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*University of Pennsylvania*  
**The Wharton School**  
Department of Operations, Information and Decisions  
OIDD 6120: *Business Analytics*

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### **Course Description**

OIDD 6120 is a course on the use of decision models for business analytics. Its main topics include constrained optimization and decision making under uncertainty. The emphasis is on models that are widely used in diverse industries and functional areas, including operations, finance, accounting, and marketing.

The applicability and use of these models have increased dramatically in recent years due to extraordinary improvements in computer, information, and communication technologies. Large volumes of data are available from automatic capture of point-of-sale (POS), Enterprise Resource Planning (ERP), and Customer Relationship Management (CRM) systems.

Information has come to be recognized as a critical resource, and models play an increasingly critical role in deploying this resource, in organizing and structuring information, so that it can be used more productively. Friendly interfaces have become effective “delivery vehicles” for powerful decision models, that enable the use of these data for more effective short-term, operational and long-term, strategic decision making.

The course has a twofold purpose. First, it seeks to introduce you to simple models and ideas that provide useful (and often surprising) *qualitative* insights about a large spectrum of managerial problems. Second, it aims to give you a feeling for the kinds of problems that can be tackled quantitatively, the methods and software available for doing so, and some of the issues involved in gathering the relevant data. Whether or not you explicitly use these decision models in the future, we believe the course will have impact on the way you think about available data and how it can be used to provide more value in management decisions.

#### ***Text***

Cliff T. Ragsdale, *Spreadsheet Modeling and Decision Analysis*, Revised 5<sup>th</sup> Edition, Cincinnati: South-Western College Publishing, 2008, 7 selected chapters.

#### ***Canvas Site***

The course has a web site on Canvas from which you can download all class materials. The Canvas site will also have Excel files with sample solutions to homework problems, software, and other materials of interest.

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## Computer Software

We will use *Microsoft Excel* spreadsheets extensively throughout the course. In the first half we will also use Excel's *Solver* add-in to solve constrained optimization problems, and in the second we will use *Crystal Ball*, an add-in for Monte Carlo simulation. If you have a Windows laptop, you will be able to download Crystal Ball from the course web site. You will be also be able to access Crystal Ball in any of the School's computer labs.

## Course Logistics

We have two class sessions each week, a lecture and a recitation. In lectures we introduce business analytics concepts, and recitations are designed to reinforce these concepts. Each recitation will be split into two halves: in the first half we refresh the lecture material, and in the second half you will work on a recitation exercise testing your understanding of this material. Solutions to recitation exercises are due on Fridays.

To encourage learning, during lectures you can use electronic devices that can communicate with other devices (e.g., mobile devices, tablets, laptops) only when explicitly allowed by the instructor. These electronic devices may be used during the time in which you are working on recitation exercises.

## Attendance

We will use polleverywhere to take attendance in each class session. There are 12 class sessions, and you can miss 2 class sessions without impacting your attendance score.

## Homework Assignments

Working on these problems is essential to your mastery of the material. There are **two written homework assignments**. Homework assignments may be done **individually or in pairs**. If you do an assignment as part of a pair, **please submit one write-up** with two names on it. (*Do not* submit two copies of the same assignment.) Your homework partner can be a student from any section of the course.

Please remember to include your **name(s) and student ID(s)**.

You are free to discuss all homework assignments with other students. When thinking of whether to work alone or not, you may consider the following trade-offs. Working alone has the advantage that you get the best insight into how well you are mastering the material. On the other hand, particularly if this material is entirely new to you, you may find that discussing the problem with another person helps in the learning process.

## Examination

**The final examination for the course will be held on the date/at time specified by the School: April 25, 9am-11am EDT. The examination will be open-book, open-notes and will be conducted in-person.** A practice examination with solutions will be distributed before the last class session.

## Grading

The course grade will be based on a weighted average of the scores earned on attendance, recitations, homework exercises, and the final examination. The weights are as follows:

Attendance	5%
Recitation Exercises	10%
Homeworks	40%
Final examination	45%

## Class Schedule

The schedule below provides a class-by-class view of topics, associated readings, and course deliverables.

Class	Week of	Type of Class/Topic	Readings	Due
1	13-Mar	Lecture 1: Course Introduction, Linear Optimization	<ul style="list-style-type: none"> <li>• <b>Notes:</b> “Background on CO and LP” and “Formulating and Solving LP using Excel Solver”</li> <li>• <b>Text–3; 45-62:</b> A systematic explanation of how to formulate an LP and then implement the formulation in a spreadsheet.</li> </ul>	
2		Recitation 1		<b>Recitation 1 Exercise:</b> Friday, March 17, 11pm EDT
3	20-Mar	Lecture 2: Interpreting Optimization Results	<ul style="list-style-type: none"> <li>• <b>Notes:</b> “LP Sensitivity” and “LP Geometry and Solution Concepts”</li> <li>• <b>Text–4; 136–151:</b> Sensitivity analysis.</li> </ul>	
4		Recitation 2		<b>Recitation 2 Exercise:</b> Friday, March 24, 11pm EDT
5	27-Mar	Lecture 3: Cash-Flow Models	<ul style="list-style-type: none"> <li>• <b>Text–3; 63–102:</b> Many examples: in class we’ll cover those listed in 3.10 and 3.12.</li> </ul>	
6		Recitation 3		<b>Recitation 3 Exercise:</b> Friday, March 31, 11pm EDT
7	3-Apr	Lecture 4: Decision Trees and Value of Information		<b>HW1:</b> Monday, April 3, 5pm EDT
8		Recitation 4		<b>Recitation 4 Exercise:</b> Friday, April 7, 11pm EDT
9	10-Apr	Lecture 5: Monte Carlo Simulation	<ul style="list-style-type: none"> <li>• <b>Note:</b> “Probability and Statistics”</li> <li>• <b>Text–12; 559–586:</b> Basics of Monte Carlo simulation</li> </ul>	
10		Recitation 5		<b>Recitation 5 Exercise:</b> Friday, April 14, 11pm EDT
11	17-Apr	Lecture 6: Making Decisions Using Simulation		
12		Recitation 6		<b>Recitation 6 Exercise:</b> Friday, April 21, 11pm EDT
				<b>HW 2:</b> Monday, April 24, noon EDT

## Class Preparation

The class moves quickly, and you should strive to keep up with the covered topics. For each lecture, we will provide detailed lecture notes. It is a good practice to review these lecture notes soon after each class to reinforce your learning from the lecture and to prepare for the recitation exercises.

## TA Office Hours

Teaching assistants' (TAs) office hours and location (in person) will be posted on Canvas. All sections of the course in a given quarter have the same assignments and exam, and you may approach any of the TAs with questions.

## Ethics Matrix

The course involves a mix of work by individuals, pairs, and groups, and the matrix below describes who you are allowed to work with and what materials you are allowed to use for homeworks and exam. It is your responsibility to understand and follow the matrix.

OIDD 6120: Business Analytics	Materials						People				
	Approved calculator	Laptop* / other electronics	Current book, class notes	Past notes / summaries	Past exams / assignments	Internet content / other outside materials	Approved work team	Other student(s) in same section	Student(s) in other sections (same term)	Wharton student not taking the class this term	Person outside of Wharton
Recitation	A	A	A	A	A	A	W	D	D	D	D
Homework	A	A	A	A	A	A	W	D	D	D	D
Final Exam	A		A								
	A = Allowed material Shaded Cell = Not allowed						W = Allowed to work together D = Discussion of general concepts and procedures is allowed but no sharing of specific answers. Shaded Cell = Not allowed				

### Notes:

Recitation may be done alone or in a group. You may discuss recitation questions with people in your sections, but you may not share specific answers.

Homework may be done alone or in a pair. You may discuss homework problems with people outside of your homework partner but you may not share specific answers with people outside of your homework partner.

Final exam preparation may be done with others. The materials you are allowed to use during the final exam may only include the course book, notes posted on the course web site, your own written notes, and a calculator. \*During the final exam, you may use your laptop/other electronic device only to access the exam online, access/read your notes, and submit your work. In particular, you should not use laptop/other electronics to perform any optimization/simulation tasks.