Introduction to Wireless and Cellular Communications

Programme: Ph. D. (ECE) Course : Elective Course Credits : 4
Sem: Odd Year: 1st Hours: 60

Course Context and Overview (100 words):

This course is focused to provide an in-depth understanding of the wireless channel and the related impairments (multipath, fading), small-scale and large-scale propagation effects, understanding of the design of cellular systems, detailed discussion of Multiple Access (TDMA/CDMA/OFDM), antenna diversity, MIMO, wireless channel capacity, exposure to current and emerging wireless and cellular systems.

Prerequisite : Analog and Digital Communications, Digital Signal Processing.

Course Outcomes (COs):

On completion of this course, the students will have the ability to:
CO1 Understand the basics overview of cellular system and evolution 2G/3G/4G/5G.
CO2 Understand basic cellular terminology, system design and capacity.
CO3 To understand the concept of multipath fading environment, BER performance in fading channels.
CO4 Understanding the antenna diversity, wireless channel capacity and optimum power allocation.
CO5 An understanding of the technologies such as CDMA, MIMO, OFDM in emerging wireless systems.

Course Topics:

UNIT – I Overview of cellular systems, Cellular concepts- Frequency reuse, Cochannel and Adjacent channel interference, C/I, Handoff, Blocking, Erlang capacity	10
UNIT – II Wireless Propagation - Link budget, Free-space path loss, Noise figure of receiver, Multipath fading, Shadowing, Fading margin, Shadowing margin	10
UNIT- III Antenna diversity, Wireless channel capacity, BER in fading channel, Coherent and Differential detection, WSSUS channel model	15
Unit- IV Diversity and Capacity, MIMO, Optimum power Allocation, Properties of Spreading Sequence, CDMA, Rake receiver for multipath channels	15
UNIT – V Large scale propagation effects and channel Models	10

Reference Books :

1. T. S. Rappaport, “Wireless Communications – Principles and Practice” (2nd edition) Pearson, 2010, ISBN 9788131731864
2. D. Tse and P. Viswanath, "Fundamentals of Wireless Communications," Cambridge Univ Press, 2005
3. A.K Jagannatham, “Principles of Modern Wireless Communication Systems,” McGraw Hill, 2016.

Evaluation Methods:

Item	Weightage
Assignment/Quiz	10%
Mid term score	35%
Final exam score	55%

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