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# OIDD6590 Advanced Topics: Supply Chain Analytics

Fall 2023

Monday Wednesday 3:30-5:00

## COURSE SYLLABUS

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Instructor: Sean Willems. JMHH 552, willems@wharton.upenn.edu

Office hours: Sean holds in-person office hours on Tuesdays from 2:30-3:30 p.m. I commit to meet anyone within 24 hours of a request. Never hesitate to reach out. Just send me a note with two times that work for you and I will make one work.

### Course Objective

The course objectives are to develop modeling skills and a problem-solving toolkit, applicable to the design and planning of supply chains, with a specific emphasis on capacity and inventory analytics. Every session is based on a real-world case study. The course is self contained; it does not assume any prior operations experience or supply chain coursework.

### Course Requirements

Course requirements are to come to class prepared, and to participate in the class. Starting with the second week of the course, a case analysis is due every day of class. This class is a steady amount of work, but it is manageable.

### Course Material

All class material is posted to Canvas. Every class session has a dedicated page on Canvas that details what we will cover that day. In the unlikely event this syllabus differs from what you see on the day's Canvas page, believe what you see on the day's Canvas page.

The class is entirely self-contained and you should not feel compelled to buy any books for this course. If you are looking for reference materials or outside reading enjoyment just let me know and I can recommend additional reading.

## OIDD6590 Advanced Topics: Supply Chain Analytics – Course Outline

Day	Date	
Mon	Aug. 28	Introduction and Course Overview Learn how to simplify and accelerate supply chain modeling.
Wed	Aug. 30	Five Worlds of Analytics Framework to analyze capacity and inventory analytics.
Mon	Sep. 4	<b>No Class Today (Labor Day Holiday)</b>
Wed	Sep. 6	Forecasting – <i>Intel data set challenge</i> Case provides real-world data to demonstrate the difficulties in forecasting.
Mon	Sep. 11	Newsvendor model – <i>Meeting Seasonal Demand at JumpRopeCo</i> Case applies newsvendor model to a company’s seasonal product offering
Wed	Sep. 13	Supply Chain and Postponement – <i>Reebok NFL Replica Jerseys</i> Case applies newsvendor model to evaluate and optimize an opportunity for postponement.
Mon	Sep. 18	Conducting strategic inventory assessment – <i>Steelworks</i> Case provides limited data to find cause of inventory problems
Wed	Sep. 20	Changing Inventory Levels in Practice – <i>Cleansing Smoothies</i> Case applies base-stock policy to evaluate and change company’s existing inventory levels.
Mon	Sep. 25	Multi-echelon inventory optimization Class provides intuition for multi-echelon inventory modeling.
Wed	Sep. 27	Postponement – <i>Gillette Postponement Center Analysis</i> Case examines postponement strategies for different geographies.
Mon	Oct. 2	Dual Sourcing – <i>Premier Logistics, Inc.</i> Case establishes framework to evaluate sourcing from multiple suppliers.
Wed	Oct. 4	Real-world inventory optimization – Identifying Inventory Reduction Opportunities at BioCo Case develops process to optimize inventory levels in practice
Mon	Oct. 9	Supply Chain Costs In-class exercise to understand how to think about supply chain cost

Day	Date	
Mon	Oct. 23	Supply chain and safety stock placement – <i>Eastman Kodak Health Alliance</i> Class illustrates challenge of optimizing a three-company supply chain.
Wed	Oct. 25	Optimizing Inventory and Service in a Supply Chain – <i>Google</i> Case determines how to optimize inventory levels across diverse lines of business.
Mon	Oct. 30	Supply chain design and safety stock placement – <i>HP Photo Printer</i> Case illustrates challenges of optimizing a new product supply chain.
Wed	Nov. 1	Scheduling – OPT Game (Individual Assignment) Game demonstrates the challenge of operational scheduling.
Mon	Nov. 6	PUG Fitness, Chattanooga Process analysis for a service industry
Wed	Nov. 8	Operational design – Use Of A Queueing Model To Design A Lean System Buffer and line design decisions
Mon	Nov. 13	Network Design – <i>BigFig Case, Part 1</i> Case solves assignment problem from plants to customer regions.
Wed	Nov. 15	Tactical planning case Case introduces aggregate production planning.
Mon	Nov. 20	Supplier selection – <i>SteelCo Case</i> Class illustrates challenge of strategic sourcing in commodity business.
Wed	Nov. 22	<b>No Class Today (Thanksgiving Holiday)</b>
Mon	Nov. 27	Flexibility – <i>FlexCap</i> Class provides intuition for product-plant assignment.
Wed	Nov. 29	Capacity design – Tesla Roadster Manufacturing strategy for a start-up operation.
Mon	Dec. 4	Network Design – <i>BigFig Case, Part 2</i> Case shares results from network design and customer assignment.

## Grading and Assignments

The grading of OID6590 will be based on the following weights:

15%	Class participation (individual)
40%	Case assignments (team based, but individually written)
20%	BigFig Group project (team deliverable, one deliverable per team)
25%	Final exam (2-hour block during final exam day)

### *Class Participation (individual)*

Because participation is a prerequisite to learning and attendance is a prerequisite to participation, class attendance is required. Please inform us if you know in advance that you will need to miss a class. Multiple absences will influence your grade.

Regularly engaging in discussion of cases and readings, asking questions that lead to better understanding of a concept by the class as a whole, clarifying concepts, and sharing professional experience about course topics constitute superior class participation and contribute to our collective learning. Some criteria that we will use to judge effective class participation include:

1. Is the participant a good listener?
2. Is the participant concise and articulate?
3. Are the points made relevant to the current discussion? Are they linked to the comments of others?
4. Do the comments show clear evidence of appropriate and insightful analysis of the case?
5. Is there a willingness to participate?

At the end of the semester, students are placed into one of four class participation categories. You do not need to worry that your class participation grade is being micromanaged. No one event will make, or break, your participation grade. Instead, think of your participation grade as the overall impression the quality and quantity of your participation makes on the entire course-learning experience.

### *Case Analyses (team based, but individually written)*

You should form a team and work together on the cases for the duration of the semester. Case learning is an integral part of OIDD6590. You will greatly benefit from working with your team on every assignment. Each team can have no more than four students. After your team discusses the case, each individual should submit their own analysis. Each team needs to stay together for the term; a team assessment will occur at the end of the term. The session's Canvas page will state the maximum length of the submission. In most cases, it is one page. This will give you sufficient space to include a table of summary calculations plus a brief paragraph putting the calculations in context. A page is defined as an 8.5" wide by 11" high piece of paper, with 1-inch margins and other normal spacing conventions employed.

So to reiterate: You should work with your team to analyze the case and perform the calculations. You are also welcome to work with your team to develop an explanation of your calculations. You should then put the explanation in your own words. What you submit each day is most definitely not a full-blown case write-up. It is much more focused. We are having you submit the core calculation in the case along with your insight into that calculation. All case assignments are submitted to Canvas, prior to the start of class.

There are seven case assignments. Only the top five scores will count toward your final grade.

### *Group project (BigFig Case)*

The same group that you join to work on the individual assignments will also complete two group assignments for the BigFig case. This case requires you to use OpenSolver or a mathematical optimization library like Gurobi. The problem can not be solved in Excel's default Solver. Each group will submit a single write-up. The group project will be submitted in two parts. The first part is a one-page writeup plus one slide summarizing your best insight; that is due on Class 19. The second part is due on the last day of class; the entire part-two submission should not exceed two pages of text and 10 pages of supplemental appendixes; a single summary slide summarizing your part-two analysis will be shared with the class on the last day of class.

### **Academic Integrity**

When preparing cases and assignments you should not receive input from anyone who has already participated in a faculty-led discussion of the same material, be it at Wharton or another school. When preparing any graded assignment you may *not* consult or use material not already included in the course packet or posted on the course webpage, unless this has been explicitly authorized by the instructor. In particular, using material from previous editions of this course or courses offered at other schools is strictly prohibited. Also, no individual may be listed as a co-author of a team assignment unless that person has contributed to the work submitted in a substantial manner. Each member of the team is fully responsible for ensuring that each submitted assignment is done according to the expected professional standards and the academic integrity policy.

The academic integrity policy of this course will be enforced, and any violators would expose themselves to the most serious consequences. In addition, you will be held personally responsible for confronting and reporting any violations that come to your attention. Finally, if at any point during the course you believe that you may be violating this academic integrity policy, or if its implications in your particular situation are not completely clear, you should immediately contact the instructor for clarification.

### **Assistive Technologies**

Every time I read the Academic Integrity policy, which was written with input across the school, I am struck by how well it is written and how encompassing it is. This is the first year I am adding a section on assistive technologies. The main assistive technologies we use in the class relate to data visualization and modeling. For example, students are welcome to model using a spreadsheet application or a programming application. Particularly within the realm of programming applications, there are libraries that go far beyond what spreadsheets can do. And there are specialized applications students have learned in other courses that can go beyond what spreadsheets and programming applications can do; one such example that can show up in our class is ArcGIS. The differences tend to not matter because the nature of the assignments are such that the population of the models and the interpretation of the results are more difficult than the modeling itself. However, as assistive technologies like ChatGPT advance, the role of assistive technologies may matter.

For this semester, I think the right balance to strike is ask students to disclose their use of assistive technologies if they use something that we do not use in class. That is, students do not need to disclose the use of anything like Excel, Google Sheets, Gurobi, OpenSolver, Power BI, Python, R, or Tableau. If they use an application that is substantially different than these assistive technologies they should disclose that to the teaching team. And this statement on assistive technologies in no way obviates the academic integrity statement.