Detailed Syllabus

Course Code	17M15EC114	Semester Summer	Semester Summer Session 2021 - 2022 Month from: June 2021 – July 2021
Course Name	ECE DESIGN AND SIMULATION LAB -2		
Credits	1	Contact Hours	
Faculty (Names)	Coordinator(s)	Dr Amit Kumar Goyal	
	Teacher(s) (Alphabetically)	Dr Amit Kumar Goyal	

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Understand and Analyze the path loss exponent for wireless communication.	Analyzing (IV)
CO2	Design an efficient communication system having adequate signal strength for base station.	Applying (Level III)
CO3	Analyze the frequency reuse and handover probability for a given wireless communication system.	Applying (Level III)
CO4	Simulate the various performance metrics of the wireless communication system.	Analyzing (IV)

Module No.	Title of the Module	List of Experiments	CO
1	Introduction to Modelling of Wireless Channel	1. To understand the path loss prediction formula and Calculation of received signal strength as a function of distance of separation, antenna height and carrier frequency. **To understand the impact of :-** a) Transmitter Power, b) Path loss exponent, c) Carrier frequency, d) Receiver antenna height, e) Transmitter antenna height.	CO1
		2. Calculation of path loss exponent and variance of shadow fading.	CO1

2	Wireless Communication System Optimization	3. To find the 3dB beam-width of a base station antenna. (a) To study the horizontal beam pattern of the Base Station antenna and calculate the beamwidth for horizontal beam pattern (b) To study the vertical beam pattern of the Base Station antenna and calculate the beamwidth for vertical beam pattern	CO2
		4. To calculate the probability that the received signal level crosses a certain sensitivity level.	CO2
		5. To understand the concept of co-channel interference and hence Signal to Interference and Noise Ratio**. A. Downlink:** To calculate & plot SINR vs. distance at the Mobile Station for adaptation of the following parameters, (a) Shadowing effect, (b) Vertical Beam Pattern, **B. Uplink:** To calculate & plot SINR vs. distance at the base stations for different distance of two mobile stations from the base stations and different separation between them for adaptation of the following parameters, (a) Shadowing effect, (b) Vertical Beam Pattern,	CO2
		6. Understanding the impact of many different parameters influence the downlink C/I ratio. (a) Cell radios, (b) Tx power of B.S, (c) Frequency reuse, (d) Sectoring, (e) Shadowing effect, (f) B.S. height, (g) Path loss exponent, (h) Vertical beam tilt	CO2
3	Capacity Improvement Techniques	7. To understand the cellular frequency reuse concept fulfilling the following objectives: (a) Finding the co-channel cells for a particular cell. (b) Finding the cell clusters within certain geographic area**.**	CO3
		8. To study the effect of handover threshold and margin on SINR and call drop probability and handover probability	CO3

4	Analysis of various performance metrics of the wireless communication systems.	9. To study the outage probability, LCR & ADF in SISO for Selection Combining and MRC.	CO4
		10. To study the effect of delay spread on frequency selectivity.	CO4

Project Based Learning: ECE DESIGN AND SIMULATION LAB -2 is a lab course designed for integrated students. The course provides a thorough knowledge about various aspects of wireless communications system (WCS). This includes understanding and analysing the impact of various performance parameters on a designed WCS. Thus, students are provided a wide scope to do their projects in different modules of the course. The projects can be taken towards designing an efficient WCS. This includes optimization of various parameters like receiving and transmitting antenna height, transmitting power, estimating handoff probability to avoid call drop and to study outage probability, LCR & ADF in SISO for Selection Combining and MRC.

Evaluation Criteria

Components	Maximum Marks
Mid Viva	20
End Viva	20
TA	60
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	T. Rappaport, "Wireless Communication" prentice-hall, 2002.
2.	Gerd Keiser, Optical Fiber Communications, 3rd Edition, McGraw-Hill International edition, 2000.
3	John M. Senior, Optical Fiber Communications, 2nd Edition, PHI, 2002.
4.	D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber Optic Communications, Pearson Education, 2005.
5.	Journal articles i.e. IEEE, Springer, IOPscience, Elsevier and Video lectures from nanohub, NPTEL, MIT video lectures
6.	http://fcmcvlab.iitkgp.ac.in/ http://vlabs.iitkgp.ernet.in/fcmc/#