Q780
Management Science Research Issues I
Summer 2021 Course Outline

Operations Management Area
DeGroote School of Business
McMaster University

COURSE OBJECTIVE

The purpose of this first PhD research course is to help the student build knowledge and skills in the areas that are most related to his/her research interest. This outline is being developed for two students: Ms. Zahra Mashayekhi and Ms. Zeinab Vosooghi. Both are taking this course in Term 3 of their doctoral studies. Thus, the first part of the course will be common to both and will touch upon the fundamental concepts of deterministic operations research, while the second part will require each student to select an area from the specified list for an in-depth understanding. It is pertinent that the latter, in addition to the interaction with the supervisor, is expected to result in the development of Q781 course content.

INSTRUCTOR AND CONTACT INFORMATION

Dr. Manish Verma
Associate Professor
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Tel: (905) 525-9140 x 27438
Classroom and Time: Zoom (https://mcmaster.zoom.us/j/7895010056)
(Fridays: 10:00am to 1:00pm)

COURSE DESCRIPTION

This course provides an exposure to the core readings, including latest works, in management science that are pertinent to the research interests of the three students.

REQUIRED COURSE MATERIALS AND READINGS

There will be weekly readings that would include book chapters and peer reviewed journal articles. Each student is expected to submit two term papers. The term papers will be an opportunity for the student to synthesize the readings on the indicated topics, and also to identify and communicate any possible grey areas.

EVALUATION

Class Participation/Presentation	40%
Term Paper (2 x 30%)	60%
Total	100%

Conversion

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme.

LETTER GRADE	PERCENT
A+	90 - 100
A	85 - 89
A-	80 - 84
B+	75 - 79
B	70 - 74
B-	60 - 69
F	00 - 59

WEEKLY READINGS AND MEETING SCHEDULE

WEEKS	**READINGS**
1 to 3	**PART I:** *Deterministic Operations Research: Models & Methods in Linear Optimization* by David J. Rader Jr. • Chapter 11: Algorithmic Applications of Duality. • Chapter 12: Network Optimization Algorithms.
4 & 5	*Deterministic Operations Research: Models & Methods in Linear Optimization* by David J. Rader Jr. • Chapter 13: Introduction to Integer Programming • Chapter 14: Solving Integer Programs: Exact Methods • Chapter 15: Solving Integer Programs: Modern Heuristic Techniques
6 to 13	**PART II:** Each student is expected to select 2 topics from the list and go through the specified set of readings. Note that the list of readings is not exhaustive, and that the student is expected to collect, review, and discuss all the pertinent articles with the Instructor. The objective of

this exercise is to encourage students to start thinking about possible dissertation area and perform the preliminary exploration to develop a thorough understanding of the chosen topic.

Each student is expected to meet with the instructor individually in weeks 6 to 12, and then present the findings to the class in week 13.

1. Transportation of dangerous goods.
2. Intentional disruption in supply chain/ transportation networks.
3. Random disruption in supply chain/transportation networks
4. Disaster management & Humanitarian logistics.
5. Green supply chain management & Sustainability.
6. Interface of one or more of the above areas.
7. Use of Big Data & Machine Learning in one of the areas above.
8. Student initiated topics.

1. Transportation of dangerous goods.

- Ditta, A., Figueroa, O., Galindo, G., Yie-Pinedo, R., 2019. A review on research in transportation of hazardous materials. *Socio-Economic Planning Sciences*, 68, 100665.
- Different modes of transportation.

Risk Assessment:

- Erkut, E., Verter, V., 1998. Modeling of transport risk for hazardous materials. *Operations Research*, 46(5), 625-642.
- Hosseini, S.D., Verma, M., 2018. Conditional value-at-risk (CVaR) methodology to optimal train configuration and routing of rail hazmat shipments. *Transportation Research Part B: Methodological*, 110, 79-103.
- Toumazis, L., Kwon, C., 2103. Routing hazardous materials on time dependent networks using conditional value-at-risk. *Transportation Research Part C*, 37, 73-92.
- Verma, M., 2011. Railroad transportation of dangerous goods: a conditional exposure approach to minimize transport risk. *Transportation Research Part C*, 19, 790-802.
- Others

Risk Management:

- Bianco, L., Caramia, M., Giordani, S., Piccialli, V., 2016. A game theoretic approach for regulating hazmat transportation. *Transportation Science*, 50(2), 424-438.
- Esfandeh, T., Kwon, C., Batta, R., 2016. Regulating hazardous materials transportation by dual toll pricing. *Transportation Research Part B*, 83, 20-35.
- Marcotte, P., Mercier, A., Savard, G., Verter, V., 2009. Toll policies for mitigating hazardous materials transport risk. *Transportation Science*, 43(2), 228-243.
- Verma, M., Verter, V., Gendreau, M., 2011. A tactical planning model for railroad transportation of dangerous goods. *Transportation Science*, 45(2), 163-174.
- Verma, M., Verter, V., Zufferey, N., 2012. A bi-objective model for planning and managing rail-truck intermodal transportation of hazardous materials. *Transportation Research Part E*, 48(1), 132-149.
- Others

Network Design:

- Bianco, L., Caramia, M., Giordani, S., 2009. A bi-level flow model for hazmat transportation network design. *Transportation Research Part C*, 17(2), 175-196.
- Fontaine, P., Minner, S., 2018. Benders decomposition for the hazmat transport network design problem. *European Journal of Operational Research*, 267(3), 996-1002.
- Kara, B.Y., Verter, V., 2004. Designing a road network for hazardous materials transportation. Transportation Science, 38(2), 188-196.
- Sarhadi, H., Naoum-Sawaya, J., Verma, M., 2020. A robust optimization approach to locating and stockpiling marine oil-spill response facilities. *Transportation Research Part E*, 141, 102005.
- Verma, M., Gendreau, M., Laporte, G., 2013. Optimal location and capability of oil-spill response facilities for the south coast of Newfoundland. *Omega*, 41(5), 856-867.
- Verter, V., Kara, B., 2008. A path-based approach for hazmat transport network design. *Management Science*, 54(1), 29-40.
- Others

2. Intentional disruption in supply chain/ facilities & transportation networks.

Review Papers:

- Analyzing the vulnerability of critical infrastructure to attack and planning defenses. G. Brown, W. Carlyle, J. Salmeron, and K. Wood. *Tutorials in Operations Research*, INFORMS 2005.
- Planning for disruptions in supply chain networks. L. Snyder, M. Scaparra, M. Daskin, and R. Church. *Tutorials in Operations Research*, INFORMS 2006.
- More recent?

Application Papers:

- Liberatore, F., Scaparra, M.P., Daskin, M.S., 2011. Analysis of facility protection strategies against an uncertain number of attacks: The stochastic R-interdiction median problem with fortification. *Computers & Operations Research*, 38(1), 357-366.
- Sarhadi, H., Tulett, DM., Verma, M., 2017. An analytical approach to the protection planning of a rail intermodal network. *European Journal of Operational Research*, 257(2), 511-525.
- Scaparra, M.P., Church, R.L., 2008. An exact solution approach for the interdiction median problem with fortification. *European Journal of Operational Research*, 189(1), 76-92.
- Wilson, M.C., 2007. The impact of transportation disruptions on supply chain performance. *Transportation Research Part E*, 43(4), 295-320, 2007.
- Zhuang, J., Bier, V., 2007. Balancing terrorism and natural disasters -Defensive strategy with endogenous attacker effort. *Operations Research*, 55(5), 976-991.
- Others.

3. Random disruption in supply chain/ facilities & transportation networks.

Review paper:

- Planning for disruptions in supply chain networks. L. Snyder, M. Scaparra, M. Daskin, and R. Church. *Tutorials in Operations Research*, INFORMS 2006.
- Others

Application Papers:

- Azad, N., Hassini, E., Verma, M., 2016. Disruption risk management in railroad networks: An optimization-based methodology and a case study. *Transportation Research Part B*, 85, 70-88.
- Jabbarzadeh, A., Azad, N., Verma, M., 2020. An optimization approach to planning rail hazmat shipments in the presence of random disruptions. *Omega*, 96, 102078.
- Ke, G.Y., Verma, M., 2021. Managing disruption risk in rail-truck intermodal transportation networks. Forthcoming in *Transportation Research Part E*.
- Khaled, A.A., Jin, M., Clarke, D.B., Hoque, M.A., 2015. Train design and routing optimization for evaluating criticality of freight railroad infrastructures. *Transportation Research Part B*, 71, 71-84.
- Lu, M., Ran, L., Shen, Z-J. Max, 2015. Reliable facility location design under uncertain correlated disruption. *Manufacturing & Service Operations Management*, 17(4), 427-619.
- Zhang, X., Zheng, Z., Zhu, Y., Cai, K-Y., 2014. Protection issues for supply systems involving random attacks. *Computers & Operations Research*, 43, 137-156.
- Others

4. Disaster Management & Humanitarian logistics.

Review papers:

- Altay, N., Green, W.G., 2006. OR/MS research in disaster operations management. *European Journal of Operational Research*, 175, 475-493.
- Apte, A., 2010. Humanitarian logistics: A new field of research and action. *Foundations and Trends in Technology, Information and Operations Management*, 3(1), 1-100.
- Galindo, G., Batta, R., 2013. Review of recent developments in OR/MS research in disaster operations management. *European Journal of Operational Research*, 230, 201-211.
- Overstreet, E., Hall, D., Hanna, J., Rainer Jr, R., 2011. Research in humanitarian logistics. *Journal of Humanitarian Logistics & Supply Chain Management*, 1(2), 114-131.

Applications:

- Dalal, J., Uster, H., 2017. Combining worst case and average case considerations in an integrated emergency response network design problem. *Transportation Science*, 52, 171-188.
- Gutjahr, W.J., Fischer, S., 2018. Equity and deprivation costs in humanitarian logistics. *European Journal of Operational Research*, 270(1), 185-197.
- Holguín-Veras, J., Amaya-Leal, A., Cantillo, V., Van Wassenhove, L.N., Aros-Vera, F.,

Jaller, M., 2016. Economic estimation of deprivation cost functions: A contingent valuation experiment. *Journal of Operations Management*, 45, 44-56.

- Kovacs, G., Spens, K., 2007. Humanitarian logistics in disaster relief operations. *International Journal of Physical Distribution & Logistics Management,* 37(2), 99-114.
- Murray-Tuite, P., Wolshon, B., 2013. Evacuation transportation modeling: An overview of research, development, and practice. *Transportation Research Part C*, 27, 25-45.
- Rafiei, R., Huang, K., Verma, M., 2021. Cash versus in-kind transfer programs in humanitarian operations: An optimization program and case study. *Socio-Economic Planning Sciences:* initial review.
- Others

5. Green supply chain management & Sustainability.

Review papers:

- Dekker, R., Bloemhof, J., Mallidis, I., 2012. Operations Research for green logistics - An overview of aspects, issues, contributions and challenges. *European Journal of Operational Research*, 219, 671-679.
- Srivastava, S.K., 2007. Green supply-chain management: a state-of-the art literature review. *International Journal of Management Reviews*, 9(1), 53-80.
- Sarkis, J., 2003. A strategic decision framework for green supply chain management. *Journal of Cleaner Production*, 11(4), 397-409.

Applications:

- Khoshroshahi, H., Azad, N., Jabbarzadeh, A., Verma, M., 2021. Investigating the level and quality of the information in the environmental disclosure report of a corporation considering government intervention. Forthcoming in *International Journal of Production Economics*.
- Kouhizadeh, M., Saberi, S., Sarkis, J., 2020. Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers. *International Journal of Production Economics*, 107831.
- Lee, H.C.B., Cruz, J.M., Shankar, R., 2018. Corporate social responsibility (CSR) issues in supply chain competition: Should greenwashing be regulated? *Decision Sciences*, 49, 1088-1115.
- Ma, P., Shang, J., Wang, H., 2017. Enhancing corporate social responsibility: Contract design under information asymmetry. *Omega*, 67, 19-30.
- Ma, X., Ho, W., Ji, P., Talluri, S., 2018. Coordinated pricing analysis with the carbon tax scheme in a supply chain. *Decision Sciences*, 49, 863-900.
- Mol, A.P.J., 2015. Transparency and value chain sustainability. *Journal of Cleaner Production*, 107, 154-161.
- Nielsen, I.E., Majumdar, S., Sana, S.S., Saha, S., 2019. Comparative analysis of government incentives and game structures on single and two-period green supply chain. *Journal of Cleaner Production*, 235, 1371-1398.
- Others.

ACADEMIC DISHONESTY

It is the student's responsibility to understand what constitutes academic dishonesty. Please refer to the University Senate Academic Integrity Policy at the following URL:

http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf

This policy describes the responsibilities, procedures, and guidelines for students and faculty should a case of academic dishonesty arise. Academic dishonesty is defined as to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. Please refer to the policy for a list of examples. The policy also provides faculty with procedures to follow in cases of academic dishonesty as well as general guidelines for penalties. For further information related to the policy, please refer to the Office of Academic Integrity at:

http://www.mcmaster.ca/academicintegrity

MISSED ACADEMIC WORK

Late assignments will not be accepted. No extensions are available except under extraordinary circumstances. Please discuss any extenuating situation with your instructor at the earliest possible opportunity.

POTENTIAL MODIFICATIONS TO THE COURSE

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

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STUDENT ACCESSIBILITY SERVICES

Student Accessibility Services (SAS) offers various support services for students with disabilities. Students are required to inform SAS of accommodation needs for course work at the outset of term. Students must forward a copy of such SAS accommodation to the instructor normally, within the first three (3) weeks of classes by setting up an appointment with the instructor. If a student with a disability chooses NOT to take advantage of an SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. The SAS website is:

http://sas.mcmaster.ca