

Programme: B.Tech CCE	Course Title: Wireless Communication Lab	Course Code: CCE-
Type of Course: Core	Prerequisites: Analog & Digital Communication	Total Contact Hours: 42
Year/Semester: 3rd/Odd	Lecture Hrs/Week: 0	Tutorial Hrs/Week: 0
	Practical Hrs/Week: 3	Credits: 1.5

Learning Objectives and Overview:

The objective of this course is to equip students with a comprehensive understanding of wireless communication systems with hands-on experience on wireless channel modeling, large-scale fading, and statistical fading models, key technologies through simulations in MATLAB. They will learn about wireless channel capacity, performance evaluation using BER, and diversity techniques to combat fading in wireless channel. Students will gain practical experience implementing **MIMO systems**, **Zero-Forcing (ZF)**, and **MMSE detection** techniques, as well as exploring multi-carrier modulation like **OFDM**. Lab sessions will enhance practical expertise, allowing students to apply these cutting-edge technologies in real-world wireless communication scenarios

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO1	Simulation of wireless systems.	4
CO2	Analyze time and frequency domain characteristics of wireless fading channels.	4
CO3	Analyze diversity techniques in wireless communication systems	4
CO4	Understand and analyze the key technologies of wireless communication system	4
CO5	Analyze multi-carrier modulation with a focus on OFDM	4

Course Topics	Hours	
UNIT – I (Introduction to Wireless Systems)	3	CO1
Lab 1: Model and simulate the wireless channel.	3	
UNIT – II Wireless Channel Models	12	CO2
Lab 2: Large-scale fading effects: Path loss, Shadowing and hata-okumara model	3	
Lab 3: 2-Ray reflection model.	3	
Lab 4: Scattering function, power delay profile, and Doppler spectrum.	3	
Lab 5: Rayleigh and Rician fading: Coherence time and bandwidth.	3	

UNIT – III (Diversity Analysis in Wireless Communication Systems)	12	CO3
Lab 6: Capacity of a wireless channel using the water-filling algorithm.	3	
Lab 7: Modulation schemes in SIMO/MISO.	3	
Lab 8: Receive diversity	3	
Lab 9: Alamouti diversity scheme	3	
UNIT-IV Wireless Communication Systems Standards (1G/2G/3G/4G/5GB)	6	CO4
Lab 10: MIMO system’s capacity analysis.	3	
Lab 11: Detection techniques of MIMO system.	3	
UNIT-V Multi-carrier Modulation (OFDM)	3	CO5
Lab 12: OFDM transmission and reception on AWGN channel and frequency selective Rayleigh fading channel	3	
MATLAB Based Project Assignments	6	

Textbook References:

Text Book:

1. Cho, Yong Soo, Jaekwon Kim, Won Y. Yang, and Chung G. Kang. *MIMO-OFDM wireless communications with MATLAB*. John Wiley & Sons, 2010.
2. Viswanathan, Mathuranathan. *Wireless Communication Systems in MATLAB*. 2020.

Reference books:

Leis, John W. *Communication systems principles using MATLAB*. John Wiley & Sons, 2018.

Evaluation Method		
Item	Weightage (%)	Associated CO
In-lab Evaluation	48%	CO1, CO2, CO3, CO4, CO5
Lab Quiz	10%	CO1, CO2, CO3, CO4, CO5
Project/Assignments	12%	CO1, CO2, CO3, CO4, CO5
End Term Exam	30%	CO1, CO2, CO3, CO4, CO5

*Please note, as per the existing institute's attendance policy the student should have a minimum of 75% attendance. Students who fail to attend a minimum of 75% lectures will be debarred from the End Term/Final/Comprehensive examination.

CO and PO Correlation Matrix (B. Tech. (CCE))

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		2					2			2	3	1	
CO2	3	3		2					2			1	3	1	
CO3	3	3		2					2			1	3	1	
CO4	3	3		2					2			1	3	1	
CO5	3	3		2	2				2			1	3	1	
CO6	3	3		2	2				2			1	3	1	

Last Updated On: 15th May 2025

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Approved By: