

ISYE 3044 SIMULATION ANALYSIS AND DESIGN

Prepared Prof. Alexopoulos, Spring 2008

Credit: 3-0-3

Prerequisite(s): ISyE 2028, ISyE 3232

Catalog Description:

Discrete event simulation methodology emphasizing the statistical basis for simulation modeling and analysis. Overview of computer languages and simulation design applied to various industrial situations.

Texts:

Banks, J., Carson, J. S., Nelson, B. L., and Nikol, D. M. *Discrete-Event System Simulation*, 4th edition, Prentice-Hall, 2005.

Kelton, W. D., Sadowski, R. P., and Sturrock, D. T., *Simulation with Arena*, 4th edition, McGraw-Hill, 2007.

Objective

Study of techniques for modeling discrete-event dynamic systems and introduction of methods for using these models in solving engineering design problems.

Topical Outline

1. General principles and simulation languages
2. Statistical models in simulation
3. Queueing models
4. Random number generation
5. Random variate generation
6. Input modeling
7. Verification and validation
8. Output analysis for a single model
9. Comparison and evaluation of alternative system designs
10. Introduction to Arena
11. Modeling Detailed Operations
12. Entity Transfers
13. Advanced Modeling Techniques

Outcomes

At the end of this course, students will be able to:

1. Evaluate the effects of randomness on system behavior and performance.
2. Develop credible and valid simulation models.
3. Fit statistical distributions to input data.
4. Analyze output data from simulations.
5. Compare alternative system designs using simulation.

Course outcome \ Program Outcomes	a. apply math	b. data	c. IE method	d. team	e. problem solving	f. prof and ethical responsibilities	g. communication	h. global, eco, envi and soc context	i. continue to improve	j. current issues	k. participate in an organization
1. Evaluate the effects of randomness on system behavior and performance	M	H	M		M		M				
2. Develop credible and valid simulation models	H		H	M	H		H				
3. Fit statistical distributions to input data	H	H									
4. Analyze output data from simulations	M	H	M	M	M		H				
5. Compare alternative system designs using simulation			H	M	M		H				

Evaluation of important outcomes

Modeling exercises are given in several homework assignments. The modeling exercises cover various systems including manufacturing and inventory systems, and warehousing systems containing transporting vehicles and conveyors. The students are asked to write reports describing the outcomes of the simulation experiments and containing appropriate recommendations. The nature of a modeling exercise does not permit testing in midterm or final examinations.

Three or more important outcomes will be evaluated from direct questions in the final examination:

1. Test the goodness-of-fit of a statistical distribution to a data set.
2. Compute confidence intervals for system performance measures.
3. Compute a sample size necessary for computing estimates with e required precision.
4. Compare systems based on outputs of simulations.