COLORADOSCHOOLOFMINES

Subject: Simulation Number: EBGN 528

Course Title: Industrial Systems Simulation

Section: A

Semester/year: Spring 2015

Instructor or Coordinator: Steffen Rebennack

Contact information (Office/Phone/Email): EH 310 / 303-273-3925 / srebenna@mines.edu

Office hours: MT 3:30 pm – 6:00 pm and by appointment

Class meeting days/times: MW / 12:30 pm – 1:45 pm

Class meeting location: EH 217 (conference room)

Web Page/Blackboard link (if applicable): -

Teaching Assistant (if applicable): Mojtaba Rezakhah

Contact information (Office/Phone/Email): Brown Building W378 / - / mrezakha@mines.edu

Office hours: M 1:45 pm – 2:45 pm

Instructional activity: _3_ hours lecture _0_ hours lab ___ semester hours

Course designation: ___ Common Core ___ Distributed Science or Engineering

___ Major requirement _X_ Elective ___ Other (please describe _____)

Course description from Bulletin:

The course focuses on creating computerized models of real or proposed complex systems for performance evaluation. Simulation provides a cost effective way of pre-testing proposed systems and answering "what-if" questions before incurring the expense of actual implementations. The course is instructed in the state-of-the-art computer lab (CTLM), where each student is equipped with a personal computer and interacts with the instructor during the lecture. Professional version of a widely used commercial software package, "Arena", is used to build models, analyze and interpret the results. Other business analysis and productivity tools that enhance the analysis capabilities of the simulation software are introduced to show how to search for optimal solutions within the simulation models. Both discrete-event and continuous simulation models are covered through extensive use of applications including call centers, various manufacturing operations, production/inventory systems, bulk-material handling and mining, port operations, high-way traffic systems and computer networks. Prerequisites: MATH111, MATH530; or permission of instructor

Textbook and/or other requirement materials:

Required text ("Arena" book): *Simulation with Arena*, by Kelton, Sadowski and Swets, 5th or 6th edition, McGraw-Hill

Recommended text ("simulation" book): *Simulation Modeling & Analysis*, by A.M. Law, 4th edition, McGraw-Hill

Student learning outcomes: At the conclusion of the class students will…

1. be able set up a simulation model in ARENA,
2. master the basics of simulation theory, and
3. interpret the simulation results in a sound way.

Brief list of topics covered:

1. Basic simulation modeling
2. Probability theory basics
3. Statistics
4. Goodness-of-fit tests
5. Generating random variates
6. (Pseudo) random number generators
7. Variance reduction techniques
8. ARENA software

Policy on academic integrity/misconduct: The Colorado School of Mines affirms the principle that all individuals associated with the Mines academic community have a responsibility for establishing, maintaining an fostering an understanding and appreciation for academic integrity. In broad terms, this implies protecting the environment of mutual trust within which scholarly exchange occurs, supporting the ability of the faculty to fairly and effectively evaluate every student's academic achievements, and giving credence to the university's educational mission, its scholarly objectives and the substance of the degrees it awards. The protection of academic integrity requires there to be clear and consistent standards, as well as confrontation and sanctions when individuals violate those standards. The Colorado School of Mines desires an environment free of any and all forms of academic misconduct and expects students to act with integrity at all times.

Academic misconduct is the intentional act of fraud, in which an individual seeks to claim credit for the work and efforts of another without authorization, or uses unauthorized materials or fabricated information in any academic exercise. Student Academic Misconduct arises when a student violates the principle of academic integrity. Such behavior erodes mutual trust, distorts the fair evaluation of academic achievements, violates the ethical code of behavior upon which education and scholarship rest, and undermines the credibility of the university. Because of the serious institutional and individual ramifications, student misconduct arising from violations of academic integrity is not tolerated at Mines. If a student is found to have engaged in such misconduct sanctions such as change of a grade, loss of institutional privileges, or academic suspension or dismissal may be imposed.

The complete policy is online.

You will not use the ARENA software for any consulting projects nor are you allowed to improve your employer's business processes. If you intend to do so, then you need to buy the commercial ARENA license.

Grading Procedures: The homework assignments count collectively for 25% of the grade. Homeworks are weighted equally.

We will have a Mid-Term exam counting for 20% of the grade, plus a final exam that will count for 25% of the grade. The final exam will be comprehensive and will cover all the material.

The team project counts for 30% of your final grade.

The final (letter) grade will be determined by considering absolute scores. Specifically, the final grades will be given according to the following table:

93 – 100%	A
90 – 92%	At least A-
87 – 89%	At least B+
83 – 86%	At least B
80 – 82%	At least B-
77 – 79%	At least C+
73 – 76%	At least C
70 – 72%	At least C-

Coursework Return Policy: All homework, exams and the project will be graded within 2 weeks.

Absence Policy (e.g., Sports/Activities Policy): Class attendance is voluntarily.

Homework, Software, Labs, Team Project, Exam make-up:

- Homework must be turned in before it is due to be graded – plan ahead.
- There will be 6 homeworks, usually due on a Wednesday beginning of class. Teamwork is encouraged, but submission has to be individual.
- In the class, we will use the ARENA software (student version). This software can be obtained at http://www.mhhe.com/kelton. For installation instructions, please refer to APPENDIX D in the textbook. Failure to follow these instructions may result in an incomplete installation of the software.
- During the course of the semester there will be in-class labs. The exercises you work on in the lab will not be collected for grade. However, it is strongly recommended that you attend them because they will benefit you greatly. The lab assignments will be posted on our web-site several days before the lab. It would be a good idea to do some of the work (at least reading the assignment) before the day of the lab so that you can focus on getting answers to your questions rather than trying to do figure out the simple stuff.
- There will be a comprehensive team project. You will work in teams of up to 5 students. At the end of the semester, you will be evaluated by your teammates. Your grade will be based not only on your team score but also on your teammates' evaluations of you. Project development will take place in stages with specific deadlines. The final product will be due in the week before the exam week.
- *Exams*: If you will be absent during a scheduled exam, you should schedule a make-up time before you leave.

Common Exam Policy (if applicable): n/a

Detailed Course Schedule:

Date		Topic	Lab	HW	Project
Wed.	01/07	Basic simulation modeling	-	-	-
Mon.	01/12	Basic simulation modeling	-	-	-
Wed.	01/14	Probability theory basics	-	-	-
Mon.	01/19	-	Lab I	-	-
Wed.	01/21	Probability theory basics	-	HW I due	-
Mon.	01/26		Lab II	-	-
Wed.	01/28	Probability theory basics	-	-	-
Mon.	02/02	Probability theory basics	-	-	-
Wed.	02/04	Probability theory basics	-	HW II due	-
Mon.	02/09		Lab III	-	-
Wed.	02/11	Statistics	-	-	-
Mon.	02/16	Presidents' Day – no class			
Wed.	02/18	Statistics	-	-	-
Mon.	02/23		Lab IV	-	-
Wed.	02/25	Statistics	-	HW III due	-
Mon.	03/02	Statistics & review	-	-	-
Wed.	03/04	*Mid-term exam*			
Mon.	03/09	Spring break – no class			
Wed.	03/11	Spring break – no class			
Mon.	03/16	Statistics	-	-	-
Wed.	03/18	Goodness-of-fit tests	-	-	-
Mon.	03/23		Lab V	-	Proposal due
Wed.	03/25	Goodness-of-fit tests	-	HW IV due	-
Mon.	03/30	Goodness-of-fit tests	-	-	-
Wed.	04/01	Generating random variates	-	-	-
Mon.	04/06		Lab VI	-	-
Wed.	04/08	Generating random variates	-	-	-
Mon.	04/13	Generating random variates	-	-	-
Wed.	04/15	(Pseudo) random number generators	-	-	-
Mon.	04/20		Lab VII	-	-
Wed.	04/22	(Pseudo) random number generators	-	HW V & VI due	-
Mon.	04/27	Variance reduction techniques	-	-	-
Wed.	04/29	Project presentations	-	-	Report due
TBA	TBA	*Final exam*			