COURSE SYLLABUS

Operations Analytics POM-4410 & 5410 / MIS-4410

Winter 2018

Department of Decision & Information Sciences

School of Business Administration

Instructor: Dr. Osman T. Aydas - Assistant Professor of Supply Chain Management

Office Hours: Tuesday and Thursday 2:00 PM - 3:20 PM and by appointment.

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Class Time: Tuesday and Thursday 3:30 PM - 4:45 PM **Lecture Room:** 223 Elliot Hall

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Course Description

Computer simulation is the art and science of creating and using computerized models of real systems to better understand them. Simulation is one of the most important and widely used quantitative/computer modeling technique in business. This course focuses on modeling and analyzing business operations using computer simulation including "Discrete Event", "Monte-Carlo", and "Systems Dynamics". Topics include simulation modeling, input and output analysis, and managing simulation projects. The course includes hands-on work related to application of computer simulation modeling in the context of managerial decision making under uncertainty and designing business processes. Cross-listed with POM 4410, MIS 4410 and POM 5410. Offered as MIS/POM/QMM 445/645 - Simulation in Business and MIS/POM/QMM 441/541 - Operations Analytics previously.

Prerequisite(s): (QMM 241 or QMM 2410) and (POM 343 or POM 3430) with a minimum grade of 2.0 in each course.

The following major topics are covered:

- Overview of Simulation Modeling
- Monte-Carlo Simulation of Static Systems
- Monte-Carlo Simulation of Dynamic Systems
- Dynamic Models and Process Physics
- Fundamentals of Discrete Event Simulation

- Introduction to Simio and Developing First Simio Models
- Modeling Business Systems with Simio
- Simulation Output Analysis
- Data Collection, Visualization & Analysis (Input Modeling)
- Conducting Simulation Studies
- Animation and more advanced modeling
- More on advanced modeling and simulation projects
- System dynamics models

Learning Outcomes

This course is intended to give students the opportunity to be business simulation modelers. Students will become familiar with both the methodology and application of computer simulation modeling within the context of managerial decision making under uncertainty and business process design and analysis. We will use an industry leading discrete event simulation software package called Simio which facilitates construction of dynamic, animated simulation models. Specifically, by the end of this course, you should be able to:

- Identify business situations in which computer simulation is appropriate
- Outline the role that simulation plays in the broader context of analyzing complex business systems
- Describe the statistical underpinnings of computer simulation modeling
- Develop conceptual discrete event models of complex business systems
- Develop spreadsheet based simulation models for decision making under risk/uncertainty
- Develop dynamic computer simulation models using a discrete event simulation package
- Collect and analyze data to estimate model input parameters
- Verify and validate simulation models
- Design experiments to compare system alternatives
- Interpret and analyze the output of computer simulation models
- Design and carry out a simulation study of a realistic business problem

Required Textbook

Simio and Simulation: Modeling, Analysis, Applications (4th Edition) - Kelton, Smith and Sturrock

See course Moodle site for details on obtaining the book.

Prerequisites

Any student who has had an introductory operations management course, introductory information systems course and completed the statistics sequence is theoretically prepared to take this course. This course will challenge most students in that it is simultaneously quantitative, technical and design oriented. It will require you to be creative and ingenious while at the same time being super logical and precise. Be prepared to push yourself and you will be rewarded with the learning of a very practical topic and set of skills that do have demand in the market place. You must also be comfortable with learning and using a myriad of software packages and with the inevitable ambiguity that comes along with building models of real systems.

Resources

Our course web site in Moodle will contain a wealth of learning resources including skeleton lecture notes, links to supplementary readings and videos, example models, and discussion forums. Our textbook is very "tutorial oriented" and is a great way to learn both Simio and simulation in general. One of the authors, David Kelton, is truly one of the giants of the simulation field.

Software

Simio is available on all SBA computers. You can also download the student version of Simio. There's a free version that has model size limits, and a $25 version that has no limits (and includes an additional Simio textbook). See the course Moodle site for more details. We will also use @Risk for Monte-Carlo simulation and it is also available in the SBA labs. MS Office will also be used for a variety of tasks including data analysis, writing log files, creating reports and presentations. We may also use a few other software tools for specialized tasks such as exploring agent based simulation models or system dynamic models.

Evaluation

The only way to learn simulation is to build simulation models and use them to solve problems. As such, this class will be VERY "hands on". We will do many short modeling/analysis assignments and a final project.

There will be no exams. There will be a few in-class and short Moodle quizzes worth 15% of your overall grade. The grading breakdown will be:

Assignments: 60%

Final Project: 25%

In class exercises/quizzes: 15%

Assignments will be individual but you can collaborate with your classmates in terms of idea sharing and problem solving. However, everyone will do and turn in their own assignment (otherwise, you will receive zero on the assignment). Assignments should be downloaded and submitted through Moodle. Make sure you check the course Moodle site regularly as the deadline of assignment submissions will be announced in Moodle. Late submissions will be penalized by 20% of the grade for every day following the deadline. The Final Project will be a group project with group sizes ranging from 1-4. The in-class exercises and Moodle quizzes will be done individually. I will give you specific guidance on each assignment and will provide more details on the Final Project in class.

Grading Scale:

A	3.6 - 4.0	90% and above
B	3.0 - 3.5	$\geqslant$ 75% but $\leqslant$ 90%
C	2.0 - 2.9	$\geqslant$ 60% but $\leqslant$ 75%
D	1.0 - 1.9	$\geqslant$ 45% but $\leqslant$ 60%
F	No Credit - 0.0	$\leqslant$ 45%

Table 1: Grading Scale

Notices

- Any student who feels he or she may need an accommodation based on the impact of a disability should contact me privately to discuss his or her specific needs.
- If you are having trouble in class, please come and see me.
- Feel free to contact the instructor through email anytime when you need help; you can expect to hear back within 24 to 48 hours.
- Online expectations (Moodle): It is the responsibility of the student to check the Moodle site of the

course regularly to be informed on course tasks, schedule, deadlines, announcements and expectations.

- Cell phones should be kept at vibration mode during the class.
- Cheating on assignments, project or exercises will not be tolerated.
- There will be no make-up for assignments, exercises, quizzes or the project except for the following four reasons supported by medical or other appropriate documentation. You must inform the instructor at least two days before the exam, and provide the instructor with supporting document(s).

  1. Participation in an authorized University activity.
  2. Confinement due to illness, under a doctor's care.
  3. Death in the immediate family.
  4. Participation in legal proceedings that requires your presence.

  This policy will be strictly enforced - no exceptions. Anyone who does not have a valid reason will receive zero on the course component.

Course Schedule

The Moodle site is the final say on course schedule. However, here is a basic tentative topic outline:

Operations Analytics POM-4410 & 5410 / MIS-4410
Winter 2018
Tentative Schedule of Topics

Date	Day	Topics Covered
4-Jan	Thu	Overview of Simulation Modeling
9-Jan	Tue	Monte-Carlo Simulation of Static Systems
11-Jan	Thu	Monte-Carlo Simulation with @RISK
16-Jan	Tue	Dynamic Monte-Carlo Simulation
18-Jan	Thu	Fundamentals of DES & Process Physics
23-Jan	Tue	Queueing Systems
25-Jan	Thu	Introduction to Simio
30-Jan	Tue	First Simio Models
1-Feb	Thu	Simio Framework: Properties, State & Response Variables
6-Feb	Tue	Simio Framework: Add-On Processes
8-Feb	Thu	Modeling Business Systems with Simio
13-Feb	Tue	Working wih Model Data: Using Data Tables
15-Feb	Thu	Working wih Model Data: Sequence & Arrival Tables
20-Feb	Tue	Winter Recess
22-Feb	Thu	Winter Recess
27-Feb	Tue	Working wih Model Data: Rate & Lookup Tables
1-Mar	Thu	Input Modeling & Analysis
6-Mar	Tue	Advanced Modeling with Simio
8-Mar	Thu	Simulation Optimization with OptQuest
13-Mar	Tue	Animation & Entity Movement
15-Mar	Thu	Animation & Entity Movement
20-Mar	Tue	Miscellaneous Modeling Topics
22-Mar	Thu	Miscellaneous Modeling Topics
27-Mar	Tue	Simulation Success Skills
29-Mar	Thu	Simulation Output Analysis
3-Apr	Tue	Case Studies Using Simio
5-Apr	Thu	Case Studies Using Simio
10-Apr	Tue	Project Group-Study Day
12-Apr	Thu	Final Project Presentations
17-Apr	Tue	Final Project Presentations

Table 2: Tentative Schedule of Topics

Class Policies:

1. **Academic Conduct Policy:** All members of the academic community at Oakland University are expected to practice and uphold standards of academic integrity and honesty. Academic integrity means representing oneself and one's work honestly. Misrepresentation is cheating since it means students are claiming credit for ideas or work not actually theirs and are thereby seeking a grade that is not actually earned. Following are some examples of academic dishonesty:

   (a) *Cheating on examinations*. This includes using materials such as books and/or notes when not authorized by the instructor, copying from someone else's paper, helping someone else copy work, substituting another's work as one's own, theft of exam copies, or other forms of misconduct on exams.

   (b) *Plagiarizing the work of others*. Plagiarism is using someone else's work or ideas without giving that person credit; by doing this students are, in effect, claiming credit for someone else's thinking. Whether students have read or heard the information used, they must document the source of information. When dealing with written sources, a clear distinction should be made between quotations (which reproduce information from the source word-for-word within quotation marks) and paraphrases (which digest the source of information and produce it in the student's own words). Both direct quotations and paraphrases must be documented. Even if students rephrase, condense or select from another person's work, the ideas are still the other person's, and failure to give credit constitutes misrepresentation of the student's actual work and plagiarism of another's ideas. Buying a paper or using information from the World Wide Web or Internet without attribution and handing it in as one's own work is plagiarism.

   (c) *Cheating on lab reports* by falsifying data or submitting data not based on the student's own work.

   (d) *Falsifying records* or providing misinformation regarding one's credentials.

   (e) *Unauthorized collaboration on computer assignments* and unauthorized access to and use of computer programs, including modifying computer files created by others and representing that work as one's own.

2. **Add/Drops:** The university policy will be explicitly followed. It is the student's responsibility to be aware of deadline dates for dropping courses.

3. **Special Considerations:** Students with disabilities who may require special accommodations should

make an appointment with campus Disability Support Services, 106 North Foundation Hall, phone (248) 370-3266. Students should also bring their needs to the attention of the instructor as soon as possible by providing the "Letter of Accommodations" created by DSS. For academic help, such as study and reading skills, contact the Academic Skills/Tutoring Center, 103 North Foundation Hall, phone 248 370-4215.

4. **Excused Absence Policy:** This policy for university excused absences applies to participation as an athlete, manager or student trainer in NCAA intercollegiate competitions, or participation as a representative of Oakland University at academic events and artistic performances approved by the Provost or designee. Students shall inform their instructors of dates they will miss class due to an excused absence prior to the date of that anticipated absence. For activities such as athletic competitions who schedules are known prior to the start of a term, students must provide their instructors during the first week of each term a written schedule showing days they expect to miss classes. For other university excused absences students must provide each instructor at the earliest possible time the dates that they will miss.

   Make-up work:

   - It is the responsibility of the student to request from the instructor an opportunity to complete missed assignments, activities, labs, examinations or other course requirements in a timely manner.
   - Students are responsible for all material covered in classes that they miss, even when their absences are excused, as defined above.
   - Missed classroom activities will be rescheduled at the discretion of the instructor.

5. **Religious Observance Policy:** It is the responsibility of the student to request (within the first week of classes) from the instructor an excused absence due to a religious observance during the semester.

6. **Emergency Preparedness:** In the event of an emergency arising on campus, the instructor will notify you of actions that may be required to ensure your safety. It is the responsibility of each student to understand the evacuation and "lockdown" guidelines to follow when an emergency is declared. These simple steps are a good place to start:

   - OU uses an emergency notification system through text, email, and landline. These notifications include campus closures, evacuation, lockdowns and other emergencies. Register for these notifications at oakland.edu/uts/emergencynotification
   - Based on the class cellphone policy, ensure that one cellphone is on in order to receive and share

emergency notifications with the instructor in class.

- If an emergency arises on campus, call the OUPD at 248-370-3331. Save this number in your phone, and put it in an easy-to-find spot in your contacts.
- Review protocol for evacuation, lockdown, and other emergencies via the classroom's red books (hanging on the wall) and oakland.edu/prepared.
- Review with the instructor and class what to do in an emergency (evacuation, lockdown, snow emergency).

7. **Faculty Feedback:** As a student in this class, you may receive "Faculty Feedback" in your OU e-mail if your professor identifies areas of concern that may impede your success in the class. Faculty Feedback typically occurs during weeks 2-5 of the Fall and Winter terms, but may also be given later in the semester and more than once a semester. A "Faculty Feedback" e-mail will specify the area(s) of concern and recommend action(s) you should take. Please remember to check your OU email account regularly as that is where it will appear.