Gautam Buddha University, Greater Noida

School of Engineering (Mechanical Engineering)

Degree	Course Name	Course Code	Marks:100
M. Tech.	Simulation, Modeling and Analysis	MEM 509	SM+MT+ET 25+25+50
Semester	**Credits**	**L-T-P**	**Exam.**
I/II	4	3-1-0	3 Hours

Unit - I

Introduction: Introduction to simulation; Systems; Models; Data collection and analysis; Monte carlo simulation; Types of system simulation; Decision making with simulation; Areas of simulation application.   **(06 Hours)**

Unit - II

Modeling Theory: Queuing models; Characteristics of queuing systems; Queuing notions; Long run measures of performance of queuing systems; Steady state behavior of Markovian models (M/G/1; M/M/1; M/M/c); Overview of finite capacity and finite calling population models; Network of queues; Monte carlo simulation and its applications in queuing and inventory models.

(06 Hours)

Unit - III

Sampling: Generation of (Pseudo) random numbers; Probability distributions and probability densities; Sampling from probability distribution: Inverse method; Convolution method; Acceptance rejection method.   **(08 Hours)**

Unit - IV

Mechanics of Simulation: Discrete simulation; Continuous simulation; Combined simulation; Problem formulation; Mechanics of discrete simulation-discrete events; Representation of time; Generation of arrival pattern;

Simulation examples; Simulation programming tasks; Gathering statistics; Measuring utilization and occupancy recording distributions and transit times.

(08 Hours)

Unit - V

Simulation Softwares: Steps to build a useful model of input data; Data collection; Verification of simulation models; Validation process; Simulation software; Classification of simulation software and desirable software features; Comparison of simulation packages with programming languages; General purpose simulation packages; Object oriented packages; Case studies.

(11 Hours)

Unit - VI

Analysis: Analysis of simulation output; Importance of the variance of the sample mean; Procedure for estimating variance; Subinterval method; Replication method; Regenerative method; Variance reduction techniques; Start up policies; Stopping rules; Statistical inferences; Design of experiments.

(06 Hours)

Recommended Books:

1. Discrete Event System Simulation; Banks; Pearson's Education.
2. Simulation Modeling and Analysis; 3rd edition; A. M. Law and W. D. Kelton; McGraw Hill.
3. System Simulation 2nd edition; G. Gordon; PHI Learning.
4. Probability and Statistics with Reliability; Queuing; and Computer Science Applications; K. S. Trivedi; Prentice Hall of India.
5. Introduction to Probability and Random Variables; G. P. Wadsworth and J. G. Bryan; McGraw Hill.
6. Theory of Modeling and Simulation; Bernard.
7. Performance Modeling of Automated Manufacturing Systems; N. Viswandhan and Y. Narhari; Prentice Hall of India.
8. Simulation Model Design and Execution; P. Fishwick; Prentice Hall.
9. Simulation; S. Ross; Academic Press.