University of Pennsylvania
The Wharton School
Operations, Information, and Decisions Department

OIDD 612: *Business Analytics*

Spring 2021 Q3

Instructor: Gerry Tsoukalas

Class Schedule: Asynchronous online, see Canvas

Prof. live online sessions: see Canvas

Teaching Assistants & Office Hours (OH) (online)

Tolga Dizdarer, Head TA (PhD)

Ankita Vij (MBA)

Palan Rishi (MBA)

Course Description

OIDD 612 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), Customer Relationship Management (CRM), and web-based 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.

Recommended Text (Optional)

Cliff T. Ragsdale, *Spreadsheet Modeling and Decision Analysis,* Revised 5th Edition, Cincinnati: South-Western College Publishing, 2008, 7 selected chapters. We have put several copies on reserve at Lippincott Library.

Canvas Site

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

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. You will be able to download Crystal Ball from the course web site on canvas.

Grading

The course grade will be based on a weighted average of the points earned on homework exercises, the group project, the final examination, and class participation. The weights are as follows:

Homework 1	20%
Homework 2	20%
Homework 3	20%
Final Exam	40%

Homework Assignments

Working on these problems is essential to your mastery of the material. There are ***three* written homework assignments.** Please submit your homeworks through canvas in digital form (pdf and/or office suite, excel sheets can be uploaded as well if needed). If you are working with a partner, you can submit one document, but make sure to clearly indicate both of your names, your Penn id's and your section. To be clear, you can be at most 2 people per submission, and to submit as a team of 2, you need to add (drag and drop) both of your names to one of the homework groups on canvas, in People>Homework Teams.

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.

We will also distribute a set of "self-study" problems and their solutions. The self-study questions will be similar to homework sets. Together, the homework and self-study problems will give you a good idea of the kind of questions you can expect on the final exam.

Examination

The final examination for the course will be held from 6pm to 8pm on Monday March 8, 2020, synchronously online. The examination will be open-book, open-notes. A practice examination with solutions will be distributed on or before the last class session.

Syllabus

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

Class	Date	Session Topic	Notes / Suggested Readings	Due
1	Jan 20	Introduction	• **Text–1; 1–13:** Sketches of applications • **Text–3; 45–62:** Modeling linear programs (LP) • **Case study:** *Domaine Paul Autard*	
2	Jan 25	Interpreting Optimization Results	• **Text–4; 136–151:** Sensitivity analysis • **Text–2; 17–39:** Geometry of LPs • **Case study:** *Domaine Paul Autard*	
3	Jan 27	LP Applications I	• **Resource Allocation** • **Case study:** *Fabulous Nuts*	
4	Feb 1	LP Applications II	• **Text–3; 63–102**: Network Optimization • **Case study:** *GlobChem I*	
5	Feb 3	Multiperiod LP	• **Multi-period optimization:** Inventory balancing over time • **Case study:** *Globchem II*	HW1
6	Feb 8	Multiperiod LP II	• **Case study:** *Private equity* • **Case study:** *FX arbitrage*	
7	Feb 10	Integer models (IP)	• **Text–6; 232—268:** Integer models, examples. We will focus mainly on *binary* variables. • **Case study:** *Globchem III*	
8	Feb 15	Decision Making Under Uncertainty	• **Decision Trees:** test marketing; the value of information. • **Case study:** *Chipotle*	HW 2
9	Feb 17	Introduction to Simulation	• **Introduction to Simulation** • **Text–12; 559–586:** Basics of Monte Carlo simulation. • **Case study:** *Wheel of fortune*	
10	Feb 22	Simulation II	• **Risk Management** • **Case study:** *Asian options*	
11	Feb 24	LP+Simulation	• Retail Inventory Optimization • **Case study:** S*imulating customer demand*	HW 3
12	Mar 1	Nonlinear Optimization	• **Non-linear Programming (NLP)** • **Case study:** *Portfolios of cryptocurrencies*	
-	Mar 8	Final Exam	• 6-8pm: synchronously online on canvas	Exam

---

TA Office Hours

Teaching assistants' (TAs) office hours 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 each assignment. It is your responsibility to understand and follow the matrix.

OIDD 612: 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
Homework	A	A	A	A	A	A	W	D	D	D	D
Project	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

Homework can 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.

Projects can be discussed with those outside of your work team. Specific project work should only be done by those on your project team.

Final exam preparation can be done with others. The materials you bring to the final exam may only include the course book, notes handed out in class and/or posted on the course web site, your own written notes, and a calculator.