Widener University
School of Engineering

ENGR 670 - Simulation of Business Processes
Spring 2007

SYLLABUS
[Subject to change during course]

Text: R. P. Jefferis, *Simulation of Business Processes*, book in progress – chapters will be distributed on-line. [Note Copyright: © 2006, 2007 Raymond P. Jefferis III]

Supplemental readings:
"User's Manual, SIMPROCESS", CACI Products Company, Chantilly, VA. (available on the Web site http://www.caciasl.com/products/simprocess_documents.cfm)

Unit	Week	Topics of Study
1	1/22	Course Introduction and software setup *Students will receive instructions on downloading, installing the course software, and running a simulation example.*
2	1/29	Introduction to Simulation *Students will learn the theory on which simulation of discrete systems depends, will be able to identify features of the process with components of the mode, and will learn the various phases of developing a successful simulation model.*
3	2/05	Models and Studies *This will be an overview of simulation, including the purposes and methods of simulation studies. Students will learn the methodology of model development and how to identify what types of simulation study will be most useful.*
4	2/12	Elements of Simulation *Entities, resources, and other objects and properties of simulated systems will be discussed, as well as source models, queuing systems, servers, and sinks. Students will learn the theory on which simulation of discrete systems depends, and they will be able to identify features of the process with components of the model.*

5 2/19 Model Building Workshop
Students will get experience building statistical models from real data sets using spreadsheet techniques. An example will illustrate incorporation of such models into a business process simulation.

6 2/26 Simulation Software Design
This is a short comparative study of the major software methods of setting up simulation models, including C++ programming ,a simulation language, and a hierarchical simulation tool. Students will learn when to use the various types of simulation tools available and will learn what effort each requires. Students will also be given an introduction to a commercial hierarchical simulation tool.

7 3/05 Spring Break (no class)
Students should use this time to begin the assigned Semester Project.

8 3/12 Basic Simulation Models
Use of a commercial simulation package to model basic business systems with queues will be shown, with examples. Students will learn to set simulation goals, lay out a process model, build a simulation, and analyze simulation results. A methodology for developing entity and activity models will be offered.

9 3/19 Resource Modeling
Resource handling in a commercial simulation package will be illustrated, with examples. Students will learn about resources as simulation components, as well as various methods of dealing with resource downtime. A methodology for developing resource models will be offered.

10 3/26 Paths and Attributes
Students will learn what data must be gathered in order to develop a simulation model with path delays, how to convert these data into a statistical model, and how to validate the model. Examples will illustrate the application of these models. A methodology for developing path and attribute models will be outlined.

11 4/02 Building a Cost Model
Students will learn how to develop activity based cost models and how to explore cost alternatives to optimize a process. Fixed and variable costs of many resources common to business processes will be considered. A methodology will be described.

12 4/09 Manufacturing Systems
A number aspects of manufacturing processes will be discussed. Students will learn the types of model particular to these systems.

13 4/16 Service Processes
A number of service processes will be discussed. Students will learn the branching, escalating, and pipeline models commonly used for these systems.

14 4/23 Project Workshop
Students will be able to discuss their semester projects and will receive recommendations for improvement.

15 4/30 **ALL WORK IS DUE IN PORTFOLIO FORMAT ON CD.**

16 ADMINISTRATIVE DETAILS FOR REGISTERED STUDENTS

Course Objectives

The lectures in this course will present methodologies for the efficient simulation of production and business operations. The theory of queuing systems and the simulation of discrete system processes will be studied and developed. Upon completion of this course, students will understand the theoretical basis of discrete system simulation and will be able to use commercial simulation software to analyze and predict traffic and queuing patterns in such systems.

Assignments

There will be a number of lesson plans posted weekly on the course Web site, including reading and homework assignments, to illustrate various topics covered in the lecture notes and text. Students will use a commercial simulation package as a special feature of the course. Homework assignments will familiarize students with the use of this package for business process simulation. Students will be able to download this package from the manufacturer's Web site. A number of simulation projects will be assigned, of increasing system complexity, which should be completed each week, some using this package. Illustrative notes will be handed out, to guide students through use of the commercial simulation package. Each student will submit an individual portfolio of the assigned simulation projects and will make an oral presentation on one of these, at the end of the semester. These will serve as the final examination, both written and oral components.

Each student must report progress as each listed Lesson Plan is completed. In addition, each student must contact the Professor weekly, by telephone or e-mail, and report course progress. Questions may be asked at any time via e-mail.

Grading

All assignments will be graded, and course grades will be on the +/- system. In determining the final course grade, homework and project grades will be weighted according to the quality and the degree of difficulty of the submitted work. Students are welcome to attempt simulation projects more difficult than those assigned. **Students may work in teams of up to three persons on projects with a high degree of difficulty. Work submitted by such teams must contain a cover page indicating who participated and what portions of the assignment were completed by each person on the team.**

Contacting the Professor

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Please begin Subject line with "ENGR670 – " .

Web: http://muse.widener.edu/~rpj0001/courses/Engr670/engr670.htm

Obtaining Course Software

SIMPROCESS® simulation software is being made available to course registrants through the generosity of CACI International Inc. To obtain your copy of the software:

(1) Please register for the course (Registrant name list will be sent to CACI) **Course registration should be completed by January 9, 2007.**
(2) Log in to the CACI Web site at: http://www.caciasl.com/
(3) Go to the "Downloads" section and fill out application form. In Question 1, "How did you hear about CACI?" please select *Widener University*.
(4) Download and install the software per instructions supplied.
(5) Course registrants can obtain a license key that will last through the course.

Viewing the **PowerPoint** slides, working with **Excel** spreadsheets, and submitting the Final Report and portfolio will require Microsoft Office. Please be sure that these are operating in your computer.

Registrants should also download an **Adobe** (**Acrobat) Reader** and a **Flash Player** at: http://www.adobe.com/

SUPPLEMENTAL BIBLIOGRAPHY

Banks, Jerry and John S. Carson, *Discrete-Event System Simulation*, Prentice-Hall, Englewood Cliffs, 1984.

Bratley, Paul, Bennett L. Fox, and Linus E. Schrage, *A Guide to Simulation*, Springer Verlag, New York, 1987.

Evans, James R. and David L. Olson, *Introduction to Simulation and Risk Analysis*, Second Edition, Prentice-Hall, Englewood Cliffs, 2002.

Fishman, George S., *Principles of Discrete Event Simulation*, John Wiley & Sons, New York, 1978.

Fishwick, Paul A., *Simulation Model Design and Execution*, Prentice-Hall, Englewood Cliffs, 1995.

H. James Harrington and Kerim Tumay, *Simulation Modeling Methods*, McGraw-Hill, New York, 2000.

Katzela, Irene, *Modeling and Simulating Communication Networks*, Prentice-Hall, Englewood Cliffs, 1999.

Law, Averill M. and W. David Kelton, *Simulation Modeling & Analysis*, McGraw-Hill, New York, 1991.

Pidd, Michael, *Computer Simulation in Management Science*, John Wiley & Sons, New York, 1998.

Shannon, Robert E., *Systems Simulation, the art and science*, Prentice-Hall, Englewood Cliffs, 1975.

Ross, Sheldon M., *A Course in Simulation*, Macmillan, New York, 1990.