Planning and Optimisation", Edited by Jaana Laiho, Achim Wacker & Tomas Novosad, John Wiley, 2006.
2. Morten Tolstrup, "Indoor Radio Planning: A Practical Guide for GSM, DCS, UMTS and HSPA", John Wiley, 2008.
3. Iana Siomina, "Radio Network Planning and Resource Optimization", Printed by LiUTryck, Link¨oping, Sweden, 2007.

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Wireless Communications Technology (EC)

M.E. Semester: II

Subject Code: **1710413**

Subject Name: **RF Microelectronics (Major Elective III)**

Sr _No	Subject Content
1.	Introduction to RF and Wireless Technology: Complexity, design and applications. Choice of Technology. Basic concepts in RF Design: Nonlinearly and Time Variance, inter symbol nterference, random processes and Noise.
2.	BJT and MOSFET behavior at RF frequencies Modeling of the transistors and SPICE models.
3.	Noise performance and limitation of devices, Integrated Parasitic elements at high frequencies and their monolithic implementation.
4.	Basic blocks in RF systems and their VLSI implementation : Low noise Amplifier design in various technologies, Design of Mixers at GHz frequency range, Various Mixers: their working and implementation, Oscillators : Basic topologies VCO and definition of phase noise.
5.	Noise-Power trade-off. Resonator less VCO design, Quadrature and single sideband generators, Radio Frequency Synthesizes: PLLS, Various RF synthesizer architectures and frequency dividers, Power Amplifiers design, Liberalization techniques, Design issues in integrated RF filters.

Reference Books:

1. B.Razavi, RF Microelectronics, Prentice-Hall PTR.
2. T.H.Lee, The Design of CMOS Radio Frequency Integrated Circuits, Cambridge University Press
3. R.Jacob Baker,H.W.Li and D.E.Boyce, CMOS Circuit Design, Lay out and Simulation,Prentice-Hall
4. of India
5. Y.P.Tsividis, Mixed Analog and Digital VLSI Devices and Technology, McGraw Hill
6. B.Razavi, Design of Analog CMOS Integrated Circuits, Tata Mc-Graw Hill.

GUJARAT TECHNOLOGICAL UNIVERSITY

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M.E. Semester: II

Subject Code: **1710411**

Subject Name: **RF and Microwave Engineering (Major Elective III)**

Sr_No	Subject Content
1.	**INTRODUCTION** Conceptual understanding of wave propagation in the guided media such as transmission lines, rectangular and circular waveguides; Various characteristics and parameters suchas wave velocity, dispersion, mismatch effects; voltage - current - field distributions. Poynting Power / Vectors Theorem and Uniqueness Theorems, Maxwell time varying equations, Smith chart applications to RF and Microwave Engineering,
2.	**RF and MICROWAVE ANALYSIS** Impedance and Admittance Matrix, Hybrid matrix, Scattering matrix, ABCD Matrix, Discontinuities and Modal analysis, Signal flow graph representation, Various excitation and coupling methods to the waveguides
3.	**MICROWAVE COMPONENTS** Understanding the in-depth principle, working, analysis and design of ferromagnetic: Passive components such as microwave resonators, power dividers and couplers, filters and impedance transformers – Chebyshev, Binomial and Tapered. Ferromagnetic components such as isolators, phase shifters, circulators.
4.	**MICROWAVE DEVICES AND CIRCUITS** Conceptual understanding the principle, working and applications of microwave circuits and active devices such as: Mixers, Detectors, Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Amplifiers, Oscillators and Synthesizers.

Reference Books:

1. Pozar D M, Microwave Engineering, Wiley
2. Mishra Ravindra, RF and Microwave Communication, Wiley
3. Gupta K C, Microwaves, New Age International Publn
4. Collin R E, Foundations for Microwave Engineering, McGrawHill International
5. M. Golio & J. Golio, RF and microwave Technologies:Vol I,II,III,CRC Press