

Semester VII
Cellular & Mobile Communications

CourseCode	23EC3701	Year	IV	Semester	I
Course Category	PC	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	1. Analog Communications 2. Digital Communications 3. Antenna Fundamentals
ContinuousInternal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Interpret the cellular system design and the technical challenges involved.	L2
CO2	Analyze mobile system methodologies and specifications to improve cellular capacity.	L4
CO3	Apply propagation theories to analyze the behavior of signals in different communication environments.	L3
CO4	Analyze the principles of GSM architecture, channels, 4G and 5G technologies, MIMO systems, and OFDM-based broadband wireless communication techniques.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1:Low)													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2				1					1	2	
CO2	3	3	1	2	1	1					1	3	
CO3	3	3	2	2	1	1					1	3	
CO4	3	3	2	2	1	1				1	1	3	
Avg	3	3	2	2	1	1				1	1	3	

Syllabus		
UnitNo.	Contents	Mapped CO
1	Cellular Systems: Limitations of Conventional System, Basic Cellular Mobile System, First, second, third and fourth Generation cellular wireless systems. Uniqueness of Mobile Radio Environment –Fading, coherence bandwidth, Doppler Spread. Operation of Cellular System, Fundamentals of cellular Radio System Design: Concept of frequency reuse channels, Trunking and Grade of service	CO1
2	Co-Channel & Non-Co-Channel Interference: Co-channel Interference Reduction Factor, desired C/I from a normal case in an Omni directional Antenna system, Handoff Mechanism, Cell splitting, Consideration of the components of cellular systems. Design of a Directional Antenna system, Antenna parameters and their effects, diversity techniques: Space Diversity, Polarization diversity and Selection diversity. Non-co channel interference -adjacent channel interference, Near End Far	CO1,CO2

	End interference, effect on coverage and interference by applying power decrease, antenna height decrease.	
3	Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels, channel assignments to cell sites-fixed & mobile, channel sharing and borrowing, sectorization, overlaid cells. 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 or flat open area, antenna height gain from a point-to-point model.	CO2,CO3
4	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. Handoffs: Handoff Initiation, types of handoffs, delaying handoff, advantages of Handoff, power difference handoff, forced handoff, mobile assisted and soft handoffs. Intersystem handoffs, dropped call rates.	CO1,CO3
5	Digital Cellular Networks and Multiple Access Schemes: GSM architecture, GSM channels, 4G evolution, Advantages & Limitations of 4G, Introduction to 5G. Introduction to MIMO systems. Principles of OFDM based broadband wireless systems.	CO4

Learning Resources

Text Books

1. W.C.Y. Lee, Mobile Cellular Telecommunications, Tata McGraw Hill, 2nd Ed., 2006
2. Theodore. S. Rappoport, Wireless Communications, Pearson education, 2nd Ed., 2002.

Reference Books

1. Gordon L. Stuber, Principles of Mobile Communications, Springer International 2nd Ed., 2001.
2. Simon Haykin Michael Moher, Modern Wireless Communication, Persons Education, 2005.
3. Asrar U.H. Sheikh, Wireless Communication theory and Techniques, Springer, 2004.
4. A. Goldsmith, Wireless Communications, Cambridge Univ Press, 2005
5. D. Tse and P. Viswanath, Fundamentals of Wireless Communications, Cambridge Univ Press, 2005

e- Resources & other digital material

1. <https://nptel.ac.in/courses/106/106/1061061067/>
2. <https://nptel.ac.in/courses/117104099/>