NORTHWESTERN UNIVERSITY
INDUSTRIAL ENGINEERING & MANAGEMENT SCIENCES
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IEMS 317: Discrete-Event Systems Simulation

Instructor

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Office Hours: Tuesday & Thursday 1-2pm or by appointment.

Teaching Assistant

To be announced.
Office:
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Class Schedule

Lectures: Tuesday & Thursday 2pm – 3:20pm, Frances Searle Building 1421
Labs: Wednesday 2pm - 2:50pm, 3pm – 3:50pm, IEMS Computer Lab

Course Overview

This is a hands-on course on computer simulation of *business*, *service*, and *manufacturing* systems that are subject to uncertainty or risk. The course takes the perspective of the consultant whose job is to analyze stochastic decision problems by building a simulation model and using it to understand the behavior of the system and explore the effects of alternative decisions.

Two modeling methodologies will be presented: 1) Models, both static and dynamic, that can be implemented as mathematical expressions in a spreadsheet; and 2) discrete-event models that utilize the event scheduling formalism. *@Risk*, from Palisade Corporation, is the tool that will be used to demonstrate how to build and execute spreadsheet simulation and *Arena*, from Rockwell Software, is the tool that will be used to demonstrate how to build discrete-event simulation models for service and manufacturing applications. Upon completion of the course students will be able to carry out the entire process of designing the model, implementing it in the appropriate software, executing the simulation, collecting and analyzing output data, and using the results of the analysis to evaluate alternative decisions.

Course Materials

- J. Banks, J. S. Carson B. L. Nelson, and D. M. Nicol. 2010. *Discrete-Event System Simulation*. 5th Edition. Prentice Hall, Inc., Upper Saddle River, NJ. ISBN 0-13-144679-7. [click here for book web page]
- *Course Supplement for IEMS 317 Discrete-Event System Simulation*, which includes labs and the PowerPoint lecture notes.
- @Risk and Arena software (CDs available from the TA).

Preparation

- Computing, particularly basic file management under Windows XP or Vista, Excel and word processing.
- Probability and stochastic processes, particularly the exponential, normal and uniform distributions, Poisson arrival processes and queueing.
- Statistics, particularly the relationship between probability distribution functions and cumulative distribution functions; confidence-interval procedures based on the normal and *t* distributions; sample mean and variance.
- The course will draw on material covered in IEMS 315, particularly the concept of simulation, Poisson arrival processes and queueing theory.

Computing

We will use the `@Risk` Excel add-in and the `Arena 12` simulation environment; both are installed on the PCs in the IEMS Lab, Tech C135. You can obtain both by checking out a CD from the TA (but you must leave your Wildcard).

Grading

Component	**Percent of Grade**
Self Studies	15%
Labs	5%
Design Projects (3)	60% (20% each)
Final	20%

Class Policies

- **On-time Attendance:** Attending and participating in class adds to your knowledge as IEs beyond what can be evaluated on projects and exams. Therefore, the course grade of those students who arrive on time for, and attend all of, 18 or more class sessions will be raised one-third letter. *No excuse for arriving late or missing class will be accepted.*

However, any grade in the class can be earned without ever attending class or being on time.

- **Working together:** You are encouraged to discuss the design problems, but all programming and analysis is to be done in **a team of one, two or three**. Numerical results will differ depending on how you code your simulation, so comparing them is no guarantee, anyway. *Notice that 30% of the course grade is determined by the final examination and it is not possible to be successful on the examination without understanding what was done on the design projects.*
- **Self-Study Assignments:** All self-study assignments are due at the *beginning* of class on the designated day. They are to be done individually.
- **Projects:** One late design project (3 extra days) without penalty will be permitted; there is no distinction between 1 hour late and 3 days late. Additional late projects are worth progressively 30% less credit per project, and no credit is given if a project is more than 3 days late.
- **Labs:** Doing the labs during the assigned lab time is strongly recommended, but not required. If you do the lab on your own you must turn it in **before** the end of your assigned lab time. Neither the instructor nor the TA will help with lab assignments outside of the schedule lab time or office hours.
- **Regrades:** Regrades of projects, self studies or labs are obtained by submitting a written explanation via the instructor's mailbox within 48 hours of when the work was returned in class. Regrades will only be discussed *after* submitting the work in this manner.
- **Examinations:** The final examination is open book and notes. The final will be given on the date scheduled by the university, it will be comprehensive, and it will not be optional.
- **Office Hours:** Please respect the office hours of the instructor and TA by planning ahead. Use e-mail to obtain answers during off hours, but first check out the Frequently Asked Questions to see if someone else has already obtained an answer to your question.

Design Project Reports

In order to receive full credit, project reports must follow the report format contained in your course notes. For additional guidance see the Frequently Asked Questions.