



SHARDA
UNIVERSITY
Beyond Boundaries



**SHARDA SCHOOL OF
ENGINEERING &
SCIENCE**



COURSE

System Simulation: Concepts and Foundations

(NV34108)

VALUE ADDED
COURSE BROCHURE-30 HRS
2026-27

ABOUT THE 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.

SSES combines the strengths of engineering and basic sciences to create a dynamic environment that fosters innovation and technical excellence along with a sense of social responsibility. With high-ranked programmes in engineering and robust offerings in pure and applied sciences, the school provides a comprehensive and future-ready education. The school has a legacy of excellence in the fields of Physics, Chemistry, Biochemistry, Mathematics, Data Science and Environmental Sciences.

ABOUT SCHOOL

The Sharda School of Engineering and Sciences (SSES) provides a vibrant academic ecosystem that integrates engineering and scientific education with real-world relevance, research excellence and interdisciplinary learning. It serves as a platform where students are empowered to explore, innovate and build impactful careers across a wide spectrum of disciplines.

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The academic programmes at SSES span undergraduate, postgraduate and doctoral levels and are aligned with the latest technology and scientific advancements in alliance with the NEP 2020. The school is deeply involved in academic research, industry collaboration, and consultancy projects—providing students with an exposure to both theoretical knowledge and practical applications.

ABOUT 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
1,2	Introduction to System Modeling and Simulation
3,4	Probability & Random Number Generation
5,6	System Modeling Concepts
7,8	Queuing Systems & Discrete System Simulation
9,10	Resampling method & Simulation

RESOURCE PERSON

Dr. Satya Prakash Mishra

Department: Department of Mathematics & Data Science, SSES Sharda University

Dr. Satya Prakash has completed B.Sc. in Mathematics and Statistics from D.S.B. Campus, Kumaun University, Nainital. He has done his M.Sc. in Statistics from The Indira Gandhi National Tribal University, M.P. He has completed his Ph.D. in Statistics from Central University of Haryana, Mahendergarh. His area of research includes Bayesian inference, Survival analysis, Reliability estimation. He has strong foundation in Simulation algorithms, Estimation procedures and applications. He has published several research papers in reputed journals.

1. Course Code	NV34108
2. Course Title	System Simulation: Concepts and Foundations
3. Credits	Audit
4. Contact Hours (L-T-P)	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	
Unit 1	Introduction to System Modeling and Simulation
A	Introduction to system, components of system, system environment
B	Concept of simulation
C	Advantages and Disadvantages of simulation
Unit 2	Probability & Random Number Generation
A	Introduction to basic of probability,
B	Probability distribution: PMF, PDF, CDF.
C	Continuous and discrete system simulation
Unit 3	System Modeling Concepts
A	Types of system and Model
B	Comparison of simulation and Analytical Method
C	Inverse transformation method, Monte-Carlo Simulation, Acceptance-rejection technique
Unit 4	Queuing Systems & Discrete System Simulation
A	Queuing system, Arrival process and Service distribution
B	M/M/1 queue, M/M/1/N queuing model, M/M/c queuing model, M/M/c/c queuing model.
C	Arrival pattern and discrete system simulation, Gibbs sampler.
Unit 5	Resampling method & Simulation
A	Resampling method, introduction, Application, Bootstrapping and Jackknife method
B	Reliability estimation, Simulation with estimation (MLE, LSE, MPS)
C	Confidence intervals, variance stabilizing transformation. Bootstrapping in regression and sampling from finite populations.
Mode of Examination	Assignment/Quiz/Viva
Text book/s*	1. Singh, P. and Singh, N., Modeling and Simulation, S.K. Kataria & Sons.
Other References	1. Frank L. Severance, System Modeling and Simulation: An Introduction, WILEY.