

QMETH 501: DECISION SUPPORT MODELS

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	Office hours: Fridays 5-6 pm on Zoom (Oct 21, Nov 4, Nov 11, Nov 18, Dec 9)		
	Review sessions: 5-6 pm on Zoom (Oct 28 and Dec 2)		
CLASS SCHEDULE	Mondays and Wednesdays; see detailed schedule on page 5		
Ехам	Final (take-home) exam due: Dec 13, 11:59 pm		

COURSE DESCRIPTION

Business managers often find themselves in situations where key variables need to be optimized while considering the financial implications of their decisions and complex inter-relationships. Mathematical models help accurately represent the business setting of interest, structure the inter-relationships, and analyze the implications of such decisions.

This course deals with the use of decision support models to drive business decision making. Two notable real-life examples of models we will see are:

- The Alliance for Paired Donations (APD) seeks to save lives by securing a living donor kidney for a patient who needs a transplant. Patients often know a loved one that is willing to donate a kidney, but their kidney is often incompatible with the recipient. The APD uses integer programming techniques to determine the best pairs of donors-recipients for a paired kidney exchange.
- American Airlines, one of the pioneers of using decision support models in the airline industry, uses revenue management to decide how to set prices for each seat and how much to overbook a plane by so that profits are maximized.

The use of decision support models has increased recently due to improvements in computing technologies and the availability of large volumes of data.

The objective of the course is three-fold: First, it introduces you to the basics of formulating a business problem using a valid mathematical model. Second, it gives you hands-on experience in using a computerbased procedure to derive solutions and generate useful insights. Third, it hones your skills on critiquing, and proposing actionable recommendations based on, quantitative models.

COURSE MATERIALS

A web page will be available for this course on Canvas. You will need to access this web page for announcements about class, lecture notes, assignments and other materials. All the slides used in class will be posted on this web page before each session. Annotated slides reflecting in-class discussion will be posted after class. The following textbooks are recommended for additional practice, but not required:

- Hillier and Hillier, Introduction to Management Science, 5th (or newer) Ed., McGraw-Hill/Irwin.
- Ragsdale, Spreadsheet Modeling & Decision Analysis, 8th (or newer) Ed., Cengage.

We will be using the following cases in this course (see Canvas for a link to download from HBSP):

- I. Designing Optimal Capacity Planning Strategies (Mapleleaf) by Hall Jr. and McPeak.
- II. Zalando: Becoming the Starting Point for Fashion by Moreno, Nageswaran, Billaud, and Gabrieli.

COMPUTER SOFTWARE

We will use Microsoft Excel spreadsheets extensively throughout the course. Moreover, we will use:

- a. Solver. We will use this to solve constrained optimization problems in Sessions 1-4. The Solver add-in can be installed for free on your computer; please view Canvas for detailed instructions.
- b. Crystal Ball. We will use this software in Sessions 6-9. We will use the Foster Remote Lab where computers have the academic license to Crystal Ball. Please view Canvas for detailed instructions.

GRADING

Your final grade will be determined using the following weights:

4 x Individual Homework	40%
1 x Team Presentation	20%
Final Exam	35%
Class Participation	5%
	4 x Individual Homework 1 x Team Presentation Final Exam Class Participation

INDIVIDUAL HOMEWORK

You should turn in your assignment by 11:59 pm (see course schedule on page 5 for due dates). This should be an Excel Workbook uploaded to Canvas. All relevant work and computations should be shown for full credit. The assignments should display your original work; there should be no sharing of solutions/answers with your peers or teammates. Late assignments will not be accepted.

TEAM PRESENTATION

Presentations will be done in teams on one of two dates (see schedule on page 5 and team assignments on Canvas). Your team will develop a spreadsheet model that addresses a decision that needs to be made. The spreadsheet model should build upon or be related to one of the techniques covered in this class.

Then your team will present the decision to be made, the spreadsheet model developed to address it, and your final recommendation. The presentations should not exceed 15 minutes, including 5 minutes for Q&A. The presentation and spreadsheet will be graded for both content (two-thirds weight) and quality of presentation (one-third weight). Criteria I will be looking for include:

- 1) How effectively the model builds on the modeling techniques discussed in class,
- 2) how well does the model address the decision being made,
- 3) is the presentation clear and easy to understand,
- 4) can you convince the audience that the model is effective and the solution a good one.

Deliverables: At least one hour before class on your presentation day, please have one member of your team submit to Canvas the spreadsheet model that your team has built and any other electronic items used in your presentation (e.g., Powerpoint slides).

FINAL EXAM

There will be a take-home final exam, available at 4 pm on Friday, Dec 9 and due by 11:59 pm on Tuesday, Dec 13. You are allowed to use the textbook and any material available on our course webpage on Canvas, but the exam must be completed individually without assistance from any other person or resource.

If you are unable to work on the final exam during this time window, a written explanation must be provided before Dec 2 (i.e., one week prior); otherwise, no alternate arrangements will be offered.

CLASS FORMAT

This course will implement the "Active" learning method, which may be different from lecture-based courses you may have taken in the past. As part of this instruction method, you are expected to complete certain learning tasks (called pre-session tasks) *before* you come to each live session. These tasks may be reading an article, watching a video, or attempting a problem; the details are provided on Canvas. The majority of live class session time will be devoted to checking your understanding of the self-paced learning content, in-class worksheets, collaborative problem-solving, discussions, and Q&A. Research shows that discussion enhances learning; you will benefit from hearing others' experiences and approach to various problems. Crucially, this allows you the opportunity to learn basic concepts independently at your convenience and at your own speed. There will be discussion boards available on Canvas to post and answer questions related to these pre-session tasks. This approach ensures that students come to the live session with questions on the concept so that the session is more focused and valuable to everyone.

CLASS PARTICIPATION

Please come to the class each day fully prepared. Please carefully review the previous classes, read the assigned materials, complete the pre-session tasks, and be ready and willing to actively engage in the classroom learning experience. Participation grade will be based on contributions to lectures. Contributions that add new insights or advance the discussions, including comments based on your work experience, will be credited higher. Low attendance will adversely affect your participation grade.

COURSE POLICIES

The Foster Undergraduate Program is committed to providing an active learning environment where student participation and engagement is valued. In the spirit of creating such an experience in the classroom, all electronic devices including, but not limited to, laptops, tablets, e-readers etc. are expected

to be used only for note taking and other activities related to this coursework. If a student comes to class late, unprepared, and/or is distracted by electronic devices, the student cannot effectively participate in class discussions and the participation grade will reflect that.

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<u>https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/</u>). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (<u>https://registrar.washington.edu/students/religious-accommodations-request/</u>).

COVID PROTOCOLS & MISSED CLASSES

The current UW mandate recommends wearing face masks indoors at UW locations. Please remember that as people need to or choose to wear masks for a wide range of reasons, we should respect their decision to do so. If you are sick with any illness, you *must* stay home, even if you are fully vaccinated.

The way to catch up for any missed classes (due to COVID-related or other reasons) is through the video recording and notes posted to Canvas: In particular, every session will be recorded, and recordings will be posted to Canvas as soon as they are available (typically the next day). Furthermore, all notes I make in class, and all complete Excel files used in class, will be uploaded to Canvas after the session as well. In order to preserve the high quality of the in-person experience for students and to ensure that the class proceeds without avoidable distractions, there is no option to join live sessions remotely.

ACADEMIC INTEGRITY

By being a student in this course you acknowledge that you are a part of a learning community at the Foster School of Business that is committed to the highest academic standards. As a part of this community, you pledge to uphold the fundamental standards of honesty, respect, and integrity, and accept the responsibility to encourage others to adhere to these standards.

COURSE SCHEDULE

WEEK	DATE	SESSION	HW DUE	KEY PRE-SESSION TASKS
4	Oct 19	1. Introduction to Models and Programming		(Read) OJ Algorithm Article
5	Oct 24	2. Basics of Linear & Integer Programming		(Watch) Excel Solver Illustration (Attempt) Example 1(a)
	Oct 26	3. Applications of Linear Programming		(Read) The Chef Program & Case Questions
	Oct 30		HW 1	
8	Nov 14	4. Applications of Integer Programming		(Read) Mapleleaf & Case Questions
	Nov 16	5. Team Presentations (1/2)		
	Nov 20		HW 2	
0	Nov 21	6. Basics of Simulation I		(Read) Simulation Article
9	Nov 27		HW 3	
10	Nov 28	7. Basics of Simulation II		(Watch) Crystal Ball Illustration
	Nov 30	8. Applications of Simulation		(Read) Zalando & Case Questions
	Dec 4		HW 4	
11	Dec 5	9. Review, Wrap-up & Conclusion		
	Dec 7	10. Team Presentations (2/2)		
12	Dec 13	Final Exam (due at 11:59 pm)		

Note: The schedule is tentative; please refer to Canvas for announcements, details about each session and all the required pre-session tasks.