

# DECISION SUPPORT MODELS BA 502 (QMETH)—SPRING 2021

## INSTRUCTOR

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Class Sessions Tuesday and Thursday March 30–May 4 (*except* April 27):

(Section A via Zoom [link](#)) 8:45am–10:15am

(Section B via Zoom [link](#)) 10:30am–12:00pm

Office Hours (via Zoom [link](#)): Mondays, Tuesdays, and Thursdays, 12:15–1:00pm (March 29–May 6)

Help Sessions (via Zoom [link](#)): Fridays, 8:45–9:15am (April 2–April 30)

## COURSE DESCRIPTION

This course introduces you to the concepts and methods of management science, which applies mathematical modeling and analysis to management problems. Our principal interest is to help you develop the skills necessary to build and evaluate models and to understand the reasoning behind model-based analysis. Spreadsheet packages now have features that allow managers to perform sophisticated quantitative analysis in the comfortable and intuitive environment of the spreadsheet.

## ONLINE LEARNING

Due to the coronavirus pandemic, all classes will be held online using Canvas and Zoom this quarter. I am confident that we can make this a successful learning experience that will accomplish all of the same learning objectives as if this class were being held live and in person.

## COURSE MATERIALS

**Textbook:** Hillier and Hillier, *Introduction to Management Science*, 6<sup>th</sup> Edition, McGraw-Hill/Irwin, 2019. This book is available at the UW Bookstore.

**Course Packet:** includes copies of the syllabus, class slides, problem sets, and case study. Available in paper form from E Z Copy N' Print at 4336 University Way. The paper format is recommended for ease of taking notes during class recordings and live Zoom sessions. The complete packet is also available for download in pdf format on the [Canvas Home Page](#), or all of the elements (syllabus, class slides by session, problem sets, case) are available individually on the various Canvas pages.

## SOFTWARE

Microsoft Excel, including the Solver, TreePlan, and Crystal Ball add-ins (see the [Canvas Home Page](#) under Course Software for how to obtain these Excel add-ins). For Windows, Excel 2010 and later will work for this course. For the Mac, Excel's Solver is somewhat unreliable—please read the information for Mac users available on the [Canvas Home Page](#) (under Course Software). The Analytic Solver available with the text is *not* required for this course.

## DELIVERY METHOD

For most class sessions, there is some material that is best delivered asynchronously (through videos that I have recorded for you)—basically lecture material. Then there is other material that is more interactive (with discussion, breakout groups, demonstrations, games, or the like) that is best delivered synchronously, in a live class meeting over Zoom.

Therefore, I will be dividing up most class sessions as follows:

**Before Class:** There will typically be a video or a set of videos to watch (posted on [Canvas](#)) that must be watched *before* the live class session. The live class session will assume that *everyone* has watched these videos. A discussion board will be provided for each video, so you can post any questions or comments you may have. Please monitor these discussion boards. If you have a question, be sure it hasn't already been asked (and possibly answered) to avoid cluttering the board with repetition. If you have an answer to another student's question, please provide it—I strongly encourage you to help out your fellow students. I will also be monitoring the discussion boards periodically to offer my help and answer questions.

**Live Class Session:** On scheduled class days, you will join a Zoom meeting at 8:45am for Section A ([link](#)), and at 10:30am for Section B ([link](#)). You should join with video *on* and audio *muted*.

**After Class:** There may be a video or a set of videos to watch (posted on [Canvas](#)) that should be watched *after* the live class session. As with the before-class videos, a discussion board will be provided for you to post questions, comments, and answers, that I will also be monitoring.

I expect that the cumulative time of the recorded videos and the live class sessions will be roughly the 90 minutes that is traditionally allocated for class. As appropriate for the material being covered, some sessions will have many recorded videos and a shorter live-class session; others will have few recorded videos and a longer live class session. The live classes will always start at the designated start time (8:45 or 10:30), but sometimes end before the scheduled ending time.

## WARM-CALL LIST

To assure that everyone gets a chance to participate, I will be utilizing a “warm-call” list. At the start of class, I will post a list of several students (chosen randomly). During class, I will periodically pose questions, and will call upon the students from this list (in order). I have found that this helps draw out participation from quieter students and also helps the discussion to not be dominated by just a vocal few, all with less anxiety than “cold calling”.

## CANVAS

[Canvas](#) will include a separate page for each class session with detailed instructions on what should be done before and after class, links for the live class session, and links to download class materials. The downloads will typically include class slides and spreadsheets, including a data spreadsheet (which is what we will start with when building the models) and a completed spreadsheet (after building and solving the models). After class, an updated version of the class slides will also be posted that includes any notes I scribbled on them during class.

**PROBLEM SETS**

Four graded problem sets will be assigned in order to provide you the opportunity to develop and apply the concepts and tools discussed in class. Modeling with spreadsheets is best learned by doing. Therefore it is critical that every student first attempt to set up and solve each of the problems in the problem set on their own. It is fine (even encouraged) to discuss and/or get help from classmates at this point, whether in person or virtually. Any help provided should be via discussion only (including sharing screenshots to aid the discussion if needed), but should *not* include sending or copying of files or portion of files. Everything in your individual submission should be entered by you, based on your understanding of the material. This individual attempt should be submitted to [Canvas](#). The individual submissions will be reviewed, but only graded for completion and effort with feedback given only if there was a deficiency in completion or effort. Students should then meet in their pre-assigned study teams (virtually as needed) to compare solutions, clarify issues that were encountered, and streamline the various analyses into a single submission from the team. Take this opportunity to make sure everyone on the team understands the material and everything in the team assignment that is being submitted. At this stage (after everyone has submitted their individual submissions), sharing of files is permitted. One member of each team should submit the team submission to [Canvas](#). If possible, include all spreadsheets in a single workbook on separate tabs. The team submissions will be graded for accuracy and correctness, and thorough feedback provided.

**FINAL EXAM**

The final exam will be an untimed take-home that is open book, open notes, but must be completed individually, without assistance from any other person, and without the use of the internet (other than the class Canvas site).

**GRADING POLICY**

The course grade will be based on problem sets and a final exam. The final grade will be based approximately on the following weights:

- Problem Sets (Individual): 20%
- Problem Sets (Team): 30%
- Final Exam: 50%

**ACADEMIC INTEGRITY AND THE MBA HONOR CODE**

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. Furthermore, as part of the Foster MBA program, we have jointly agreed to conform to and uphold the MBA Honor Code.

**PRIVACY STATEMENT**

Part of this course is scheduled to run synchronously at your scheduled class time via Zoom. These Zoom class sessions will be recorded. The recording will capture the presenter's audio, video and computer screen. Student audio and video will be recorded if they share their computer audio and video during the recorded session. The recordings will only be accessible to students enrolled in the course to review materials. These recordings will not be shared with or accessible to the public.

The University and Zoom have FERPA-compliant agreements in place to protect the security and privacy of UW Zoom accounts. Students who do not wish to be recorded should:

- Change their Zoom screen name to hide any personal identifying information such as their name or UW Net ID, and
- Not share their computer audio or video during their Zoom sessions.

**RELIGIOUS OBSERVANCE ACCOMMODATION**

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 \(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/\)](https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/). Accommodations must be requested within the first two weeks of this course using the [Religious Accommodations Request form \(https://registrar.washington.edu/students/religious-accommodations-request/\)](https://registrar.washington.edu/students/religious-accommodations-request/)

# SCHEDULE

**TUESDAY, MARCH 30: SESSION 1****INTRODUCTION TO DECISION MODELING**

**Skim:** Text, Chapter 1

In this session we will discuss the role of models in managerial decision making, and provide an overview of the models and techniques to be covered during the quarter.

**THURSDAY, APRIL 1: SESSION 2****INTRODUCTION TO LINEAR PROGRAMMING**

**Read:** Text, Chapter 2 (you may skip Section 2.6)

Through a hands-on example (using Lego building blocks), we introduce the linear programming model. We will then discuss the use of the Solver feature in Microsoft Excel for modeling and solving such problems. We discuss the benefits and pitfalls of modeling a problem as a linear model. Finally, we examine the process of solving linear programs and basic properties of their solutions.

**PROBLEM SET 1 (A PRODUCT MIX MODEL)**

Individual Submission **due by 11:59pm on Monday, April 5**

Team submission **due by 11:59pm on Tuesday, April 6**

**TUESDAY, APRIL 6: SESSION 3****APPLICATIONS OF LINEAR PROGRAMMING MODELS**

**Read:** Text, Chapter 3

In this session we learn to recognize the various kinds of managerial problems to which linear programming can be applied. We will formulate linear programs that address problems from a variety of different business areas.

**THURSDAY, APRIL 8: SESSION 4****PRUDENT FINANCIAL SERVICES CASE STUDY**

**Read:** Text, Chapter 4

**Read (but do NOT prepare):** Case 4-1 “Prudent Provisions for Pensions” (at the end of Chapter 4 and also available in the packet just before Session 4 or on [Canvas](#)).

The objective of this session is to improve your ability to develop models in spreadsheets. We discuss the process of modeling, some guidelines for building good spreadsheet models, and techniques for debugging spreadsheet models.

**PROBLEM SET 2 (LINEAR PROGRAMMING APPLICATIONS)**

Individual Submission due by 11:59pm on Monday, April 12

Team submission due by 11:59pm on Tuesday, April 13

**TUESDAY, APRIL 13: SESSION 5****SENSITIVITY ANALYSIS****Read:** Text, Sections 5.1–5.6 (you may skip Ch. 5 subsections covering Parameter Analysis Reports)

We discuss the use of Solver output for performing post-optimality or sensitivity analysis for linear programs. This analysis is useful in testing the robustness of the solutions to a particular model, and also in providing valuable economic information about the problem being analyzed.

**THURSDAY, APRIL 15: SESSION 6****INTEGER MODELS****Read:** Text, Chapter 7

In this session we address problems where some or all of the decision variables are required to assume integer values. We discuss when rounding is appropriate and when it is not. We also discuss the application of binary variables to making “yes-or-no” type decisions.

**PROBLEM SET 3 (SENSITIVITY ANALYSIS AND INTEGER MODELS)**

Individual Submission due by 11:59pm on Monday, April 19

Team submission due by 11:59pm on Tuesday, April 20

**TUESDAY, APRIL 20: SESSION 7****INTRODUCTION TO DECISION ANALYSIS****Read:** Text, Sections 9.1–9.3 (replacing the Analytic Solver coverage in 9.3 with the Supplement to Chapter 9: TreePlan available on [Canvas](#) and also in the packet before the Session 7 class notes)

We discuss an approach to making decisions when there is uncertainty or risk present. We will discuss different criteria for making decisions and introduce decision trees as a tool for framing these problems. The TreePlan Excel add-in for developing decision trees is demonstrated.

**THURSDAY, APRIL 22: SESSION 8****VALUE OF INFORMATION AND RISK ATTITUDE****Read:** Text, Sections 9.4–9.11

Here we will discuss methods for adapting decision trees to evaluate the value of information that might be gathered before a decision needs to be made. Then we introduce the concept of risk aversion and discuss the importance of incorporating risk attitudes in a decision analysis model. We will discuss the use of utility functions to model risk aversion.

**PROBLEM SET 4 (DECISION ANALYSIS)**

Individual Submission due by 11:59pm on Wednesday, April 28

Team submission due by 11:59pm on Thursday, April 29

**THURSDAY, APRIL 29: SESSION 9****SIMULATION AND CRYSTAL BALL**

**Read:** Text, Chapter 20 (electronic chapter available on [Canvas](#))

In this session we discuss and demonstrate the role of simulation as a tool for analyzing systems involving uncertainty or risk. We discuss the use of the Crystal Ball Excel add-in for performing Monte-Carlo simulation.

**TUESDAY, MAY 4: SESSION 10****APPLICATIONS OF SIMULATION**

In this session we continue discussion of Monte-Carlo simulation and the Crystal Ball Excel add-in and its application to various business problems.

**THURSDAY, MAY 6: FINAL EXAM AVAILABLE AT 8:45AM**

**SATURDAY, MAY 8: FINAL EXAM DUE BY 11:59PM**