

EC404: Wireless Communications

Details of course:-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Wireless Communications	3	0	2	Signals and System, Communication System

Course Objective: To introduce the basic concepts and significance of wireless communication. The mathematical foundations of wireless communication systems include channel modeling and capacity analysis.

Course Outcomes:

- CO1: Acquire knowledge about the basics of wireless communication
- CO2: Explain cellular mobile system architecture, fundamentals, and associated concepts
- CO3: Analyze the evolution of different cellular systems
- CO4: Explain various wireless technologies and their applications.
- CO5: Gain knowledge of emerging wireless technologies such as IoT, SDR, and cognitive radio

S. No.	Content	Contact Hours
Unit 1	Introduction to different types of wireless communication, the difference between wired and wireless communication, fundamentals of cellular systems, different generations and standards in cellular communication systems, satellite communication, multiple access schemes (FDMA TDMA, CDMA, SDMA), spectrum Allocation for various Wireless services, challenges of wireless communication-fading, interference, Shanon Channel Capacity, diversity architectures.	6
Unit 2	Mobile Radio Multipath Propogation, Statistical characterisation of Multipath Channel, Delay Spread, Doppler Spread, Free Space Path Loss Model, Outdoor Propogation Model, Indoor Propogation Model, Fading Models- Rayleigh, Rician, Nakagami, Composite Fading – shadowing Distributions, Link power budget Analysis for wired and wireless system,	10

	Ray Tracing.	
Unit 3	Capacity of AWGN Channel, Capacity of Flat Fading Channel-Channel Distribution Information Known, Channel Side Information at Receiver, Channel Side Information at Transmitter and Receiver, Optimal Water Filling Power Allocation, Capacity with receiver diversity, Capacity of Frequency Selective Channel	8
Unit 4	Receiver Diversity- Selection Combining, Maximal Ratio Combining, Equal Gain Combining, Transmit Diversity- Alamouti Scheme, OFDM, MIMO Channels: Physical modeling, Slow and fast fading channels, Capacity, Multiplexing architectures: V-BLAST and D-BLAST. Introduction to Software Defined Radio, UWB Radio, Wireless Adhoc Network, Cognitive Radio, Green Communication, Optical and Wireless Communication, Long Term Evolution, Internet of Things	8
Unit 5	Cellular System Fundamentals: Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies, Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio for Minimum Cochannel and adjacent interference, Handoff Strategies, Umbrella Cell, Trunking and Grade of Service, Cell splitting, Cell sectorization, Repeaters, Microcell Zone. GSM-Architecture, Channel Types, GSM Call Flow, GSM Frame Structure, CDMA- Concept of spread spectrum, Architecture of IS-95 CDMA system, CDMA forward channels, CDMA reverse channels, Power control in CDMA, Capacity of CDMA System, RAKE Receiver	10
Total		42

Books:-

S. No	Name of Books/Authors/Publisher
1	Communication Systems/Simon Haykin/John Wiley, Fourth Edition
2	Fundamentals of wireless communication/David Tse/Cambridge University Press, 2012
3	Wireless Communication/Andrea Goldsmith/Cambridge University Press, 2011
4	Wireless Communications/Andreas.F. Molisch/John Wiley – India, 2006
5	Wireless Communications: Principles and Practice/Theodore S. Rappaport/Cambridge University Press/2024