WIRELESS COMMUNICATION AND NETWORKS

VI Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC524	ELECTIVE	3	-	-	3	30	70	100
Contact Classes: 45	**Tutorial Classes: -**	**Practical Classes: Nil**				**Total Classes: 45**		

OBJECTIVES:

The will try to learn:

I The basic concepts of frequency reuse, handoff, multipath channels and multiple access techniques used in wireless communication systems.

II The concept of fading mechanism, types of equalizers and diversity techniques

III The wireless network standards together with network protocols.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1 Illustrate the concept of cell structure, frequency reuse and handoff mechanism to increase the number of users within the system.

CO 2 Demonstrate the channel capacity and co-channel interference of cellular communication system for improving the design parameters.

CO 3 Compare the basic propagation mechanisms for understanding the behaviour of radio waves propagation.

CO 4 Apply the channel path loss models for fading behaviour with the function of distance and frequency.

CO 5 Examine the parameters of mobile multipath channels for mean excess delay, rms delay spread and excess delay spread.

CO 6 Analyze the multiple access schemes and techniques used in wireless communication to provide multiple users over a single channel.

CO 7 Summarize the process of equalization carried out in mobile devices for reduced distortion of received signals.

CO 8 Extend the need for diversity schemes to the enhancement of reliability signals received from communication channels.

CO 9 Classify the wireless local area networks for the user device to communicate with the network.

CO 10 Demonstrate the wireless networking standards and protocols for wireless transmission approved by IEEE.

MODULE-I	THE CELLULAR CONCEPT SYSTEM DESIGN FUNDAMENTALS	Classes: 10

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.

MODULE-II	MOBILE RADIO PROPAGATION	Classes: 09

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) mode; 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 modelling

MODULE-III	CELLULAR SYSTEM DESIGN FUNDAMENTALS	Classes: 08

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 model for flat fading, spectral shape due to Doppler spread in Clarke model, simulation of Clarke and Gans Fading model, level crossing and fading statistics, two-ray Rayleigh fading model.

MODULE-IV	EQUALIZATION AND DIVERSITY	Classes: 08

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.

MODULE-V	WIRELESS NETWORKS	Classes: 10

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, comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, wireless PANs, Hipper LAN, WLL.

Text Books:

1. Theodore .S. Rapport, ―Wireless Communications‖, Pearson Education, 2 nd Edition, 2010.
2. Upen Dalal, "Wireless communication", oxford University press, 2010.
3. Kaveh Pahlvan, Prashant Krishnamurthy, "Principle of wireless networks", A United Approach‖, Pearson Education, 2004.
4. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.

Reference Books:

1. P.Nicopolitidis, M.S. Obaidat, G.I.Papadimitria, A.S. Pomportsis,"Wireless Networks" John Wiley & sons, 1st Edition, 2003.
2. Vijay K Garg,"Wireless Communications and Networks", Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indian Reprint).
3. Mark Ciampa Jorge Olenewa, "wireless communication and Networking", IE, 2009.
4. X.Wang, H.V.Poor ,Wireless communication system, Pearson 2nd Education, 2004.
5. Jochen Schiller,"Mobile Communication", Pearson Education, 2nd Edition, 2003.

Web References:

1. http://keshi.ubiwna.org/2017IoTCOMM/Wireless_Communications_&_Networking_Stallings_2nd.
2. https://www.google.com/wirelesscommunicationnetwork.
3. https://www3.nd.edu/~mhaenggi/ee598q/books/stallings_jagadish.pdf

E-Text Books:
1. https://www.oreilly.com/library/view/wireless-communications-principles/0130422320/ 2. https://groups.google.com/forum/#!topic/kluecm2010-2014/7Q5gRhqh51g.