

University of Pittsburgh  
Joseph M. Katz Graduate School of Business

**DECISION TECHNOLOGIES IN MANUFACTURING AND OPERATIONS  
MANAGEMENT  
BQOM 2421  
Meets in 114 MR**

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**Course objective:** The pervasive use of computers in the business environment has opened up new vistas for managerial decision making. This course discusses critical, computer-based, decision making methodologies for managing the Operations function of both manufacturing and service organizations; we also cover applications from other managerial functions such as Finance and Marketing. The Management Science part of the course is designed to provide knowledge of, and develop skills in, model-building. The objective of this segment is to enhance managerial problem-solving and we stress on problem identification, model formulation, assessment of assumptions and data requirements, and evaluation of model-based recommendations. The Operations Management part of the course considers important issues arising in organizing and managing the production and distribution of goods and services.

The course covers both *deterministic* (when the problem parameters are certain) and *stochastic* (when the problem parameters are probabilistic or uncertain) situations. Both these situations result in complexity that may be difficult to untangle without appropriate methodologies. The complexity may arise due to the size of the problem we are tackling, the number of alternatives we need to evaluate, or because of interaction in and competition for resource allocations. In addition, the complexity arises because the outcome of our decision making is uncertain which make the situation risky. With the use of well-designed strategies and tactics, we can mitigate the level of the risk.

The content of this course includes a discussion of linear programming, network optimization, project management, integer programming, queuing models, inventory models and materials management, and simulation. Although this content is traditional, the delivery and the form of the course is relatively new and reflects the latest pedagogical developments for the material. We will thus extensively use spreadsheets, instead of using specialized computer packages. This approach will hopefully provide you with the skill

and the universal use of spreadsheets in the business world will hopefully provide you with the opportunity to apply the methodologies learnt in this course.

This is a “quantitative” course; however, it is not a course in mathematics or theorem proving. The emphasis of the course is on the structure, logic and application of the models, not on the underlying mathematical details and proofs. The requirements for particular mathematical operations should be within your capabilities. Where we require concepts and mathematical operations beyond elementary calculus/high school algebra, I will cover them in class. I will also try to review the required mathematical material that you have seen earlier but with which you might be rusty now. If you find that you are unsure of your ability to deal with the mathematics during any part of the course, you should contact me as quickly as possible.

**Prerequisite:** Statistical Analysis: Uncertainty, Prediction and Quality Control.

**Text:** Cliff T. Ragsdale. **6<sup>th</sup> Edition.** *Spreadsheet Modeling and Decision Analysis.* **2011.** South-Western. The ISBN is 10 0-538-74631-9.

The 6<sup>th</sup> Edition is hot off the press—it’s scheduled due date is November 15, 2010, An important change in the 6<sup>th</sup> Edition is the use of a commercial, integrated, more powerful software.

**Additional References:** 1. Wayne L. Winston and S. Christian Albright. 3rd Edition. Practical Management Science. 2007. Duxbury Press.

2. Frederick S. Hillier and Mark S. Hillier, Introduction to Management Science. 3<sup>rd</sup> Edition, 2007. McGraw Hill.

**No. of Credits:** 1.5.

**Format:** The course will consist of a mixture of lectures, problem-solving exercises and case assignments. The text has problems from many different application contexts including those from operations, finance and marketing. All examples in the text are included in the student CDROM shrink-wrapped with the book. The more problems that you work on, the better will be your grasp on the subject material. The following outline describes the plan for readings and problem assignments.

The nature of the course requires frequent homework assignments to be completed. It is better to turn in these assignments even if they are incomplete since the primary objective for assigning them is to provide prompt feedback on the learning process.

**Software:** I will use the Excel version 2010, which is included with Microsoft Office 2010. Previous versions of Excel (2007, 2003) as well as

competing spreadsheet packages have similar capabilities. A 140-day license code for a commercial package, Risk Solver Premium for Education (RSPE) is shrink-wrapped with the book. RSPE integrates well with both Excel 2007 and Excel 2003 in addition, of course, to Excel 2010. (The add-in, Solver, with capabilities limited to optimization, comes standard with Excel and has no expiration date.) In addition, we will be using Microsoft Project. Please install these two packages just before the course begins. We will also use other Excel add-ins included on the CDROM for the queueing topic.

**CourseWeb:** We will be using BlackBoard, also referred to as CourseWeb (<http://courseweb.pitt.edu>), the University of Pittsburgh's course management system. As and when needed, homework templates and solution files will be kept on the course's "BlackBoard" space in the "Course Documents" section.

**Videos:** Time permitting, I will show short videos for some modules.

<b>Grading:</b>	Midterm exam	35%
	Final exam:	35%
	Group project 1:	8%
	Group project 2:	8%
	Group project 3:	8%
	Homework:	6%

*Midterm and Final exams.* The exams will have two types of questions with roughly the following breakup: (i) Objective type (about 20%), and (ii) Problems (about 80%). The "problems" section will contain some questions that will require laptop use and some that you will do in longhand. The exams will be closed book and closed notes, and you will not be permitted to connect to the network or with anyone else in any way. If you take the exam early, please do not discuss the exam with anyone in any way until everyone has finished taking the exam. Any violation of these instructions will be reported to the Academic Integrity Committee and will result in a penalty of at least one letter grade. I will make and randomly distribute multiple versions of the exams; the basic concepts tested and the level of difficulty will be the same in all the versions. More announcements will be made in class.

*Group projects.* You are required to prepare and submit analysis of three cases for the course. The cases must be done in groups of 4 to 5. Your work must be presented in a professional-looking report. Limit your analysis to three double spaced typed pages excluding exhibits and appendices (you can have any number of exhibits and appendices). You are free to choose your own group, and change groups if you want. Interaction/collaboration between different groups, or gathering information from any exogenous sources, is not permitted. I hope that you will adhere to this honor code.

*Homework.* The course schedule lists the homework assignments. Homework submissions, in hardcopy form, are due in the *class following* the one they are assigned. You do not need to type the solutions—handwritten solutions are fine—and you can take screenshots where necessary. The solutions will be kept on the Course Documents page of the CourseWeb for the course after the homework is due; therefore, late homework will not be accepted for grading. You can discuss the problems with your colleagues, but must submit your work independently. Simply taking screenshots of someone else’s computer files, and submitting them as your work is not permitted.

I cannot overly emphasize the importance of completing your homework on a regular basis. The more problems you work on, the more comfortable you will feel with this type of material.

The HW problems will be graded on a *Satisfactory* (Grade = 100%) and *Not Satisfactory/Not Attempted* (Grade = 0%). To get a satisfactory grade, you will have to show evidence of having tried the problem and some progress, even if the solution is not correct or fully complete. You will be responsible for checking the solution from the Courseweb. Each problem has equal weight. The grade for the worst problem submitted over the entire course will not be considered.

Regular attendance and class participation are required. Adjustments for exceptionally good or bad class participation are typically important in determining borderline grades.

**Make-up Exam:**

In general, there will be no make-up exams. In the event that extraordinary circumstances prevent you from taking the exam at the scheduled time, you must contact me *prior* to the examination day.

**Ethics Integration:**

Instead of devoting a separate session for ethics integration with the course material, we will, as and when appropriate, discuss ethical considerations while using decision technologies for decision making throughout the course.

**Best Practices Partner:**

As you know, for each course, the Katz School has a series of partnerships with nationally known companies for their business practices. The objective of this program is to make our courses more rigorous and relevant, and to involve our partners in the conduct of our classes. General Electric will be the best practice partner for the course. This session is a required part of the course. More information on this talk will be provided later.

**Grading**

The school’s grading policy will be followed in awarding the final

<b>Policy:</b>	grades. All three sections will be combined when determining the grading curve.
<b>Students with Disabilities:</b>	If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both me and the Office of Disability Resources and Services (DRS), 216 William Pitt Union, (412) 648-7890 / (412) 383-7355 (TTY) as early as possible. DRS will verify your disability and determine reasonable accommodations for this course.
<b>Classroom Decorum:</b>	Please follow all guidelines for the MBA classroom, and maintain the classroom decorum. Please come to the class on time, and do not leave during the class unless it is absolutely necessary. Likewise, engaging in conversations with your colleagues during class is disruptive. Use your laptop only for the purposes of following along with what I may be doing in class. Using your laptop or cellphone to browse the internet, or check your email is not permitted. Also, please turn your cell phones off, unless you are expecting a telephone call regarding a medical emergency. Even in this case, please sit near an exit and leave quickly so that others are not disturbed by the call.
<b>Grader:</b>	To be announced.
<b>Office hours:</b>	Please see me if you need any clarifications regarding the material. Generally, I follow an open door policy. However, I will also be in my office on Wednesdays from 11:00 am to 1:00 pm.
<b>Academic Integrity:</b>	This is a graduate course and I do not expect any academic integrity violations. Any collaboration, except between individuals of the same group for the group projects or for the homework assignments, as discussed above, is strictly prohibited. If there are any questions about what is acceptable conduct or not, please contact me. Any breach of academic integrity is an extremely serious matter and will be reported to the Katz Academic Integrity Committee. An academic integrity violation will result in a reduction of at least one letter grade, in addition to any further consequences according to the KGSB academic integrity policy.

### Tentative course schedule

Class 1	Tuesday, 01/18//11	<b>Introduction Spreadsheet Modeling</b>
<p>Introduction to the course and to modeling.            Optimizing resource management. Linear programming: formulation and applications</p> <p>Reading:                      Chapters 1, 2</p> <p>Homework assignment: Homework problem 1 from the handout.            (Problem 2 in the handout is optional.)</p>		

Class 2	Thursday, 01/20/11	<b>Linear Programming</b>
<p>Linear programming: Formulation and applications            Linear programming: Graphical solution method</p> <p>Reading:                      Chapter 3.1 – 3.13</p> <p>Homework assignment: Problems 3.22 (a), 3.23 (a) , 3.28 (a)            (Formulate only. Do not solve.)</p>		

Class 3	Tuesday, 01/25/11	<b>Linear Programming (contd.)</b>
<p>Linear programming: Using Risk Solver Premium (Optimization module) for solving linear programs            Linear programming: Sensitivity Analysis</p> <p>Reading:                      Chapter 3.1 – 3.13, Chapter 4.1 – 4.6</p> <p>Homework assignment:</p> <p style="padding-left: 40px;">Solve problems 3.22, 3.23, and 3.28 using Solver (Skeleton templates available on the course website.)</p> <p>Group project 1 assigned. Due 02/05/11</p>		

Class 4	Thursday, 02/01/11	<b>Linear Programming (contd.) Network Optimization</b>
<p>Linear programming: Sensitivity Analysis Network Optimization.</p> <p>Reading: Chapter 4.1 – 4.6, Chapter 5.1 – 5.5</p> <p>Homework assignment: Solve problems 4.16 a, b, c, d</p>		

Class 5	Tuesday, 02/03/11	<b>Network Optimization</b>
<p>Network Optimization (contd.)</p> <p>Reading: Chapter 5.1 – 5.5</p> <p>Homework assignment: Use Solver to solve 5.9, 5.13 (Skeleton templates available on the course website.)</p>		

Class 6	Thursday, 02/05/11	<b>Integer Programming</b>
<p>Integer Programming. Review for midterm.</p> <p>Reading: Chapter 6.1 – 6.16</p> <p>Homework assignment: Use Solver to solve 6.11 (Skeleton spreadsheets available on the course website.)</p> <p>Group project 1 due</p>		

Class 7	Tuesday, 02/08/11	<b>Mid-Term Exam</b>
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Mid-Term Exam

**8:00 am class: 7:30 am to 9:25 am**

**9:30 am class: 9:30 am to 11:25 am**

**12:30 pm class: 12:30 pm to 2:25 pm.**

Class 8	Thursday, 02/10/11	<b>Project Management</b>
Discuss Midterm Project Management. Managing one time activities. Critical activities. Crashing.		
Reading:	Chapter 15.1 – 15.6; 15.9 – 15.12	
Homework assignment:	15.10 a, c	
Group project 2 assigned. Due 02/17/11		

Class 9	Tuesday, 02/15/11	<b>Simulation</b>
Project Management. Managing one time activities. Critical activities. Crashing. Using Microsoft Project		
Monte Carlo Simulation		
Reading:	Chapter 12.1 – 12.10	
Homework assignment:	15.10 d	

Class 10	Thursday, 02/17/11	<b>Best Practice Lecture</b>
Simulation (contd.) Using Risk Solver Premium (Simulation module)		
Reading:	Chapter 12.11 – 12.17	
Homework assignment:	12.4, 12.9	
Group project 3 assigned. Due 02/24/11		
Project 2 due.		



Class 11	Tuesday, 02/22/11	<b>Simulation</b>
Simulation (contd.)		
Reading:	Chapter 12.11 – 12.17	
Homework assignment:	12.8, 12.12	

Class 12	Thursday, 02/24/11	<b>Queueing</b>
Why do we wait at the supermarket checkout counter? How many tellers should we have at a bank for an “acceptable” level of service?		
Reading:	Chapter 13	
Homework assignment:	13.5, 13.6 (Use Q.xls, included with the book.)	
Project 3 due.		

Class 13	Tuesday, 03/01/11	<b>Supply Chain Management Ethics in Decision Tech. Review</b>
Nonlinear Programming and basic Inventory Models		
Ethics in Decision Tech.		
Final comments and Review for Final exam. (Please come prepared with your questions.)		
Reading:	8.4, Handout	
Homework assignment:	8.8, 8.14 (these problems not to be submitted)	

Exam period	03/03/11	<b>Final exam</b>
<b>8:00 am class: 7:30 am to 9:25 am</b>		
<b>9:30 am class: 9:30 am to 11:25 am</b>		
<b>12:30 pm class: 12:30 pm to 2:25 pm.</b>		