CSCI 4331 - SYSTEM SIMULATION AND MODEL BUILDING

CREDIT HOURS: 3
PREREQUISITES: CSCI 3302; MATH 1325 or 2313; MATH 1342
GRADE REMINDER: Must have a grade of C or better in each prerequisite course.

CATALOG DESCRIPTION

Simulation methodology, generation of random variants, design of experiments with deterministic and stochastic models.

PURPOSE OF COURSE

To provide the student with a knowledge of and practice in applying discrete event simulation and modeling methodologies.

EDUCATIONAL OBJECTIVES

Upon successful completion of the course, students should be able to:

1. Identify probability and statistical principles.
2. Demonstrate a knowledge of simulation terminology and model development processes.
3. Demonstrate capabilities in problem analysis, model formulation, model verification, model validation, model experimentation, and data analysis.
4. Understand pseudo-random number generation techniques, statistical tests for randomness, and random variate generation methods.
5. Analyze single simulation models and comparatively evaluate alternative system designs.
6. Implement simulation models in a general-purpose programming language and in a specific-purpose simulation language in order to understand the capabilities and advantages of simulation languages.
7. Carry out, from conception through implementation, both individual and team simulation projects, some of which involve the collection and analysis of data for an actual existing system.
8. Understand the requirements and value of performing both as an individual and as a team member on a simulation project.
9. Demonstrate an awareness of the practical usefulness of simulation and model building.

COURSE CALENDAR

This course meets for a minimum of 37.5 lecture contact hours during the semester. Students have significant weekly reading assignments. Students are expected to complete weekly homework/programming assignments, and 2-3 periodic exams in addition to the final exam. Students are expected to prepare for any class assignments or quizzes over the material covered in class or in the reading material. Successful completion of these activities requires at a minimum six additional hours of outside of classroom work each week.

CONTENT — Hours

Introduction to Modeling and Computer Simulation.....2

Simulation in decision making, elements of simulation modeling, modeling packages, languages for simulation, interpretation of simulation data

Probability and Statistical Tools 12
Probability distributions, discrete and continuous random variables, pseudorandom number generation and testing, hypothesis testing, confidence intervals, one-way analysis of variance, variance reduction

Simulation Modeling Procedures, Techniques, and Case Studies 18
Model design
Inventory and queuing models, single models, alternative models
Collection and analysis of input data
Simulation performance
Analysis of simulation results, simulation verification and model validation, sensitivity analysis

Discrete Event Simulation with a Simulation Language 10
Deterministic and stochastic models, probability distribution sampling, simulation i/o, simulation projects with written and oral presentations

Exams.....3

TOTAL 45

REFERENCES

Banks, J., Editor, Handbook of Simulation, Wiley, 1998.

Banks, Carson, and Nelson, Discrete-Event System Simulation, 3rd Ed., Prentice Hall, 2001.

Banks, Carson, and Sy, Getting Started with GPSS/H, Wolverine Software Corp., 1989.

Fishwick, Simulation Model Design and Execution, Prentice Hall, 1995.

Kelton, Sadowski, and Sadowski, Simulation with Arena, 2nd Ed., McGraw-Hill, 2002.

Law, A. M. and Kelton, W. D. Simulation Modeling and Analysis, 3rd Ed., McGraw-Hill, 2000.

Shriber, An Introduction to Simulation Using GPSS/H, Wiley, 1991.

Silverman, A Laboratory Manual for Simulation with GPSS/H for Computer Science Majors: an Integrated Approach, NSF Workshop, 1997.