A. Course Description

Credits: 4

Lab Hours/ Weeks: Corequisites: None

Lecture Hours/ Week:

MnTC Goals: None

This course is the study of fundamentals of computer simulation modeling and queuing theory at graduate level. Computer simulation can be an extremely powerful tool, yet few in industry seem well trained in the design, implementation, and interpretation of a useful simulation experiment. The instructional materials in this course are designed to familiarize the students with the use of computer simulation and queuing theory. Students will be taught to focus simulation studies on tractable and intractable questions, to draw conclusions from simulations results, and to bring these conclusions into appropriate domain context. This is a hands-on course. Students are taught simulation theory through the practice of developing models and writing software. Examples of application areas include: Computer Networks, Bioinformatics, Public Health Issues, Trends in Education, Trends in Industry and many, many more. Topics include: Introduction to Simulation; Introduction to the Arena software package; Simulation Examples; Statistical Models in Simulation; Queuing theory and Models; Analysis of Simulation Data; Verification and validation of Simulation Models.

B. Course Effective Dates: 01/12/2010 - Present

C. Outline of Major Content Areas:

See Course Description for major content areas.

D. Learning Outcomes (General)

1. Apply basic statistics concepts to simulation (such as generating random distributions for inputs and using confidence intervals for outputs).
2. Know the strengths and limitations of simulations.
3. Formulate a focused question that can be answered by simulation, to design a simulation model of appropriate complexity for the question of interest, and to use the results of the simulation to justify a recommended action or system design.
4. Implement Monte Carlo simulations, general simulations, and complex simulations using general-purpose software or simulation software.
5. Know how to represent different types of queueing systems and apply formulas of the two representative queueing systems (M/M/1/¿/¿ and M/G/1/¿/¿) to obtain queueing data.
6. Demonstrate expertise in reading peer reviewed papers in simulation and explain them in writing.
7. Formulate simple Operations Research (OR) models using the basics of optimal theory in OR and solve the optimization problem using the Simplex method.
8. Verify and validate simulation models.

E. Learning Outcomes (MN Transfer Curriculum)

This contains no goal areas.

G. Special Information

Prerequisites: Graduate standing in the MSCS program or permission of the instructor.