

COURSE DESCRIPTION

Department and Course Number: CSCI 405

Course Title: Computer Simulation

Current Catalog Description: Introduction to computer-based simulation and its applications to engineering, the sciences, and management.

Total Credits: 3 hours

Coordinator: H. Conrad Cunningham, Associate Professor of Computer and Information Science

Textbook: Jose M. Garrido. *Object-Oriented Discrete-Event Simulation with Java: A Practical Introduction*, Kluwer Academic/Plenum Publishers, New York, 2001.

References: <http://www.cs.olemiss.edu/~hcc/csci405/>

Course Goals: The primary goals are to increase each student's abilities (1) to design appropriate models of real world systems and (2) to implement those models so that they can be executed on computers to answer questions about the real world. A secondary goal of this course is to increase the student's understanding, knowledge, and skill in application of object-oriented design and programming techniques to such problems.

Prerequisites by Topic:

1. Object-oriented programming (CSCI 211)
2. Basic data and file structures (CSCI 211)
3. Basic college-level mathematics (MATH 262)
4. Probability and statistics (statistics course)

Major Topics Covered in the Course:

1. Introductory problem (1 hour).
2. Object-oriented programming and design concepts (6 hours).
3. Fundamental concepts of simulation (2 hours)
4. Process-interaction approach to discrete-event simulation (2 hours)
5. Single server queuing models (3 hours)
6. Multi-server queuing models (2 hours).
7. Queuing networks (2 hour).
8. Models with priority (3 hours).
9. Resource synchronization (3 hours)
10. Producer-consumer cooperation (3 hours).
11. Synchronous cooperation (3 hours).
12. Conditional waiting (3 hours)
13. Process interrupts (3 hours).
14. Input modeling and data analysis (4 hours).
15. Exams (3 hours)

Laboratory Projects:

1. Bursar's Office simulation (2.5 weeks)
2. Sandwich Shop simulation (3 weeks)
3. Round Robin Scheduler simulation (2 weeks)

Estimate of ABET/CAC Category Content:

	CORE	ADVANCED		CORE	ADVANCED
Data Structures	_____	_____	Computer Organization and Architecture	_____	_____
Algorithms	_____	_____	Concepts of Programming Languages	_____	_____
Software Design	_____	_____ 3 _____		_____	_____

Oral and Written Communications: All students are required to submit a written design report consisting of appropriate text and graphics with each project. The grade on the overall project includes an assessment of the overall professional quality of the materials submitted. Optionally, the instructor may require a few (1 or 2) short (10-20 minute) oral presentations by individuals or groups on some assignments.

Social and Ethical Issues: Ethical and social implications are considered as they arise naturally in the discussion of data collection, model construction, and use of simulation results. These issues are considered in the evaluation of all student models and answers to questions on examinations. Approximately one hour total is devoted to such discussions during the semester.

Problem Analysis: A goal of this course is to help students learn to build appropriate models. In the classroom, the instructor and students examine example problems and various solutions. In their projects, students must analyze systems, build models of those systems that enable the desired questions to be answered, decide what data to collect, devise appropriate experiments, and interpret the results in terms of the system modeled.

Solution Design: All students must design and implement computer programs that enable the model to be executed, the needed performance data to be collected, and the selected experiments to be carried out. The programs are implemented in an appropriate object-oriented language (e.g., Java) using an appropriate simulation package (e.g., Garrido's Psim-J).