MSIS 5303 – Quantitative Analysis for Managers
(Management Science Methods)
Fall 2007

Professional MBA Program
William S. Spears School of Business
Oklahoma State University

Instructor:

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Overview of the Course

The primary objective of this course is to develop skills in quantitative modeling of business problems and opportunities. The main focus of the course exposes students to the readily available optimization analysis tools (such as linear programming) that are standard in today's spreadsheets. Emphasis will be placed on understanding how such modeling techniques can be used to **assist** the decision-maker, when they are applicable, and an identification of technique limitations.

Course Prerequisites

Spreadsheet and algebra proficiency (calculus helpful).

Course Goals

Decision making in organizations is a partnership between humans, models and data. This course focuses on primarily the partnership between humans and mathematical models, and will provide the student with additional 'tools in their tool-belt' to facilitate more effective decisions.

Course Objectives/Process

By the end of the course, the students are expected to be able to:

- Create sophisticated spreadsheet models using EXCEL Solver that address so-called desktop applications in scheduling, resource allocation, distribution, etc.
- Analyze decision making situations and understand limitations, drawbacks and advantages of using spreadsheet models and their output to assist in making decisions.
- Understand the limitless potential of larger 'killer applications' that are possible even with just a semester's worth of exposure.
- Employ the concepts of management science modeling in practice even WITHOUT sophisticated models, specifically related to identifying objectives, decisions under the control of the organization, the constraints faced in the situation, and the usefulness of sensitivity analysis to derive alternative solutions.

Texts and Supplementary Materials

Introduction to Management Science, 9th Edition, Bernard Taylor, Prentice Hall, 2007.

Grading Policy

Part I of class = 20%
Part II of class = 40%
Part III of class = 40%

Letter grades will be assigned according to the standard scale (90/80/70/60). The scale may be lowered as warranted. A weighted average is used to determine the final class percentage.

More specifics follow below.

Description of Course Requirements

In general, two categories of class content will be presented. New material related to quantitative models will first be presented to the students (with specific learning objectives as highlighted below), followed by out-of-class practice homework problems which the student attempts 'off-line'. The next module will then illustrate solutions to these homework problems. This process will be repeated throughout the semester.

We plan on using the threaded discussion capability of D2L to offer an on-line 'help-desk' or FAQ for the homework. Details on how this will be implemented will be forthcoming. It will involve the use of a graduate student and me (Wilson).

The practice homework problems are just that – for practice. They are not collected, but are useful in understanding the baseline modeling capability necessary to

successfully complete the class. The 'exam questions' will require the use of integrating these homework 'fundamentals' (treating them as building blocks) to solve the more challenging questions.

Exams

There will be three exams 'periods' during the semester. For the first exam 'period', each student will solve the same three problems and place them in the dropbox by the deadline. One problem will require 'drawing', so a scanner may be necessary.

Exam periods 2 and 3 will have multiple problems that the students may select to solve. They will not have to solve all of the problems to receive 100% (though 100% is the maximum score that a student may receive during these exam periods). Each problem will have different points associated with it depending on degree of difficulty. Spreadsheets will be submitted to the dropbox by the stated deadlines.

Exams are done on an individual basis.

Make-up Policy

There is some flexibility in due dates, but I'd prefer to stay somewhat on target. Watch for the specific dates to be posted as the semester moves along.

University Policy

Drop Policy
See the most recent OSU catalog at:
http://www.okstate.edu/registrar/AcademicCalendarFall07.html

Academic Integrity
As a reminder, the University has a policy on academic honesty. You are expected to abide by the procedures set forth in the document. For more information, see:

http://www.okstate.edu/ucs/integritystudent.html

Accessibility
Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact the instructor as soon as possible, so we can discuss accommodations necessary to ensure full participation and facilitate your educational opportunity. For more information about OSU Student Disability Services, please go to: http://www.okstate.edu/ucs/stdis/

Class Schedule

LO = Learning Objective (each module has more specific items stated on .ppt slides
OCW = Outside class work

PART I - Foundations

Module 1 – Syllabus Introduction

LO – What is mathematical modeling?
OCW – Hell's Library 'fun' questions

Module 2 – Answers and more syllabus introduction

OCW – Muffin Mania – Version 1 (and/or Version 2)

Module 3 – Introduction to Optimization and Linear Programming
Module 3.5 (cont'd)

LO – Differentiate between linear and non-linear models
LO – What is optimization?
LO – What are the components of a good model?
LO – How do we create and solve a linear programming (LP) model?
OCW – Chapter 2 homework (focus on basics, less emphasis on parts a), b) etc.)

Module 4 – Solutions to Chapter 2
Module 4.5 (cont'd)

Module 5 – Using EXCEL's Solver to model/solve/perform sensitivity analysis
Module 5.5 (cont'd)

LO – Use EXCEL's built-in Solver to create and solve LP models
LO – Understand that sensitivity analysis leads to critical 'insight'
OCW – Chapter 3 homework problems

Module 6 – Solutions to Chapter 3
Module 6.5 (cont'd)

OCW – Chapter 4 – group 1 – more practice problems

Module 7 – Solutions to Chapter 4, Group 1

Module E1 – Exam 1 problem review

PART II – LP … and more LP … and more LP

Module 8 – Expanding LP Applications

LO – Learn how to use key 'types' of models for various decision situations
OCW – Chapter 4, groups 2 and 3 problems

Module 9 – Solutions to Chapter 4, Groups 2 and 3

Module 10 – More Linear Programming Models
Module 10A – (Cont'd)

LO – Expand our capability to distribution models
LO – Expand our capability to assignment/allocation models
OCW – Chapter 6 homework problems

Module 11 – Solutions to Chapter 6

Module 12 – Adding Integer and Binary Modeling Components

LO – Expand our modeling capability by the use of integer and binary variables
OCW – Chapter 5 homework problems

Module 13 – Chapter 5 solutions

Module E2 – Exam 2 problem review

Module 14 – Killer Applications

LO – Understand how the small models we study can be scaled up to solve problems that generate millions of dollars of savings for organizations.

Part III – Further Decision Modeling

Module 15 – Network models

LO – Expand our modeling capability to include network models
LO – See an example of when we cannot model as effectively as using a greedy heuristic
OCW – Chapter 7 homework

Module 16 – Chapter 7 solutions

Module 17 – Multiple Objective Modeling

LO – Add dealing with multiple objectives into our modeling repertoire.
OCW – Chapter 9 problems

Module 18 – Chapter 9 solutions

Module 19 – Probability/Expected Value – the world as a probabilistic state

LO – Be able to model the world as a probabilistic state, understanding concepts such as expected value, etc.

Module E3 – Exam 3 Problem Review

Module 20 – Decision Trees

LO – Be able to model sequential decisions
OCW – Chapter 12 homework

Module 21 – Chapter 12 solutions