

Course Type	Course Code	Name of the Course	L	T	P	Credits
DP	NECC517	<b>Modelling and Simulation Lab-I</b>	0	0	3	1.5

Course Objective
To understand simulation and modelling mathematical principles behind communication systems.
Learning Outcomes
Upon successful completion of the lab, students will: <ul style="list-style-type: none"> <li>• be able to simulate common probability distributions and stochastic processes used in communication</li> <li>• be able to simulate numerical methods for root finding, differentiation and integration</li> <li>• be able to simulate convex sets and functions</li> <li>• be able to learn linear algebraic tools used in communication</li> </ul>

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Simulations of distributions and evaluating data statistics	6	Understanding probability distributions and statistical properties of data
2	Experiments on stochastic processes and sequence of random variables and random vectors	9	Understanding stochastic processes, random vectors
3	Simulations on limit laws and Monte-Carlo method	6	Understanding limit laws and Monte-Carlo method of simulation
4	Implementation of numerical methods for root finding, differentiation and integration	6	Understanding numerical methods for mathematical operations
5	Experiments on Convex sets and functions	3	Understanding convexity
6	Experiments on numerical methods for Matrix analysis	6	Understanding numerical methods for matrix analysis
7	Simulation of Finite State Markov Chains	3	Implementing finite state Markov chains
8	Simulation of signal constellations and symbol error calculation	3	Implementing signal space concepts
	<b>Total</b>	<b>42</b>	

**Text Books:**

1. Sheldon M. Ross, "Introduction to Probability Models", Academic Press Inc.
2. Carl D. Meyer, "Matrix Analysis and Applied Linear Algebra", SIAM.
3. Robert G. Bartle, Donald R. Sherbert, "Introduction to Real Analysis", John Wiley & Sons, Inc.

**Reference Book:**

1. Atkinson, Kendall, *Introduction to Numerical Analysis*. Cambridge University Press, 2012.