UM-SJTU Joint Institute
VG441 Supply Chain Management

Instructor: Professor Cong Shi

Course Information

- Time: Monday & Wednesday 8:00-9:40am, Shanghai Time
- Format: Canvas → Zoom → Join
- Email: shicong@umich.edu or shicong@gmail.com
- Office hours: Monday 10:00-11:00am, Shanghai Time and Piazza Q&A, around the clock
- TA: Shunyi Zhu (zhushunyi@sjtu.edu.cn)
- TA office hours session: Wednesday Night 8:00-9:30pm, Shanghai Time

Course Description

Introductory course on optimization methods in supply chain management. Topics include forecasting and demand models, deterministic and stochastic inventory models, multi-echelon inventory models, facility location models, process flexibility, supply chain contracts, and reinforcement learning algorithms in supply chain models.

Prerequisites

Students require a basic level of mathematical maturity and ease/familiarity with rigorous mathematical development. Familiarity with basic concepts in probability and statistics and at least one programming language (e.g., C/C++, Java, Python) are required.

Course Details

This course is an introductory graduate or advanced undergraduate course on (1) how to build good mathematical models in supply chain management and (2) how to apply optimization methods to make better planning and operational decisions. Several excellent reference textbooks are [6, 3, 4, 8, 1, 7, 5, 2] but students do not need to purchase them. Teaching materials will be provided and self-contained. We will also learn how to use *Python + Gurobi* to code some of these algorithms.

The following fundamental topics are covered in this course.

- Demand forecasting
- Inventory optimization
- Facility location models
- Supply chain contracts
- Revenue management

- Process flexibility
- Approximation algorithms and reinforcement algorithms

Textbooks and Grading

1. Students are not required to purchase any textbooks. Notes or lecture slides for each lecture will be uploaded to Canvas. But additional readings from the reference list are always encouraged.
2. Participation (20%): Approximately 1% per class.
3. Problem sets (30%): Late homework will not be accepted unless reasonable excuses are given (e.g., university approved excuses, medical conditions). Bonus questions are not graded and counted (for your own interests)!
4. Midterm (25%): Take-home 24-hour open-book exam with time TBD.
5. Final (25%): Take-home 24-hour open-book exam with time TBD.
6. Your final grade will be curved. I will make the median score "A-".

Honor Code

All students are expected to be familiar with the Engineering Honor Code, and to be bound by its requirements on all homework and examinations.

References

[1] Daskin, M. S. 2011. *Network and discrete location: models, algorithms, and applications*. John Wiley & Sons, NY.

[2] Hazan, Elad, et al. 2016. Introduction to online convex optimization. *Foundations and Trends® in Optimization* **2**(3-4) 157–325.

[3] Hopp, W. J., M. L. Spearman. 2011. *Factory physics*. Waveland Press, NY.

[4] Simchi-Levi, D., X. Chen, J. Bramel. 2014. *The Logic of Logistics*. Springer, NY.

[5] Slivkins, Aleksandrs, et al. 2019. Introduction to multi-armed bandits. *Foundations and Trends® in Machine Learning* **12**(1-2) 1–286.

[6] Snyder, L. V., Z.-J. M. Shen. 2011. *Fundamentals of Supply Chain Theory*. John Wiley & Sons, NY.

[7] Williamson, David P, David B Shmoys. 2011. *The design of approximation algorithms*. Cambridge university press, Cambridge, UK.

[8] Zipkin, P. H. 2000. *Foundations of inventory management*. McGraw-Hill/Irwin, NY.