

**Fall 2022**  
**McMaster University**  
**DeGroote School of Business**  
**Q780 : Management Science Research Issues I**  
(for Ms. Fatima Ulubayova)

Instructor: Dr. Mahmut Parlar and Dr. Yun Zhou  
Office / Tel: DSB-425 / Ext. 22858 · DSB-428 / Ext 27549  
Email: {parlar, zhoy185}@mcmaster.ca  
Place / Time: TBA

## 1 Nature and the Composition of the Course

The objective of the course is to prepare the groundwork for the development of a thesis proposal. This will be in the form of,

- discussions with the thesis supervisors on important theories and new developments in operations research and management science related to the student's research interests — *Ms. Ulubayova is expected to work on relevant exercises and prepare a summary report after completing the presentation and discussion of each topic;*
- literature searches to establish the state of knowledge in the topic which has been selected by the student,
- regularly presenting the findings in the class in the form of lectures and discussions,
- **developing a written review of the research area of interest**,<sup>1</sup>, presented in a format similar to a research journal article. See Wang and Parlar [WP89] for an example of a literature review paper.

Note that the written report is not a thesis proposal, but a review of the state of current research in the area in which the student may be doing his thesis work. If well done, the report may be submitted to a research journal.

---

<sup>1</sup>This is expected to be a paper surveying data-driven optimal decision problems in operational problems such as inventory management and queueing models

## 2 Mark Distribution

Class Participation: 50%

Written Reports: 50%

- The passing grade in a PhD course is a B–. The percentage grade will be converted to a letter grade by the following scheme.

Letter Grade	Points	Equivalent Percentage
A+	12	90–100
A	11	85–89
A–	10	80–84
B+	9	77–79
B	8	73–76
B–	7	70–72
F	0	69–under

## 3 Tentative Work Plan

In this course we will read and discuss the following materials on topics related to the student’s research interest.

- Fundamental theories in operations research and management science
  - Parlar [Par00, Chapters 8 and 9].

The two chapters, Chapter 8 - Inventory Models and Chapter 9 - Queueing Models, discusses the fundamentals of the fundamental theories (inventory management and queueing theory) and their business applications. It is expected that the materials in the chapters will help the student bridge her knowledge gap in operations research and management science.
- Additional materials on inventory models from research papers
  - Parlar and Goyal [PG84]
  - Parlar [Par85]
  - Parlar [Par86]
  - Parlar [Par88]

- Parlar [Par97]
- Gürler and Parlar [GP97]
- Parlar [Par00]
- Additional materials on queueing models from research papers
  - Parlar and Sharafali [PS08]
  - Parlar and Sharafali [PS14]
- Data-driven decision models in operations research and management science
  - Bastani, Zhang, and Zhang [BZZ22]
 

This book chapter provides a review of recent work related to applying machine learning methods to operations management problems
  - Ban and Rudin [BR19]
  - More materials will need to be searched for and added to the list

**As the course progresses, more may be added to this list as the course progresses.**

## References

- [BR19] Gah-Yi Ban and Cynthia Rudin. The big data newsvendor: Practical insights from machine learning. *Operations Research*, 67(1):90–108, 2019.
- [BZZ22] Hamsa Bastani, Dennis J Zhang, and Heng Zhang. Applied machine learning in operations management. In *Innovative Technology at the Interface of Finance and Operations*, pages 189–222. Springer, 2022.
- [GP97] Ülkü Gürler and Mahmut Parlar. An inventory problem with two randomly available suppliers. *Operations Research*, 45(6):904–918, 1997.
- [Par85] Mahmut Parlar. Optimal ordering policies for a perishable and substitutable product: A markov decision model. *INFOR: Information Systems and Operational Research*, 23(2):182–195, 1985.

- [Par86] Mahmut Parlar. A heuristic method for the multi-item inventory problem with stochastic and substitutable demands. *Opsearch*, 23(4):250–257, 1986.
- [Par88] Mahmut Parlar. Game theoretic analysis of the substitutable product inventory problem with random demands. *Naval Research Logistics (NRL)*, 35(3):397–409, 1988.
- [Par97] Mahmut Parlar. Continuous-review inventory problem with random supply interruptions. *European Journal of Operational Research*, 99(2):366–385, 1997.
- [Par00] Mahmut Parlar. *Interactive operations research with Maple: methods and models*. Springer Science & Business Media, 2000.
- [PG84] M Parlar and SK Goyal. Optimal ordering decisions for two substitutable products with stochastic demands. *Opsearch*, 21(1):1–15, 1984.
- [PS08] Mahmut Parlar and Moosa Sharafali. Dynamic allocation of airline check-in counters: a queueing optimization approach. *Management Science*, 54(8):1410–1424, 2008.
- [PS14] Mahmut Parlar and Moosa Sharafali. Optimal design of multi-server markovian queues with polynomial waiting and service costs. *Applied Stochastic Models in Business and Industry*, 30(4):429–443, 2014.
- [WP89] Qinan Wang and Mahmut Parlar. Static game theory models and their applications in management science. *European Journal of Operational Research*, 42(1):1–21, 1989.