MIS/POM/QMM 445/645 – Simulation in Business

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Course Description and Objectives

Computer simulation is the art and science of creating and using computerized models of real systems to better understand them. Simulation is one of the most important and widely used quantitative/computer modeling techniques used in business. This course is intended to give students the opportunity to be business simulation modelers. Students will become familiar with both the methodology and application of computer simulation modeling within the context of managerial decision making under uncertainty and business process design and analysis. We will use an industry leading discrete event simulation software package called Simio which facilitates construction of dynamic, animated simulation models. Specifically, by the end of this course, you should be able to

- Identify business situations in which computer simulation is appropriate
- Understand the role that computer simulation plays in the broader context of analyzing complex business systems
- Understand the statistical underpinnings of computer simulation modeling
- Develop conceptual discrete event models of complex business systems
- Develop spreadsheet based simulation models for decision making under risk/uncertainty
- Develop dynamic computer simulation models using a discrete event simulation package
- Collect and analyze data to estimate model input parameters
- Verify and validate simulation models
- Design experiments to compare system alternatives
- Interpret and analyze the output of computer simulation models
- Design and carry out a simulation study of a realistic business problem

Text

Simio and Simulation: Modeling, Analysis, Applications (3rd Edition) - Kelton, Smith and Sturrock

See course Moodle site for details on obtaining the book.

Prerequisites

Any student who has had an introductory operations management course, introductory information systems course and completed the statistics sequence is theoretically prepared to take this course. This course will challenge most students in that it is simultaneously quantitative, technical and design oriented. It will require you to be creative and ingenious while at the same time being super logical and precise. Be prepared to push yourself and you will be rewarded with the learning of a very practical topic and set of skills that do have demand in the market place.

You must also be comfortable with learning and using a myriad of software packages and with the inevitable ambiguity that comes along with building models of real systems.

Resources

Our course web site in Moodle will contain a wealth of learning resources including skeleton lecture notes, links to supplementary readings and videos, example models, and discussion forums. Our textbook is very "tutorial oriented" and is a great way to learn both Simio and simulation in general. I taught myself Simio using this book and found it very valuable. One of the authors, David Kelton, is truly one of the giants of the simulation field.

Software

Simio is available on all SBA computers. You can also download the student version of Simio. There's a free version that has model size limits, and a $25 version that has no limits (and includes an additional Simio textbook). See the course Moodle site for more details. We will also use @Risk for Monte-Carlo simulation and it is also available in the SBA labs. MS Office will also be used for a variety of tasks including data analysis, writing log files, creating reports and presentations. We may also use a few other software tools for specialized tasks such as exploring agent based simulation models or system dynamic models.

Evaluation

The only way to learn simulation is to build simulation models and use them to solve problems. As such, this class will be VERY "hands on". We will do many short modeling/analysis assignments and a final project. There will be no exams. There may be a few short Moodle quizzes worth a small percentage of your grade. The grading breakdown will be:

Assignments	60%
Final Project	25%
In class exercises/quizzes	15%

Assignments will generally be individual but you can collaborate with your classmates in terms of idea sharing and problem solving. However, everyone will do and turn in their own assignment. The Final Project will be a group project with group sizes ranging from 1-4. The In Class Exercises and Quizzes will be done individually. I will give you specific guidance on each Assignment and will provide more details on the Final Project in class.

Course Schedule

The Moodle site is the final say on course schedule. However, here is a basic topic outline.

4-Sep	Overview of simulation
11-Sep	Monte-Carlo simulation of static systems
18-Sep	Monte-Carlo simulation of dynamic systems
25-Sep	Dynamic models and process physics
2-Oct	Fundamentals of DES and Intro to Simio
9-Oct	Basic DES modeling with Simio
16-Oct	Basics of input analysis and intermediate modeling
23-Oct	Basics of output analysis and intermediate modeling
30-Oct	Conducting simulation studies
6-Nov	Animation and more advanced modeling
13-Nov	Animation and more advanced modeling
20-Nov	Agent based models and system dynamics models
27-Nov	No Class - Thanksgiving
4-Dec	Project work
11-Dec	Final Project Presentations