

# Simulation Modeling

## Course Objectives: □

1. Introduce computer simulation technologies and techniques, provides the foundations for the student to understand computer simulation needs, and to implement and test a variety of simulation and data analysis libraries and programs. This course focusses what is needed to build simulation software environments, and not just building simulations using preexisting packages.
2. Introduce concepts of modeling layers of society's critical infrastructure networks.
3. Build tools to view and control simulations and their results.

## Course Outcomes:

1. provide a strong foundation on concept of simulation, and modeling.
2. understand the techniques of random number generations.
3. understand the techniques of testing randomness.
4. design simulation models for various case studies like inventory, traffic flow networks, etc.
5. practice on simulation tools and impart knowledge on building simulation systems.

## Syllabus:

### UNIT-I:

System models: Concepts, continuous and discrete systems, System modeling, types of models, subsystems, system study.

### UNIT-II:

System Simulation: Techniques, comparison of simulation and analytical methods, types of simulation, Distributed log models, cobweb models.

### UNIT-III:

Continuous system Simulation: Numerical solution of differential equations, Analog Computers, Hybrid Computers, continuous system simulation languages CSMP, system dynamic growth models, logistic curves.

### UNIT-IV:

Probability concepts in simulation: Monte Carlo techniques, stochastic variables, probability functions, Random Number generation algorithms.

### UNIT-V:

Queuing Theory: Arrival pattern distributions, servicing times, queuing disciplines, measure of queues, mathematical solutions to queuing problems.

Discrete System Simulation: Events, generation of arrival patterns, simulation programming tasks, analysis of simulation output.

### UNIT-VI:

GPSS & SIMSCRIPT: general description of GPSS and SIMSCRIPT, programming in GPSS & SIMSCRIPT, Data structures, Implementation of activities, events and queues, Event scanning, simulation algorithms in GPSS and SIMSCRIPT.

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## TEXT BOOKS

1. Geoffrey Gordon, "System Simulation", 2nd Edition, Prentice Hall, India, 2002.
2. Narsingh Deo, "System Simulation with Digital Computer", Prentice Hall, India, 2001.

## REFERENCES

1. Jerry Banks and John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete Event System Simulation", 3rd Edition, Prentice Hall, India, 2002.

2. Shannon, R.E. Systems simulation, The art and science, Prentice Hall, 1975.
3. Thomas J. Schriber, Simulation using GPSS, John Wiley, 1991