3/4 B.Tech - SIXTH SEMESTER

EC6T5 Cellular and Mobile Communications Credits: 4

Lecture : 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks** -------
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Course Objectives:

- To understand the underlying principles of cellular mobile radio for voice, data and video;
- To use the theoretical and technical content of previous modules to assess the limitations and possibilities of mobile communications;
- To perform basic radio channel modelling;
- To understand the basic features of cellular-mobile communication systems and digital radio: FDMA, TDMA, CDMA
- To appreciate future developments and design requirements (e.g. 4-G systems).

Learning Outcomes:

At the end of this course, the students will be aware of

- The principles of working of various analog & digital cellular radio systems for mobile communication & their design aspects.
- The architecture & principles of their working & various multiple access schemes in digital cellular networks.

UNIT- I

Cellular mobile radio systems : Introduction to Cellular Mobile System, Performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, , planning of cellular system Analog and Digital Cellular systems.

UNIT -II

Elements of cellular radio system design : General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT- III

Cell coverage for signal and traffic : Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

UNIT-IV

Interference : Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, non-co-channel interference-different types.

UNIT-V

Cell site and mobile antennas : Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

UNIT -VI

Frequency management and channel assignment : Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT-VII

Handoff And Dropped Calls : Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

UNIT -VIII

Digital cellular networks : GSM architecture, GSM channels**,**

Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

Learning Resources

Text Books:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edition 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

References:

1. Wireless Communications, Theodore. S. Rapport, Pearson education, 2rd Edition., 2002.
2. Wireless and Mobile Communications, Lee McGraw Hills, 3rd Edition, 2006.
3. Wireless Communication and Networking, Jon W. Mark and Weihua Zhqung, PHI, 2005.
4. Wireless Communication Technology , R. Blake, Thompson Asia Pvt. Ltd., 2004.