GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (WIRELESS COMMUNICATION TECHNOLOGY) (44)
WIRELESS COMMUNICATION THEORY
SUBJECT CODE: 2714401
SEMESTER: I

Type of course: Core

Prerequisite: Concept of signals and systems, Fourier Transformations, concept of spectrum and bandwidth, the concepts of various antennas and electromagnetic wave propagation theories, the fundamentals of various Analog and Digital Communication systems, the concepts of various error detecting and correcting coding

Rationale: ME students of EC [WCT] Engineering need to have good understanding of the fundamentals and application of Wireless Communication networks and Mobile Communications. For these they also need to have the good knowledge of Cellular System Design with the detailed knowledge of currently existing 2G, 2.5G, 3G Cellular technologies in market (like GSM, EDGE, GPRS, CDMA etc..)

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
4	2#	2	6	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Evolution of Wireless Communication Systems:** Brief History of Wireless Communications, Advantages and Disadvantage of Wireless Communications, Wireless Network Generations, Comparison of Wireless Systems, Evolution to Next Generation Networks	2	5
2	**Principles of Cellular Communication:** Cellular Terminology, Cell Structure and Cluster, Frequency Reuse Concept, Cluster Size and System Capacity, Method of Locating Co-channel Cells, Frequency Reuse Distance, Co-channel Interference and Signal Quality, Co-channel Interference Reduction Methods	7	15
3	**Frequency Management and Channel Assignment** Frequency Management, Channel Assignment Strategies, Fixed Channel Assignment, Dynamic Channel Assignment, Hybrid Channel Assignment	6	12
4	**Cellular System Design Trade-offs:** System Parameters to Increase Cell Coverage, System Parameters to Reduce Interference, Methods to Increase Traffic Capacity, Cell Splitting, Sectoring Hand Off Mechanisms	7	15
5	**Multiple Access Techniques:**	4	10

	Introduction, Frequency Division Multiple Access, Time Division Multiple Access, Spread Spectrum Multiple Access, Space Division Multiple Access, Hybrid Multiple Access Techniques, Comparison of Multiple-Access Techniques, Packet Radio Multiple Access Techniques, Multicarrier Multiple Access Schemes		
6	**Wireless Communication System:** Paging and Messaging Systems, Cordless Telephone Systems, Wireless Local Loop, LMDS, Cellular Telephone System, Advance Mobile Phone Service (AMPS), US Digital Cellular Systems (IS-54/136), Personal Digital Cellular (PDC)	4	10
7	**Personal Communication Systems:** Global System for Mobile (GSM), CDMA Digital Cellular Standards (IS 95), Comparison of CDMA with GSM	4	10
8	**3G Digital Cellular Technology:** 2.5G TDMA Evolution Path, GPRS Technology, EDGE Technology, 2.5G CDMA One Cellular Technology, Need of 3G Cellular Networks, The IMT-2000 Global Standards, UMTS Technology, W-CDMA Air Interface, CDMA2000 Cellular Technology	8	15
9	**Emerging Wireless Network Technologies:** IEEE 802.11 WLAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMAN Technology, Mobile Ad-hoc Networks (MANETs), Mobile IP and Mobility Management, Security Aspects in Wireless Networks	3	8

Reference Books:
1. Wireless Communication, Tata McGraw Hill Education, T L Singal
2. Wireless Communication Principle and Practice, Second Edition, T. S. Rappaport. PHI Pub.
3. Fundamentals Of Wireless Communication, First Edition, David Tse, Cambridge University Press India Pvt Ltd

Course Outcome:
1. Understand the concept of frequency reuse.
2. Understand the practical approach for design of wireless system with various propagation models
3. Understand the improvement of performance due to diversity.
4. Learn various multiple access techniques e.g. CDMA, TDMA and FDMA coding techniques

List of Experiments:

Based on syllabus

Open Ended Problems:

1. MATLAB implementation of digital modulation techniques e.g. QPSK, OQPSK, GMSK etc.
2. MATLAB implementation of forward channel and reverse channel for mobile communication.
3. MATLAB implementation of Rake Receiver

Major Equipments : Matlab

Learning website:www.nptel.ac.in