



SHARDA
UNIVERSITY
Beyond Boundaries



**SHARDA SCHOOL OF
BASIC SCIENCES
& RESEARCH**



COURSE

**System Simulation:
Concepts and Foundations**
(NV34108)

VALUE ADDED
COURSE BROCHURE-30 HRS

2025-26

ABOUT UNIVERSITY

Sharda University is a leading Educational institution based out of Greater Noida, Delhi NCR. A venture of the renowned Sharda Group of Institutions (SGI), The University has established itself as a high quality education provider with prime focus on holistic learning and imbining competitive abilities in students.

The University is approved by UGC and prides itself in being the only multi-discipline campus in the NCR, spread over 63 acres and equipped with world class facilities.

Sharda University promises to become one of the India's leading universities with an acknowledged reputation for excellence in research and teaching. With its outstanding faculty, world class teaching standards, and innovative academic programs, Sharda intends to set a new benchmark in the Indian education system.

Sharda School of Basic Sciences and Research (SSBSR) boasts of providing an interdisciplinary approach, exposure to different disciplines in science including Chemistry, Bio-Chemistry, Physics, Mathematics, Life Sciences, and Environmental Sciences.

ABOUT THE SCHOOL

Sharda School of Basic Sciences and Research (SSBSR) boasts of providing an interdisciplinary approach, exposure to different disciplines in science including Chemistry, Bio-Chemistry, Physics, Mathematics, Life Sciences, and Environmental Sciences.

The Sharda School of Basic Sciences and Research is unique from other institutions of higher learning as it is committed to imparting knowledge in pure and applied sciences, which not only forms the foundation for further academic pursuits in science and technology but also acts as the foundation for students to pursue a career in multi facet directions.

The academic programs are designed to meet the requirement of the latest technological developments and envisages to become a state-of-the-art department that cater the students at Graduate, Post- Graduate and Research level along with providing high-quality education and cutting-edge interdisciplinary research in sciences. SSBSR has well-equipped laboratories for Physics, MATLAB, Microbiology, Molecular Biology, Cell Culture, Virology, Bio-Chemistry, Physical, Organic and Inorganic chemistry for Graduate and Post-Graduate Programs. In addition, there are Central Instrumentation Facility (CIF) and other advance research labs to promote research culture.

ABOUT THE COURSE

The objective of this course is to provide a basic treatment of all the important aspects of modeling and simulation. A simulation is a model that mimics the operation of an existing or proposed system, providing evidence for decision-making by being able to test different scenarios or process changes. Simulation is a powerful technique for solving the wide variety of problems.

COURSE SCHEDULE

Week	Content
1	Introduction to System Modeling and Simulation
2	Probability & Random Number Generation
3	System Modeling Concepts
4	Queuing Systems & Discrete System Simulation
5	Resampling method & Simulation

RESOURCE PERSON

Faculty:

Mohd. Shahid Baboo, Assistant Professor

Department of Mathematics, Sharda University

A committed and capable Research Fellow with overall 19 years of experience in teaching. Extensively published in theoretical work, with significant expertise in Differential and Integral Calculus and Complex Analysis also capable of handling of examinations. He is much more interested in teaching and learning

MODULE

School: SSBSR		Batch : 2024-26	
Program: (PG)		Current Academic Year: 2025-26	
Branch: M.Sc. Mathematics, M.Sc. Data Science & Analytics		Semester : III	
1. Course Code	NV34108		
2. Course Title	System Simulation: Concepts and Foundations		
3. Credits	Audit Course		
4. Contact Hours	(30 Hours)		
Course Type	Value added course		
5. Course Objective	1.To introduce the fundamental concepts of system modeling and Simulation. 2.To understand the mathematical foundations of system model. 3.To explore the principles and methods of simulation.		
6. Course Outcomes	CO1: The student will be able to understand the basic concepts of system and model. CO2: The student will be able to explain the basics of probability and random number generation. CO3: The student will be able to explain the concept of validation and verification. CO4: The student will be able to develop model of arrival process CO5: The student will be able to apply the concept of discrete and continuous system simulation. CO6: The student will be able to find various real world application of simulation.		
7. Course Description	This is an introductory course that provides an in-depth understanding of system, model and different types of simulations. The objective of this course is to provide a basic treatment of all the important aspects of modeling and simulations. This course explores the process of model and simulation, verification and validation of simulation model and its real word applications in various fields, such as inventory system model, computer center model and Reliability estimation.		
8. Outline syllabus	CO Mapping		
Unit 1	Introduction to System Modeling and Simulation		
A	Introduction to system, components of system, system environment		CO1
B	Concept of simulation		CO1
C	Advantages and Disadvantages of simulation		CO1
Unit 2	Probability & Random Number Generation		
A	Introduction to basic of probability,		CO2
B	Probability distribution: PMF, PDF, CDF.		CO2/CO3
C	Continuous and discrete system simulation		CO3
Unit 3	System Modeling Concepts		
A	Types of system and Model		CO4
B	Comparison of simulation and Analytical Method		CO4
C	Inverse transformation method, Monte-Carlo Simulation, Acceptance-rejection technique		CO4
Unit 4	Queuing Systems & Discrete System Simulation		
A	Queuing system, Arrival process and Service distribution		CO5
B	M/M/1 queue, M/M/1/N queuing model, M/M/c queuing model, M/M/c/c queuing model.		CO5
C	Arrival pattern and discrete system simulation, Gibbs sampler.		CO6
Unit 5	Resampling method & Simulation		
A	Resampling method, introduction, Application, Bootstrapping and Jackknife method		CO5/CO6
B	Reliability estimation, Simulation with estimation (MLE, LSE, MPS)		CO5/CO6
C	Confidence intervals, variance stabilizing transformation. Bootstrapping in regression and sampling from finite populations.		CO5/CO6
Mode of examination	Assignment/Quiz		
Text Book	1. Singh, P. and Singh, N., Modeling and Simulation, S.K. Kataria & Sons.		
Other Reference	1. https://www.amazon.in/Frank-L-Severance/e/B001KDUFE2/ref=dp_byline_cont_book_1 System Modeling and Simulation: An Introduction, WILEY.		