**Industrial System Simulation (EMGT 356)**

# Fall, 2013

**Class Meetings: TR 2-3.15 in 201 EMAN BLDG (LAB 235)**

**Instructor**: Dr. Abhijit Gosavi

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**Course** **Objectives:** Simulation modeling is one of the most widely used operations research tools in the industry for studying complex random systems for which closed-form formulations of performance metrics and costs are not available. Many employers expect our graduates to have a thorough understanding of computer simulation. “Lean manufacturing” experts extensively use simulation to measure lead times of products, to identify bottlenecks in production lines, and in designing the number of machines and material-handling devices needed for optimal performance. The military also uses computer simulation widely in its operations for planning purposes and to make important strategic decisions. The airline industry employs simulation for setting prices of tickets. Simulation modeling has also become popular in the health-care industry. Hospitals regularly use simulation to determine the waiting times in their clinics and outpatient departments.

This course is designed to introduce you to the fundamentals of computer simulation of discrete-event systems. Computer simulation is a very powerful method for studying and analyzing stochastic systems. Some examples of stochastic systems that we will consider in this course are: manufacturing systems (e.g., a single machine, a job-shop, and a flow-shop), service systems (banks, airports, and hospitals), and supply chains. As engineers, we are interested in:

1. issues related to the design of a system and
2. issues related to improving a *given* system.

Via simulation, we can address questions related to both of the above in the context of many a stochastic system. At the end of the semester, you should know the answers to the following questions.

* 1. What purpose does a simulation model serve?
  2. What are the fundamental principles underlying computer simulation?
  3. What needs to be done *before* constructing a simulation model?
  4. How should the simulation model be used in the real world?
  5. When should a simulation model not be developed?

One important skill that you will acquire in this course is programming with ARENA to construct simulation models, which includes performing input and output analysis of data with simulation, and animation. Learning the use of other simulation languages is relatively easy if one masters the use of one language.

**Textbook:** “Simulation Modeling and ARENA” written by M. Rossetti; published by John Wiley and Sons.

**References:**

1. “Simulation Modeling and Analysis with ARENA”written by T. Altiok and B. Melamed, published by Cyber Research Inc. and Enterprise Technology Solutions, Inc.

2.“Simulation Modeling and Analysis”, A.W. Law and W.D. Kelton; published by McGraw Hill.

**Grading Policies:**

Homework 1: 10%

Homework 2: 15 %

Homework 3: 15%

Midterm Exam 1: 30 %

Midterm Exam 2: 30%

**Class Policies:**

**Academic Dishonesty:**

**All homework assignments must be done individually. Students must not help each other on assignments. During exams, students are not allowed to talk to each other or communicate via any other medium (e.g., cell phone). Students must not bring any material that is not permitted to the exam room.**

* Late homework will not be accepted under normal circumstances.
* The examinations will be held as per schedule, and no adjustment will be made for any travel plans of students.
* The rules regarding academic dishonesty are at: <http://registrar.mst.edu/academicregs>
* *If you have a documented disability and anticipate needing accommodations in this course, you are strongly encouraged to meet with me early in the semester. You will need to request that the Disability Services staff* (<http://dss.mst.edu>) *send a letter to me verifying your disability and specifying the accommodation you will need before I can arrange your accommodation.*
* The purpose of the Academic Alert System [http://academicalert.mst.edu](https://minermail.mst.edu/exchweb/bin/redir.asp?URL=http://academicalert.mst.edu/) is to improve the overall academic success of students by improving communication among students, instructors and advisors; reducing the time required for students to be informed of their academic status; and informing students of actions necessary by them in order to meet the academic requirements in their courses. I will use the academic alert system in case of problems.

**Course syllabus (and a tentative schedule):**

* Introduction to Simulation: Online Notes and Chapter 1 (Weeks 1-3)
* Definition of models and systems; definition of simulation models.
* What simulation models can and cannot do.
* Advantages and disadvantages of simulation models.
* Random number generation.
* Simulation with calculators and simulation clocks.
* Introduction to Simulation with ARENA (Chapter 2: all sections) (Weeks 4-7)

1. Entities, variables, and various ARENA blocks.
2. Replications and simulation length.
3. Running the program.

* Input analysis of data (Weeks 9-11)

(Chapter 3: all sections excluding 3.3.1.1, 3.3.3, 3.3.4, and Appendices; Examples 3.5, 3.6, 3.7, 3.8, and 3.9 also excluded)

* Output analysis of data (Weeks 12-end)

(Chapter 4. Only the following sections: 4.1; 4.2; 4.3 exclude 4.3.3 and 4.3.4; 4.4 exclude 4.4.1, 4.4.2 and 4.4.3, 4.4.4 and 4.4.5)

***During the course of the semester, feel absolutely free to stop by my office during office hours or at any time you see me in my office. Send me an email to make an appointment, or leave a message on my voice mail, if you don’t see me in my office. Wish you good luck and a great semester!***