BUAN 5260: Mathematical Modeling for Decision Making

Spring 2018: Tuesday, 6:00 – 8:40 PM, Law Annex 143

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Office Hours: Tuesday, 4:00 – 5:30 PM
or **by appointment**, I'm on campus most days

DESCRIPTION: This course introduces a variety of modeling approaches for decision-making problems. The first part of the course focuses on constrained optimization problems, including linear, network, dynamic, integer, and nonlinear programming. The second part of the course addresses other decision-making frameworks such as decision trees, queueing theory and Markov decision processes. Applications that may be used during the course include: allocation of advertising and sales effort, revenue management, production and distribution systems planning, consumer behavior, and scheduling of operations. The emphasis throughout is on understanding the problem, formulating a suitable model, finding a solution, performing sensitivity analysis, and interpreting and communicating the results in terms of decision making. The course seeks to provide an intuition for how different techniques work, along with experience in applying them to real problems, and in presenting results and recommendations in a clear and persuasive manner to specialists and non-specialists alike.

PREREQUISITES: The general course prerequisites include programming in R, calculus and introductory level statistics.

LEARNING OBJECTIVES: At the end of this course students will be able to:

1. Identify and describe complex business problems in terms of analytical models
2. Compare and contrast different analytical models and their critical components
3. Be proficient using software to set-up and solve analytical models
4. Communicate business problems and solutions to technical and lay audiences

This course meets the following Seattle University's graduate learning outcomes:

- Demonstrate mastery of competencies required in their profession or field
- Demonstrate effective communication in speech and in writing
- Exhibit effective collaboration skills

This course meets the following among the Albers School's MSBA learning outcomes:

- Identify and describe complex business problems in terms of analytical models
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives
- Translate results of business analytic projects into effective courses of action
- Communicate technical information to both technical and non-technical audiences in speech, in writing, and graphically
- Exhibit effective collaboration and leadership skills

COURSE PARTICIPATION EXPECTATIONS: Treat classmates with respect! We will spend a significant portion of each class meeting actively working on setting up and solving problems. One of your most valuable resources is other students in the class, so it is paramount that we create an open, supportive and collaborative learning environment. If you have a question it is very likely that several of your classmates either have the same question or have dealt with a similar situation. So please ask questions so we can learn from each other.

REQUIRED TEXT: *Introduction to Operations Research, 10th Edition*, F. S. Hillier and G. J. Lieberman. The class will require the 10th edition because it was updated substantially relative to previous editions; however, the online resources are not required to you can purchase a used copy of the text. Renting and online versions are also an option.

COMPUTER: We will use computers during each class meeting, make sure you have R installed, or can connect to the SU V-lab.

TEACHING APPROACH: There will be a combination of lecture and in-class activity. There will be assigned reading and activities prior to class, then a portion of class will be spent applying techniques from the assigned readings.

MATERIALS: Course materials including assignments and links will be made available at the course web page on Canvas, which can be found at: http://seattleu.instructure.com.

FIRST DAY ASSIGNMENT: No FDA, you deserve a break!

PARTICIPATION ACTIVITIES: There will be 4+/- in-class assignments; each will contain basic analysis and writing worth 5 points each. These assignments are to be completed and submitted in class (unless you give prior notice that you cannot attend class). There will be significant discussion during these activities. You are encouraged work in groups of 2 or 3 students.

HOMEWORK: There will be 4 homework assignments worth 10 points each that will be completed in R. You are encouraged work in groups of 2 or 3 students.

QUIZZES: There will be 2 in-class quizzes worth 25 points each. Each quiz will cover material from the previous couple of weeks and will be hand written, no computer allowed.

TAKE-HOME PROJECTS: There are 2 take-home project assignments that will be covered in separate handouts. The goal of these projects is to develop deeper understanding of the course material by applying them to detail oriented projects.

GRADING: Points will be assigned to individual assignments, not letter grades. A final grade will be assigned at the end of the term based on total points and relative standing in class. Plus/minus grades vary from the range given below by approximately 3% (i.e. 87-89.5% is a B+ and 90-93% is an A-). A tentative grading schedule is:

A range: 90-100% of total points
B range: 80-89.5% of total points
C range: 70-79.5% of total points
D range: 60-69.5% of total points
F range: less than 59% of total points

This grading schedule is subject to change during the course of the quarter based on the overall performance of the class, but it will **NOT** be made more difficult.

Grades will be based on the following assignment points:

4+/−	Participation Activities (5 points each, 20+/- points total)
4+/−	Homework Assignments (10 points each, 40+/- points total)
2	Quizzes (20 points each, 40 points total)
1	Mid-term Project (40 points)
1	Final Project (60 points)
200+/−	Total assigned points

ELECTRONIC DEVICES: The use of laptops, netbooks or PDAs in class to take class-notes, run analysis, view PowerPoints or work on class projects is encouraged. However, please do not use laptops, netbooks or PDAs (cellphones, hand-helds) in class for any non-class related activity (including instant messaging, web-browsing, etc.) unless specifically suggested by the instructor.

LEARNING SERVICES AND DISABILITY: All students should consider using the SU Learning Assistance Programs as a tutoring and learning resource. They provide services to support academic success, including: Study Skills Workshops, 1-to-1 Peer Tutoring, Drop-in Tutoring, Study Groups, Language Conversation Groups, and Individual Learning Style and Study Skills Consultations. You can learn more about SU's programs at: https://www.seattleu.edu/learning-assistance/. If you have, or think you may have, a disability that interferes with your performance as a student in this class, you are encouraged to arrange support services and/or accommodations through Disabilities Services staff in the Learning Center, Loyola 100, (206)296-5740. Disability-based adjustments to course expectations can be arranged only through this process.

ACADEMIC INTEGRITY: It is assumed that students understand Seattle University's policies regarding plagiarism and academic integrity. Any deviation from said policies will not be tolerated!

TITLE IX OF THE EDUCATION AMENDMENTS OF 1972: Title IX prohibits discrimination based on sex in educational programs or activities that receive Federal financial assistance. This prohibition includes sexual misconduct, which encompasses sexual harassment and sexual violence. Seattle U remains committed to providing a safe and equitable learning, living, and working environment. Seattle U offers emergency, medical, and other support resources, as well as assistance with safety and support measures, to community members who have experienced or been impacted by sexual misconduct.

COURSE OUTLINE: A detailed schedule will be provided on a separate handout

Section I: Constrained optimization

1. Linear programming
2. Duality theory
3. Linear programming under uncertainty
4. Network optimization
5. Dynamic programming
6. Integer programming
7. Nonlinear programming

Section II: Other decision models

1. Queueing theory

Section III: Simulation

1. Simulation