MGB-206 – Decision Making and Management Science

AREA: Analytics, General Management

TERM: Summer 2019

INSTRUCTOR: Mehul Rangwala
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OFFICE HOURS: Anytime I am not teaching.

I'm pretty approachable so, please feel free to contact me any time if you have any questions. We can get on a Zoom call and get your question answered anytime.

I will always stay back for 2 hours after every class.

CLASS DAYS AND TIMES: Fridays 2:00 pm – 5:00 pm and 6:00 pm – 9:00 pm
Bishop Ranch BR-1503
August 30, 2019 – Final (**Take-Home**)

COURSE DESCRIPTION: Management decisions involve uncertainty and cannot be simply made on the basis of common sense, rules of thumb, and judgement. The business environment is very dynamic and complex and the cost of making errors can be quite high. Systematic and scientific methods in decision-making supplement the traditional decision-making approaches. Contemporary decision-making involves developing decision models – simplified representations of real-life problems – and performing computer-based procedures to determine solutions to the problems.

This course provides a coverage of various quantitative techniques to aid managerial decision-making by using a model building approach. We will cover this course in three parts. The **first part** (classes 1 – 7) will cover optimization models using linear programming, integer programming, nonlinear programming, and multiple objective optimization. The **second part** (classes 7 and 8) will cover decision analysis. The **third and the final part** (classes 9 and 10) will cover the basics of computer simulation, how it differs from optimization, and the applications of simulation in management. At the end of the course, students will present a group project involving an optimization study in a subject area of their choice.

The course is covered from a managerial rather than technical perspective, that is, we won't delve into the details of the algorithms used by computers to solve the models, but use Microsoft Excel for model formulation and rely on the Solver software for the model execution and displaying results. We will then interpret the results for guiding management actions.

PREREQUISITES:

1. College-level Mathematics.

2. Since the course relies on Microsoft Excel for model building, basic familiarity with Microsoft Excel is required. You don't need to be an expert or an advanced user of Excel, but you should know how to name ranges, generate, cut, copy, paste formulas with absolute, relative, and mixed cell references. No programming experience in VBA is required.

TEXTBOOK:

Introduction to Management Science by Hillier and Hillier, 6th edition. McGraw-Hill Irwin.

MATERIAL TO BE COVERED:

Chapters 1 – 9, 12, 13, 17, and 20 (see the page 5 for the schedule)

NOTES AND HANDOUTS:

They will be made available on Canvas before every class. Additionally, there will be some Excel templates available for download for the later part of the course. Please download all material **prior to the start** of each class.

COMPUTER PACKAGE:

Throughout the course we will use the **Solver** software. Microsoft Excel has a native solver. However, it has pretty limited functionality for the level of modeling involved in our course. Furthermore, Excel's native solver does not perform any simulations. To go beyond the rudimentary modeling functionality, an Excel add-in, the *Frontline Analytic Solver* will be used. The software is free for the first 15 days but then you have to pay $25 for a 140-day license. Starting 2019, Frontline requires everyone to have an active subscription for Office 365. Up until last year this software did not work on Macs. Starting version 2019, this will work on Macs as long as you have the Office 365 subscription.

I will post detailed step-by-step installation instructions on Canvas.

CLASS WORK:

Excel modeling is an important skill to develop as a part of the MBA experience. Modeling involves understanding the problem/objective, identifying appropriate variables and

constraints, and then developing a structure and a framework to derive solutions to the problem. Observing someone create a model can be deceptively simple. The best way to learn this skill is to practice it yourself. To this end, the course will be example-based, hands-on, and involve in-class exercises in model formulation and execution. There could be many variations of a model for a given problem objective. Students would benefit from working in groups during the in-class exercises and learn alternative ways to model the same scenario. Attending all classes and having laptops are essential to deriving maximum value from the course. Each class would start with a lecture introducing the concepts and then allot time for students to develop and review the models for exercises.

GRADING:

Group Homework	30%
Midterm (take-home)	20%
Final Exam (take-home)	30%
Group Final Project	20%

Learning Objectives:

1. Understand what management science is and the scope of management problems that can be addressed using the topics in management science.
2. Understand the management problem on hand and evaluate which quantitative techniques and modeling tools are appropriate/not appropriate for the given situation. Apply the major techniques to analyze a variety of managerial problems.
3. Apply the best practices of spreadsheet modeling and create effective/scalable spreadsheet models.
4. Critically evaluate the results from the optimization/simulation models, interpret the results, and communicate your findings to management and stakeholders.

Additional Points and Suggestions:

1. Please read the assigned chapters/topics prior to the class. After the class, re-read the chapter. Summarize what you have learned. Practice extra problems and cases. You will realize that the best way to learn modeling is to actually create models and not observe someone create them.

2. Work on graded homework in groups of two (2) or three (3) depending on the class size. I favor small group sizes to large ones, especially in skills-based class such as this one. Please resist the temptation to split the problems or distribute the problems among team members. By doing so, some won't get the experience with working on problems not assigned to them and such problems may appear on the exam or may be relevant to your profession. My suggestion is to for you to meet, brainstorm, and work together on the problem formulation, modeling, and the solution. This way, you can learn from each other and collectively arrive at a better model. However, this is just my suggestion and not a requirement. You should do whatever works best for you.

3. If you have any difficulty with any material, please don't hesitate to contact me. My topmost priority is to ensure that you are successful in understanding of the material.

4. The formats of the midterm and final exams may be varied. Please note that the purpose of the exams is to test your understanding of the concepts and not to test your ability to mechanically execute the model using Solver. The exams will be take-home and can be completed in multiple sittings. I don't track time. The exams will be open-book, open-notes, open-computer, and open-internet.

5. The group final project details will be provided as a separate document on Canvas after the first class. This project doesn't have to be complicated or something on a large scale. The idea is for you to apply the concepts learned to non-textbook problems in your own area of experience/expertise/liking.

Schedule on the next page…

Schedule (Tentative): This is a tentative schedule. It may be adjusted according to the pace of the class.

	Date	Assignments Due	Topics Covered
1	6/21/2019 (First Session)		Chapter 1 – Introduction Chapter 2 – Linear Programming: Basic Concepts
2	6/21/2019 (Second Session)		Chapter 4 – The Art of Modeling with Spreadsheets
3	7/5/2019 (First Session)	Group Homework 1	Chapter 5 – What-If Analysis
4	7/5/2019 (Second Session)		Chapter 3 – Linear Programming: Formulation and Applications Data Envelopment Analysis (DEA) (not in your book but notes will be provided)
5	7/19/2019 (First Session)	Group Homework 2	Chapter 6 – Network Optimization Problems
6	7/19/2019 (Second Session)		Chapter 7 – Binary Integer Programming Chapter 17 – Goal Programming
7	8/2/2019 (First Session)	Midterm Exam (due on 8/2/2019.) Will be posted on Canvas after the class on 7/19 or on 7/20.)	Topic: Multiple Objective Optimization (not in book but notes will be provided). Chapter 8 – Nonlinear Programming
8	8/2/2019 (Second Session)		Chapter 9 – Decision Analysis
	8/10/2019 **NO CLASS**	Group Homework 3	**No class**. ONLY Group Homework 3 Due.
10	8/16/2019 (First Session)		Chapter 12 – Computer Simulation: Basic Concepts
11	8/16/2019 (Second Session)	Final Project Presentations	Chapter 13 and 20 – Computer Simulation using Risk Solver and Crystal Ball (Brief overview if time allows after presentations.)
12	8/30/2019	Final Exam (due 8/30)	The final exam is **take-home**. It will be posted sometime on 8/16 after the class or on 8/17 and needs to be submitted on Canvas on or before 8/30. No need to come to the class.