OIDD 643
Analytics for Revenue Management

Class Schedule
TBA

Instructor
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Teaching Assistants
TBA

Office hours
Times and links listed on the course's Canvas site.

Course Overview

In the 1980's, Yield Management revolutionized the airline industry. Since then, the tactical use of forecasting and optimization tools to squeeze more revenue out of scarce operational capacity has spread widely. This approach – in what has come to be known as revenue management (RM) or pricing and revenue optimization (PRO) – is now actively used in a range of industries, including various forms of passenger and cargo transportation, media and communication services, hospitality, sports and performing arts, and retailing.

RM thrives in industries in which: 1) short-run operating capacities are fixed and perishable; and 2) for which there is some element of demand elasticity that can be estimated and used to extract more revenue out of that limited capacity. In some cases, demand elasticity comes from the identification of higher-paying segments of the general population for whom capacity can be reserved. The yield management models first developed by the airlines identified business customers as favored and reserved capacity for that group by requiring that low-cost fares include a weekend stay. In other cases, companies can use broader estimates of price elasticity of demand to dynamically change prices in response to changing forecasts of potential capacity-demand imbalances. This approach is the core of the dynamic markdown management tools used by fashion retailers.

This course introduces you to the essential concepts and techniques required to understand and implement RM. This approach, in part, represents the tactical implementation – day-by-day or even moment-by-moment – of classical demand estimation and capacity allocation models whose origins can be found in applied microeconomics and marketing. But the need for repeated, rapid cycles of estimation and optimization has driven the development of a set of analytical tools that are particularly well suited for RM, and in this course we will focus on those tools.

Class Format

TBA.

Prerequisites

Students who have already taken OIDD 612 and STAT 613 should be well equipped for the class. Other students should have a solid understanding of elementary probability and statistics, as well as constrained optimization.

- Your background in probability and statistics should include an understanding of random variables, probability distribution functions, probability density functions, cumulative distribution functions, summary statistics such as mean and variance, sample statistics, and regression.
- Your background in constrained optimization should include an understanding of the algebraic formulation and spreadsheet implementation of simple linear and nonlinear programs (LPS and NLPs), as well as shadow (dual) prices.

For questions regarding the specifics of your background, please contact the instructor.

Course Materials

All course materials are downloadable from Canvas or Study.Net. The course's Canvas link is

https://canvas.upenn.edu/courses

and you can access Study.Net materials from the Sudy.Net menu on the course's Canvas page.

For those who would like to have reference texts, I recommend:

- R. W. Phillips (2005). *Pricing and Revenue Optimization*, Stanford University Press.
- K. T. Talluri and G. J. van Ryzin (2004). *The Theory and Practice of Revenue Management*. Springer.

Course Requirements and Grading

Course grades will be based on five short homework questions (25%), the best two out of three case-homework problem sets (30%), and a final exam (45%).

Short Homework Exercises

There will be five relatively short homework exercises that, in some cases, prepare you for an upcoming class and, in others, review material we've just covered. I'll distribute the homework questions after specific classes and ask you to **enter your answers into a Canvas Quiz by 12pm on the day the homework is due.** You may discuss the assignments with others, but your answers to the quizzes must be your own.

Case Homework Problems

There are three longer homework exercises associated with cases we'll cover in class. I will count the best 2 scores toward your final grade.

For each case, I will post on Canvas a set of questions to be answered. You may answer the questions one at a time. While there is no need to write up the case as a memo, your answers to case questions should be crisp and complete. I will judge your answers based on the depth, clarity, and care with which you present them.
You should do these cases with a partner, and I have set up Case HW groups on Canvas where you and your Case HW partner can form a group. The first Short Homework asks you to sign up and report who your partner is. You and your partner should hand in one write-up for the two of you.

You should upload a Word or PDF file with your write-up to Canvas by 12pm Philly time of the day on which the homework is due. **Late submissions will be penalized.**

Video Recordings

There are three prerecorded videos available to you within the **Class Recordings** menu on the course's Canvas site. Each video has associated files, available within the **Files** menu of Canvas, that you can use to follow along with the video.

Two of the videos cover prerequisite materials for the course, random variables and linear programming. You can review these right away and should, in any case, complete each review before the associated classes for which they are assigned. The third video is optional and covers the construction of heat maps in Excel.

Self-Study Exercises

The course also includes ungraded self-study exercises that are designed to for you to practice using the course's analytical models to solve problems. I will post sample solutions for the exercises on Canvas.

I suggest you work in pairs on the self-study exercises. Having a partner will help to ensure that you do the work on a timely basis. You are also likely to find that discussing the problem with another person helps you in the learning process.

Final Exam

An open-book exam will cover the tools and concepts developed in class. The exam is scheduled by the University to take place **TBA.** Details of how we will administer the exam will follow, as we near the end of the course.

Homework and self-study problems will give you a good idea of the kind of questions you can expect on the exam. In the last week of class, I'll also distribute a sample exam which you can also use to practice for the exam.

While you may prepare in groups for the exam, the notes you use during an exam must be your own. Similarly, the work performed on the exam itself must be your own.

Class Schedule

Below is a summary listing of class topics and the due dates for case write-ups. To prepare for a given session, you should go to Canvas

https://canvas.upenn.edu/courses/

and follow the appropriate link for instructions for the given class.

	Topic	Video Review	Short HW	Case HW
1	Intro: Customer Valuation Game			
2	Optimization for Statistical Estimation	#1	#1	
3	Demand-Curve Estimation, Pricing for NYHC			#1
4	Estimating with Censored Data		#2	
5	Segmentation and Peak-Load Pricing for NYHC			
6	Dynamic Pricing Using Dynamic Programming		#3	
7	Retailer: Dynamic Demand Estimation, Pricing			#2
8	Capacity Allocation and Control	#2		
9	No-Shows and Overbooking		#4	
10	Large Networks, Real-Time Control			
11	Guest Speaker – Dave Roberts		#5	
12	Capacity Allocation at Harrah's			#3
13	Answer Your Questions Regarding the Final Exam			