OIDD 642
Analytics for Services: Capacity Management

Class Schedule
TR 10:30-11:50am EDT

Instructor	Teaching Assistant
Instructor	**Teaching Assistant**
Noah Gans	Cynthia Shuangyue Wu
gans@wharton.upenn.edu	Office Hours Sun 1:30-3pm EDT
Office Hours MW 12-1:30pm EDT	*Google Docs Sign-Up for Office Hours:*
Sign Up for Office Hours Using Canvas	https://docs.google.com/spreadsheets/
Appointments.	d/1OEKHoYKe1DprgTPGG1McrSrme5RS
	hbTgYB_odell9qA/edit?usp=sharing

Course Overview

While operational excellence is critical for success in most industries today, in a wide range of service industries this is particularly true. For example, intensified competition in the banking, health care, and communications industries has led to pressure on their operations.

Elements common to many service operations make their management complex, however. In particular, service capacity is not storable or transportable, and its usage can often be highly variable.

At the same time, the rapid evolution of information technology has allowed firms to operate in a fashion – and to offer a level of service – that had not been previously possible. The electronic capture of customer and transaction information has enabled the use of a wide variety of analytical models that allow for better matching of supply to demand.

This course covers a range of analytics tools that are useful for capacity management in services, and it will provide you with insights into the economics of a range of services businesses. During the course, we'll cover the following topics.

- High-level planning models that account for multiple dimensions of service capacity.

- Low-level models of system congestion that capture the relationship between capacity choices, quality of service and, in some cases, system revenue.

- Statistical estimation and forecasting models to characterize key measures of future supply and demand.

In class, we will apply these tools and ideas to examples of service operations in health care, financial, travel, rental, restaurant, government, and information-based services.

Prerequisites

Students who have already taken OIDD 611, OIDD 612, and STAT 613 should be well equipped for the class. Other students should have a solid understanding of elementary probability, statistics, and linear programming.

- Your background in probability and statistics should include an understanding of random variables, measures of central tendency and variation, sample statistics, and regression.

- Your background in linear programming should include an understanding of the algebraic formulation and spreadsheet implementation of linear programs (LPs).

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

Managing the Class Online

Live class sessions will use BlueJeans conferencing software. Before the class starts, you can make sure your audio, video, and microphone work on BlueJeans, following this link:

https://bluejeans.com/111?ll=en.

How You Should use BlueJeans Video and Audio
With many students and online communication, we'll need to follow fairly strict communications guidelines so that sessions do not become confusing.

- Please keep your microphones muted as a default.
- Only unmute your microphone if/when you have a turn to speak.
- If bandwidth is limited and quality is low, you may need to mute your video.

How You Should use BlueJeans Chat
Unfortunately, BlueJeans does not have a facility that allows students to virtually "raise their hands" to ask for a turn to speak. So we will use its chat function for that purpose.

This means, we need to also follow strict guidelines regarding chat.
- Chat should ONLY be used for asking for a turn to speak.
- Chat should NOT be used for side conversations.

Experimenting with How I Run the Class
While the guidelines above follow from "best practices" that are being offered by Penn and Wharton, they are not guaranteed to work well, and I may change some of them as we all gain experience in live classes.

In addition, as an alternative to live classes, I will introduce one-way video sessions, posted to Canvas, in which I run through PowerPoint / Excel instructional presentations. As we see how well they work, I may use more or fewer of these video sessions.

Course Materials

All other course materials are available from study.net

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http://www.study.net/r_mat.asp?crs_id=30145046

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and Canvas

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https://canvas.upenn.edu/courses/1497508.

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

- J. A. Fitzsimmons and M. J. Fitzsimmons (2008). *Service Management: Operations, Strategy, and Information Technology*, Irwin-McGraw Hill, 6th ed.
- R. W. Hall (1991). *Queueing Methods for Services and Manufacturing*, Prentice Hall.

Course Requirements and Grading

Course grades will be based on four short homework questions (20%), the best two out of three case-homework problem sets (30%), and a final exam (50%).

Short Homework Exercises
There will be four 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 9am 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. In I will count the best 2 scores toward your final grade.

You should do these with a partner, and I have set up Case HW groups on Canvas where you and your Case HW partner can form a group. Both of you must join one of these groups and 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 9am Philly time of the day on which the homework is due. <u>Late submissions will not be accepted.</u>

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.

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.

Exam

An open-book exam will cover the tools and concepts developed in class. The exam was originally scheduled by the University to take place **Friday May 8th, 3-5pm.** Details of how we will administer the exam will follow when I know more.

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/1497508

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

Session	Date	Topic	Short HW	Case HW
1	3/24	Intro to Capacity Planning: Long Term Staffing		
2	3/26	Review of Probability, Statistics, Optimization		
3	3/31	Capacity with Multiple Resources: Shouldice		#1
4	4/02	Forecasting Demand / Customer Traffic	#1	
5	4/07	Basics of Congestion: Little's Law		
6	4/09	Economics of Congestion: Queueing	#2	
7	4/14	Two-Level Capacity Planning: Megacard		#2
8	4/16	Queueing Models - Applications	#3	
9	4/21	Capacity-Censored Demand: Abandonment, Loss		
10	4/23	Abandonment and Loss Models - Applications	#4	
11	4/28	Wrap-Up: DTW Design at Kentucky Fried Chicken		#3