OR 690 – Optimization of Supply Chains (Fall 2022)

Instructor: Dr. Ran Ji
Office: Nguyen Engineering Building, Room 2210
Email: rji2@gmu.edu
Phone: (703) 993-5993
Office Hours: Mondays 2:00 – 4:00 PM or by appointment

**Class Place
and Time:**   Innovation Hall 209
                 Wednesday 7:20 – 10:00 PM

Prerequisites: This course is suitable for students with some basic knowledge in mathematical programming, probability, statistics, optimization, and some basic programming experience. No specific pre-requisite courses are required. Mathematics through linear algebra and STAT 344 is recommended. Basic knowledge on predictive and prescriptive analytics is preferred.

**Course
Description:**   This course introduces the methodology and foundations of supply chain optimization and also demonstrates how recent developments build upon classic models. The course focuses on strategic, tactical, and operational aspects of supply chain management and cover a broad range of topics from forecasting, inventory management, and facility location to transportation, vehicle routing, and supply chain contracts, etc. Key mathematical models and advance optimization techniques for optimizing the design, operation, and evaluation of supply chains are presented. Students gain hands-on coding experience and perform case studies using optimization software.

Software: No specific optimization software is required. Students can choose the programming language and optimization solvers based on their preferences.
                 For lecture purposes, AMPL with different solvers and Matlab will be the primary software/programming language adopted in this course.

                 AMPL algebraic/mathematical modeling language (see blackboard)
                 Academic/Commercial optimization solvers: Cplex, Gurobi, Knitro, Minos, Snopt, Bonmin, Ipopt, etc. (see blackboard)
                 Matlab (available on VSE computers, or via GMU Virtual Computing Lab)

Textbooks: *The course materials will be adapted from several textbooks and some research papers. The books listed below are suggested but NOT required.*
   - **Snyder, Lawrence V., and Zuo-Jun Max Shen. "*Fundamentals of Supply Chain Theory*". 2nd Edition. John Wiley & Sons, 2019.**
   - Simchi-Levi, David, Xin Chen, and Julien Bramel. *"The logic of logistics: Theory, algorithms, and applications for logistics and supply chain management".* (2005).
   - Silver, Edward A., David F. Pyke, and Douglas J. Thomas. "*Inventory and production management in supply chains*". CRC Press, 2016.

- Geunes, Joseph, and Panos M. Pardalos, eds. "*Supply Chain Optimization*". Vol. 98. Springer Science & Business Media, 2005.
- Tipi, Nicoleta. "*Supply chain analytics and modelling: Quantitative tools and applications*". Kogan Page Publishers, 2021.
- Robertson, Peter W. "*Supply Chain Analytics: Using Data to Optimise Supply Chain Processes*". Routledge, 2020.
- *Some relevant research papers will be distributed on blackboard*

Assignments Exams and Grading:

The course grade will be based on individual homework assignments, an oral presentation of a selected research paper (or case study), a term project (proposal + presentation + technical report). Each grading component is described below.

Assignments:	40%
Paper Presentation:	15%
Term Project:	45%

The +/- letter grades will be used.

The instructor reserves the rights to make minor modifications in the percentages related to the number and difficulty of the homework given.

Paper Presentation:

Each student will pick a recent research paper of interest on a specific topic within the theme of this class. The goal of the research paper presentation is to present the key ideas, models, solution methods and results of the paper at an appropriate technical level. With good understanding, the students are expected to make their own slides and present the paper in their own words to the peers.

Term Project:

Each student will propose (or pick) a specific topic of interest with appropriate applications to work on a term project. The student is expected to understand the background of optimization problems, design/propose solution method(s), implement them and evaluate them on data sets. The entire project would consist of a project proposal in the mid of the semester, an oral presentation, and a written technical report.

Topics and Schedule

Note: The list of topics is tentative and may be subject to update.

#1:	Introduction to Supply Chain Management
#2:	Demand Modeling and Forecasting
#3:	Deterministic Inventory Models
#4:	Stochastic Inventory Models
#5:	Facility Location Models and Network Design
#6:	Supply Uncertainty and Disruption Risks
#7:	The Traveling Salesman Problem
#8:	The Vehicle Routing Problem
#9:	Metaheuristic Algorithms: Brief Introduction
#10:	Integrated Supply Chain Models
#11:	Supply Chain Contracts
#12:	Fairness and Equity Issues in Supply Chain
#13:	Chance-Constrained Programming in Supply Chain

Class Website:	**Blackboard**: http://mymson.gmu.edu
	Click on the Courses tab in the green area and then on the Fall 2022 Optimization of Supply Chains (OR-690) link when the course list column appears.
	The left column menus include the following:

Syllabus: Class syllabus, schedule, course overview information.

Content: Links to weekly modules with lectures, data files, and suggested readings.

Assignments: Homework information, data, and guidelines. Solutions to the Assignments. Links to submit assignments.

Projects: Project information. Links to submit the proposals and final reports.

Software: Some resources for optimization software are available here.

My Grades: This is the place to check on your grades.

Discussion Board: At least one discussion board will be open to support communication among students.

General Material

Academic Integrity
Mason is an Honor Code university; please see University Catalog (http://oai.gmu.edu/the-mason-honor-code-2/) for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely.

Mason Email Accounts
Students must use their MasonLive email account to receive important University information, including the messages related to this class. See Mason Live (http://masonlive.com) for more information.

Office of Disability Services
If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at (703) 993-2474. All academic accommodations must be arranged through the ODS (http://ods.gmu.edu).

Writing Center: Robinson Hall A114. Phone: (703) 993-1200. Webpage: http://writingcenter.gmu.edu

University Libraries: "Ask a Librarian". Webpage: http://library.gmu.edu/mudge/IM/IMRef.html

University Policies: The University Catalog (http://catalog.gmu.edu) is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at University Policy (http://universitypolicy.gmu.edu). All members of the university community are responsible for knowing and following established policies.