



Course Title: WIRELESS COMMUNICATIONS (PRINCIPLES AND PRACTICES)

Course Level:PG

Course Code: CSIT613

Credit Units: 3

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	-	-	-	3

Course Objectives: The objective of the course is

- Introduce the students with the various “Next Generation Technologies” in the area of wireless
- Define infrastructure requirements for GSM, CDMA, 3GPP, 4G
- Assist students to understand how base station communicates, and what are the various test and other environmental issues
- Deliver the practical and theoretical concepts of Design, Implementation, Research and Invention of Wireless Communication System
- Improve learning of many emerging wireless standards and networks

Pre-requisites: Data Communication & Computer Networks

Course Contents/Syllabus:

	Weightage (%)
Module I: Introduction to Cellular Mobile Systems	20
1G, 2.5G & 3G Systems. Networks & Services particularly Data Transport Services, Status of GSM & CDMA based Cellular networks in India. Architecture & Services Derived from them (Tele/Bearer & supplementary services)	
Wireless Networks: PAN, LAN, WAN, MAN; IEEE standards for each category and its Applications; Comparison of Conventional Wireless Communication System and Space Based Wireless Communication systems	
Frequency Spectrum as a Resource : Use of Frequency Spectrum in Early Mobile Systems (Non Cellular), Need to Reuse Frequency in Cellular Systems, Channel Assignment Strategies, Various Hand off Strategies (Hard , Soft Handoff & Seamless Hand-off), Interference & System Capacity, Co – channel interference & System Capacity, Adjacent Channel Interference, Power Control for Reducing Interference, Trunking & Grade Of Service(GOS) in Cellular Networks.	
Module II: Modulation Techniques for Mobile Radio Communication	20

Linear Modulation Techniques, Binary Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), Constant Envelope Modulation, Binary Frequency Shift Keying, Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK), Spread Spectrum Modulation Techniques, Pseudo - Noise (PN) Sequences, Direct Sequence Spread Spectrum (DS-SS), Frequency Hopped Spread Spectrum (FH-SS)	
Module III : Multiple Access techniques for wireless Communication	20
Fading, Propagation Effects with mobile radio, Doppler Effect, Rayleigh Fading, Rician Fading, Path Loss Models Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access / Code Division Multiple Access (CDMA), Space Division Multiple Access (SDMA)	
Module IV Mobile Propagation and Antennas	20
Point to Point Model, Propagation over Terrains, Power Requirement of Antennas, Smart Antennas, Antennas at Cell Site, Gain and Pattern – relationship mobile antennas, Tilting Effect, Parasite Elements Usage, Diversity Techniques. Packet Radio Protocols, Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access Protocols (CSMA)	
Module V Wireless technologies	20
Descriptors/Topics Cellular Digital Packet Data (CDPD), Data Services derived from 2G(GSM/CDMA-one), 2.5G (GPRS/CDMA-2000) & 3G (UMTS/CDMA 1XEV) Systems Digital European Cordless Telephone (DECT) based WLL Systems, DECT Architecture, Data Services derived from DECT Systems Multipoint Multichannel Distribution Service (MMDS), Local Multichannel Distribution System (LMDS)	

Student Learning Outcomes: The student will be able to:

- Explain the concept of the principles, algorithms and technologies used in transmission information in wireless mobile channels
- Apply the concept of hand-off of voice calls between the cells
- Plan and design Cellular Networks
- Derive expressions for error performance and capacity for various transmission schemes
- Analyze the performance of various technologies such as GSM, GPRS, CDMA, W-CDMA, DECT, Satellite Based Cellular Communication, UMTS, LMDS, MMDS.
- Apply research findings on increasing the channel efficiency

Pedagogy for Course Delivery:

The method of the course delivery will be lecture – based, assisted by power point presentations. The effectiveness of the course will be enhanced by promoting High Order Thinking questions on the various modules. Each student would be given a project on the various topic and asked to present an enhanced model based on the current trends in wireless communication in the market.

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100	NIL	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	ATTN	CT	Project	Viva	
Weightage (%)	05	10	10	05	70

Text & References:

Text:

- Yi-Bing Lin & Imrich Chlamtac, Wireless and Mobile Networks Architectures, John Wiley & Sons, 2001.
- Raj Pandya, Mobile and Personal Communication systems and services, Prentice Hall of India, 2001.
- Rapport Theodore, S. ,Wireless Communications: Principles and Practices, 2nd edition, 2010

References:

- Mark Ciampa, Guide to Designing and Implementing wireless LANs, Thomson learning, Vikas Publishing House, 2001.
- Ray Rischpater, Wireless Web Development, Springer Publishing, 2000.
- Sandeep Singhal, The Wireless Application Protocol, Pearson Education Asia, 2000.
- P. Stavronlakis, Third Generation Mobile Telecommunication systems, Springer Publishers, 2001.

Journals:

- Eurasip Journal on Wireless Communications and Networking
- IEEE Transactions on Wireless Communications