

## **OIDD 642 Analytics for Services: Capacity Management**

**Students enrolling in OIDD 642 in Q4 2019 must attend the first class session and take the final exam at its regularly scheduled time (+ place), Monday May 13th, 9-11am.**

### **Class Schedule and Room**

TR 1:30-3pm, JMHH 345

### **Instructor**

Noah Gans

Office Hours: MW 4:30-6pm, JMHH 564

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### **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.

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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.

## **Course Materials**

All course materials are available from study.net

<http://www.study.net/>

and Canvas

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

or will be distributed in class.

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

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

## **Course Requirements and Grading**

Course grades will be based on class participation (10%), case write-ups (30%), homework questions (10%), and a final exam (50%).

### **Class Participation**

One half of this grade will reflect basic measures of participation. On-time attendance is mandatory. You are expected to do the pre-assigned readings and to be prepared to discuss the readings in class.

The other half reflects my qualitative judgment concerning your effective contribution to class discussions and dynamics. You should be attentive to the class discussion. Your comments should respond to and “push forward” what is happening in class.

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## **Case Write-Ups**

There are three case write-ups, which should be done in groups of 5. Each group should hand in a hard copy of its write-up at the start of the associated class.

For each case, I will post on Canvas a set of questions to be answered. Your group 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.

Answers based on *quantitative analysis* should include summary charts or tables that are sufficient to communicate your findings. They should not describe each analytical step. Rather, for each analysis you should include this type of detail in an appendix.

*Qualitative questions* are often open-ended. Your analysis here should be thorough in its treatment and succinct in its description or explanation of individual points.

## **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 hand out the homework questions in class 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.

## **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 will be scheduled by the University and is tentatively scheduled to take place **Monday May 13<sup>th</sup>, 9-11am**. You must take the exam at the scheduled date and time to pass 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 hand out 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.

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## **Class Schedule**

Below is a summary listing of class topics and the due dates for case write-ups. **We may also have an additional (13<sup>th</sup>) session with a guest lecture.**

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.

<b>Session</b>	<b>Topic</b>	<b>HW Due</b>	<b>Case Due</b>
1	Introduction: Appointment Scheduling Game		
2	Review of Probability, Statistics, Optimization		
3	Shouldice Hospital Limited Case		Case 1
4	Regression Models to Forecast Demand	HW 1	
5	Congestion Models and Little's Law		
6	Many Server Queues: Economics of Congestion	HW 2	
7	Megacard Case		Case 2
8	Applying Models of Multi-Server Queues	HW 3	
9	Queues with Abandonment and Loss		
10	Applying Models of Abandonment and Loss	HW 4	
11	Kentucky Fried Chicken Case		Case 3
12	Wrap-Up and Review		