

4/4 B.Tech – SEVENTH SEMESTER

EC7T3

Cellular and Mobile Communications

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Prerequisites: Antennas and Wave Propagation (EC5T4)

Course Objectives:

- To enable the student to synthesis and analyze wireless and mobile cellular communication systems over a stochastic fading channel
- To provide the student with an understanding of advanced multiple access techniques
- To provide the student with an understanding of diversity reception techniques
- To give the student an understanding of digital cellular systems (GSM, CDMA)

Learning Outcomes:

Student will be able to

- Develop a cellular system using frequency reuse concept with minimum interferences
- Implement best frequency management and channel allocation schemes to improve the trunking efficiency
- Design the cellular base station for the desired specifications
- Deploy GSM system for mobile communications

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

UNIT- II

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, general formula for mobile propagation over water and flat open area, antenna height gain, form of a point to point model.

Small-Scale Fading and Multipath: Small-Scale Multipath Propagation, Types of Small-Scale Fading, Statistical Models for Multipath Fading Channels, Diversity techniques.

UNIT – III

Interference: Co-Channel Interference, Measurement of co-channel interference, Non-co-channel interference – Different types.

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 -IV

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

Handoff and Dropped Calls: Handoff, Dropped calls, Types of handoff, Handoff invitation, Delaying handoff, Forced handoff, Mobile assigned handoff. Intersystem handoff, Cell splitting, Micro cells,

UNIT -V

Global System For Mobile (GSM): GSM Services and features, GSM System architecture, GSM radio subsystem, GSM Channel types, GSM Traffic channels, GSM Control channels, Examples of GSM call, Frame structure for GSM, Signal processing in GSM.

Learning Resources

Text Books:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edition 1995.

References:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.
2. Wireless Digital Communications - Kamilo Feher, PHI, 2003.
3. Wireless Communications, Theodore. S. Rappoport, Pearson education, 2rd Edition, 2002.

Web Resources:

1. <http://nptel.iitm.ac.in/syllabus/117103016/>
2. <http://nptel.iitm.ac.in/video.php?courseId=1036>
3. <http://rechargesvec.blogspot.in/2011/09/cellular-and-mobile-communications-cmc.html>