

Course Type	Course Code	Name of the Course	L	T	P	Credits
DP	NECC515	5G Communication Systems Lab	0	0	3	1.5

Course Objective

To understand 5G communication techniques and understand their principles.

Learning Outcomes

Upon successful completion of the lab, students will:

- be able to simulate advanced modulation techniques
- be able to implement OFDM system
- be able to implement MIMO OFDM system

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Simulations of QAM and GMSK modulations	6	Acquire knowledge on advanced modulation techniques
2	Simulation of OFDM transmitter	3	Acquire knowledge on OFDM transmitter
3	Simulation of OFDM linear receiver with perfect channel state information	3	Acquire knowledge on OFDM receiver
4	Simulation of Pilot-aided channel estimator for OFDM	3	Acquire knowledge on OFDM channel estimation
5	Simulation of Transmit diversity using Alamouti coding	3	Acquire knowledge on transmit diversity for space-time coding
6	Simulation of Receive diversity using MRC	3	Acquire knowledge of receive diversity for space-time coding
7	Implementation of 2X2 MIMO system	3	Acquire skills on implementation of a MIMO system
8	Simulation of ZF and MMSE equalizer for MIMO	3	Acquire understanding of equalizers for MIMO
9	Simulation of MIMO OFDM transmitter	3	Acquire understanding of MIMO-OFDM transmitter
10	Simulation of MIMO OFDM linear receiver	3	Acquire understanding of MIMO-OFDM linear receiver
11	Simulation of MIMO OFDM Channel Estimation	3	Acquire understanding of MIMO-OFDM channel estimation
12	Implementation of 5G waveform technique using SDR setup	6	Acquire skills on implementation of 5G waveform techniques over hardware
Total		42	

Text Books:

1. Tse, David and Viswanath, Pramod, *Fundamentals of Wireless Communication*, Cambridge University Press, 2005.
2. Goldsmith, Andrea, *Wireless Communications*. Cambridge University Press, 2005.

Reference Book:

1. Rappaport, Theodore S., *Wireless Communications*. Pearson, 2010.