

MAST 223
Introduction to Stochastic Methods of Operations Research
Winter 2021

- Preface:** Due to exceptional circumstances, this course will be taught, and all assessments will be done completely ONLINE. Given the subject matter and nature of this course, exams, including the class tests and/or the final exam will be given online through the Concordia Online Exams (COLE) platform with online proctoring. For more details read the ADDENDUM at the end of this course outline.
- Instructor:** Dr. D. Sen
Email: debaraj.sen@concordia.ca
- Office Hours:** Tuesdays, 9:30-11:00, Online via Zoom link (refer to the course's Moodle page).
- Textbook:** *Operations Research: Applications and Algorithms*, 4th Edition, by W. L. Winston.
The textbook will be available at:
<https://www.bkstr.com/concordiastore/home>
Note: Students should order textbooks as early as possible, especially for printed versions in case books are backordered or there are any shipping delays.
- Calculators:** Only calculators approved by the Department such as **Sharp EL 531** or the **Casio FX 300MS** are permitted for the class test and final examination. See <http://www.concordia.ca/artsci/math-stats/services.html#calculators> for details.
- Assignments:** Assignments are compulsory. There will be 5 assignments. Students are expected to submit electronic assignments as PDF files through **Moodle**. **Late assignments will not be accepted.**
- Midterm Test:** There will be one midterm test, based on the material of Weeks 1-7, which will contribute up to 25% to your final grade (see the Grading Scheme below). Missed tests cannot be made up. The midterm test will be held on **Thursday, March 11, 2021** proctored by COLE and/or Moodle platform (See Addendum). This test will be held during online lecture time. This exam and the final will be closed book exams.

NOTE: It is the Department's policy that tests missed for any reason, **including illness**, cannot be made up. If you miss the midterm test because of illness (*medical note required*) the final exam will count for 85% of your final grade, and the assignments will count for the remaining 15%.

Final Exam: The final examination will be given online. This exam will be two hours long and will cover all the material in the course.

NOTE: Students are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts or problems with the scheduling of the final exam must be reported directly to **the Examinations Office, not to your instructor**. It is the Department's policy and the Examination Office's policy that students must be available to take the final exam on the selected date and time. Conflicts due to travel plans will not be accommodated.

Final Grade: The final grade will be based on the higher of **(a) or (b)**:

- a) 15% for the assignments, 25% for the midterm test, and 60% for the final exam.
- b) 15% for the assignments, 15% for the midterm test, and 70% for the final exam.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

IMPORTANT: **PLEASE NOTE THAT THERE IS NO "100% FINAL EXAM" OPTION IN THIS COURSE.**

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." [Undergraduate Calendar, Sec 17.10.2]

Behaviour

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

Intellectual Property

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or

broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

Extraordinary circumstances

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.

Weeks	Chapters
1	<p>Chapter 12: Review of Probability Basic Rules of Probability. Bayes’ Rule. Random Variables, Mean, Variance, and Covariance. The Normal Distribution. Z-Transforms.</p>
2 & 3	<p>Chapter 15: Deterministic Inventory Models Introduction to Basic Inventory Models. Basic Economic Order Quantity Model. Computing the Optimal Order Quantity. The Continuous Rate EOQ Model. The EOQ Model with Back Orders Allowed. When to Use EOQ Models. Multiple Product EOQ Models.</p>
4 & 5	<p>Chapter 16: Probabilistic Inventory Models Single-Period Decision Models. The Concept of Marginal Analysis. The News Vendor Problem: Discrete Demand. The News Vendor Problem: Continuous Demand. Other One-Period Models. The EOQ with Uncertain Demand. Periodic Review Policy. Exchange Curves.</p>
6 & 7	<p>Chapter 17: Markov Chains Introduction to Stochastic Process. Introduction to Markov Chain. n-step Transition Probabilities. Classification of States in a Markov Chain. Mid-Term Test</p>
8	<p>Chapter 17: Markov Chains Steady-State Probabilities. Mean First Passage Times. Absorbing Chains. Work-Force Planning Models.</p>
9, 10 & 11	<p>Chapter 20: Queuing Theory Introduction. Modeling Arrival and Service Processes. Birth-Death Processes. The M/M/1/GD/∞/∞ Queuing System. The M/M/1/GD/c/∞ Queuing System. The M/M/s/GD/∞/∞ Queuing System.</p>

	<p>The M/G/∞/GD/∞/∞ and GI/G/∞ /GD/∞/∞ Models. The M/G/1/GD/∞/∞ Queuing System. Finite Source Models. Exponential Queues in Series and Open Queuing Networks. The M/G/s/GD/s/∞ System. Checking Inter-arrival Times & Service Times.</p>
12 & 13	<p>Chapter 21: Simulation & Review Introduction. Discrete Event Simulation. Monte Carlo Simulation. Simulation with Continuous Random Variables. Stochastic Simulation.</p>

Addendum:

This course will be taught and all assessments will be completely online. A midterm and/or a final online exam will be provided through the Concordia Online Exams (COLE) platform with online proctoring (also known as auto-proctoring). More information about the COLE system may be found at the [COLE website](#). Additionally, an **online proctoring tool called Proctorio** will be used to provide proctoring during the exam.

Please note the following with respect to online proctored exams:

- That the exam will take place during the exam period at the designated date and time set by the professor (midterm) or the Exams office (final). All exam times will be set to Eastern Standard/Daylight Time.
- That your image, voice and screen activity will be recorded throughout the duration of the exam.
- That you must show your Concordia University Identification card to validate your identity. Alternative government-issued photo identification will be accepted, though it is not recommended. Only identification in English or French will be accepted.
- That any recording made will only be viewed by authorized university personnel (no external entity has authorization to review the recording).
- That you will be responsible for ensuring appropriate, properly functioning technology (webcam, a microphone, appropriate browser and an ability to download any necessary software, as well as a reliable internet connection with a minimum of a 3G connection).
- That you are very **strongly recommended** to enter the virtual test site found at the [COLE website](#) and become familiar with the software that will be used for your exam before starting the exam.
- That you will need a quiet place within which to take the exam. Earplugs or noise-cancelling headphones that are not connected to a device may also be used to allow you to focus for the duration of the exam.

Students who are unable to write an exam because they are unable to meet the above conditions and requirements are advised that they will need to drop the course. More information can be provided on the next offering of this course

by consulting the Department. Students are advised that the drop deadline (DNE) for this course is **January 26, 2021**.

Students who require additional accommodations for their exams due to a documented disability should contact the Access Centre for Students with Disabilities as soon as possible (acsinfo@concordia.ca).

If you face issues during the exam, you should inform your professor of those issues immediately. Please note that there are in-exam supports you should spend time getting to know. [Visit the COLE website](#) for more information.