Course: IEEM514100- Simulation Analysis

Semester: Spring 2013 M 2:20-5:20 AM Engineering Building I, 809R

Number of credit hours: 3

Instructor: Professor Kuo-Hao Chang (changk@mx.nthu.edu.tw)
Office: Engineering Building I, 713R, Tel: (03)5742337
Office Hour: W 3:00-5:00 pm or by appointment

Description: Introduction to Monte Carlo simulation methods and their application to decision problems. Student will learn to identify constraints on problems, collect data for modeling and develop computer programs to simulate and analyze practical situations. Results interpretation is particularly emphasized.

Prerequisites: Engineering Statistics, Introduction to Operations Research.

• Computing, particularly some programming language such as C, Matlab etc.
• 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.

Textbook:
Simulation Modeling and Analysis, by Averill Law, 5th Ed.-McGraw Hill

Additional References:
Discrete-Event System Simulation, by Banks, Carson, Nelson and Nicol

Course Website:
http://moodle.nthu.edu.tw/
Important Policies:

Grading Elements, Weighting and Scale:

Grade Element	Weighting	Grade Scale
Homework and Presentation	60%	A: 90-100
Project	20%	B: 80-89
Final exam	20%	C: 70-79

Student attendance is mandatory unless excused by the instructor. Roll will not be taken, homework assignments will typically be given in class. No show students will be given a 0 (zero) to the assignments. Students are responsible for all the material covered in class and all the announcements made (e.g. date of mid-term tests and deadlines of homework and project). If you know you will be absent for a homework or test, make arrangements with the instructor beforehand.

Electronic Submission: All the electronic assignments are required to be sent to the following email

address: chang.ie514100@gmail.com

• Please title your email "Name_AssignmentName", e.g., "王小明_Homework3", "王小明_Project2"

• If technical difficulties are encountered with the gmail account, please use the instructor's email address.

• Please remember to CC yourself on all the emails submitting electronic assignments, and make sure that at least the email has been successfully delivered to your own mail box. Please keep your own copy of the submission until you have received the grade for that assignment.

Course Goals:

1. To provide students with the basic concepts of simulation.
2. To provide students with hands-on experience in the application of a widely used, general-purpose simulation software.
3. To provide students with basic knowledge on the analysis of simulation output.

Student Learning Objectives:

Upon completing the course, the student will be able to:

a) Recognize problems that can be modeled and solved using simulation techniques.

b) Become familiar with the main elements and principles needed to build and implement valid and credible simulation models.

c) Identify the input data needed for the model, perform proper statistical analysis, and select the input probability distributions.

d) Generate random numbers and random variates.

e) Perform basic statistical analysis on the output of the simulation models.

f) Develop good simulation models using SIMTOOLS and ARENA.

g) Perform a complete simulation study (problem definition and formulation, model building, data acquisition, model translation, model verification, model validation, model implementation, and analysis of the results.)

Course Contribution to Professional Component:

Engineering Science - 50%, Engineering Design - 50%

Course Relationship to Program Educational Outcomes:

The course relates strongly to the following program educational outcomes.

1. The course enables the students to acquire the ability to use modern and classical industrial engineering methodologies pertaining to simulation modeling (Outcome 1).
2. The course enables the students to acquire the ability to apply knowledge of math, statistics, and industrial engineering (Outcome 2).
3. The course enables the students to acquire the ability to design and conduct experiments, analyze and interpret data, develop implementation strategies, shape recommendations so that results will be achieved, and communicate findings effectively (Outcome 3).
4. The course enables the students to acquire the ability to work individually and on teams to identify, formulate, and solve problems using simulation and statistical analysis tools (Outcome 4).
5. The course enables the students to acquire the ability to design integrated systems (Outcome 5)

Course Topics (Note: This schedule is tentative and flexible)

- Generating random variables (2 weeks)
- Input modeling (3 week)
- Output analysis (4 week)
- Resampling method (1 week)
- Variance reduction (3 week)
- Comparing multiple systems (2 weeks)
- Simulation optimization (3 week)