Management Science PhD Program Q787
Optimization Under Uncertainty
Winter 2021 Course Outline

Operations Management Area
DeGroote School of Business
McMaster University

COURSE OBJECTIVE

- Master the basic models and solution methodologies in two-stage stochastic programming.
- Master the basic models and solution methodologies in multi-stage stochastic programming.
- Apply the optimization under uncertainty techniques to operations management problems.

INSTRUCTOR AND CONTACT INFORMATION

C01 Wednesday	10:00-12:00PM	Location: Online
C01 Friday	11:00-12:00pm	Location: Online

Dr. Kai Huang
Instructor
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Office Hours: Open
Tel: (905) 525-9140 x23449

Christine Mcconnell
Administrative Assistant
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Tel: (905) 525-9140 x24434

Course Website: http://avenue.mcmaster.ca

COURSE DESCRIPTION

In this course, we will focus on an important optimization under uncertainty technique called stochastic programming. Firstly, we will discuss the two-stage stochastic programming models. Second, we will discuss the multi-stage stochastic programming models. Thirdly, we will introduce chance-constrained programming models and robust optimization models. We will present applications of these models to operations management problems.

LEARNING OUTCOMES

Upon completion of this course, graduate students will be able to complete the following key tasks:

- Master the basic knowledge and expertise in stochastic programming models.
- Master the computational skills in implementing stochastic programming models.

COURSE MATERIALS AND READINGS

Selective:

- J.R. Birge and F. Louveaux. Introduction to Stochastic Programming. Springer, 2011.
- A.J. King and S. W. Wallace. Modeling with Stochastic Programming. Wiley-Interscience. 2012.

EVALUATION

Notes about the types of assessments used as well as notes regarding how group work will be evaluated.

Components and Weights

Midterm Exam	25%
Final Exam	25%

Lecture Notes	10%
Course Project	40%
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.

Grade	Points	Equivalent Percentages
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 and under

Lecture Notes

Each student has to prepare Latex lecture notes for two lectures.

Course Project

Each student must conduct an individual course project on a research problem using optimization under uncertainty models.

- The research problem and the selected papers must be approved by the instructor.
- The project must contain computational implementation of the optimization under uncertainty models.
- The final report will have a journal paper format. It must contain a literature review and the report of computational results.
- Each student will present the project (20 minutes presentation).

Midterm and Final Exams

The midterm and final exams are take-home exams. Each student must finish the exams independently.

Please review the Graduate Examinations Policy (if applicable):
http://www.mcmaster.ca/policy/Students-AcademicStudies/GradExamsPolicy.pdf

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at:

www.mcmaster.ca/academicintegrity

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations

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.

STUDENT ACCESSIBILITY SERVICES

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca.

For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities:

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

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request, including the dates/times needing to be accommodated and the courses which will be impacted, to their Program Office normally within 10 days of the beginning of term. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

POTENTIAL MODIFICATION TO THE COURSE

The instructor reserves the right to modify elements of the course during the term. There may be changes to 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.

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

COURSE SCHEDULE

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WEEK	DATE	CONTENT
1	Jan. 11	• Review: LP and duality; IP and Lagrangian Relaxation. • BL, Chapter 1: Examples.
2	Jan. 18	• BL, Chapter 2: Modeling issues.
3	Jan. 25	• BL, Chapter 3: Basic properties and theory.
4	Feb. 1	• BL, Chapter 4: The value of information and the stochastic solution.
5	Feb. 8	• BL, Chapter 8: Evaluating and approximating expectations
	Feb. 15	Reading Week

6	Feb. 22	• BL, Chapter 9: Monte Carlo methods.
7	Mar. 1	• BL, Chapter 5: L-shaped method.
8	Mar. 8	• BL, Chapter 7: Stochastic Integer Programming.
9	Mar. 15	• BL, Chapter 3: Basic properties and theory.
10	Mar. 22	• BL, Chapter 6: Nested decomposition for multi-stage stochastic programming.
11	Mar. 29	• Chance constrained programming • Robust optimization
12	Apr. 5	• Presentation