**Department of Mathematics & Statistics**
**Concordia University**

# MAST 221
Applied Probability
***Fall 2025***

**Instructor:** Dr. N. Ben Ghorbel
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**Schedule:** Mondays & Wednesdays, 13:15-14:30.

**Office Hours:** Mondays, 11:30-13:00.

**Text:** *John E. Freund's Mathematical Statistics with Applications*, 8th Edition, by I. Miller and M. Miller, Pearson Education, Inc. (2014).

The digital and print versions of the textbook will be available at: https://www.bkstr.com/concordiastore/home
**NOTE:** Students should order textbooks as early as possible, especially for print versions in case books are back ordered or there are any shipping delays.

**Assignments:** There will be 5 or 6 assignments. Assignments are compulsory. Students are expected to submit their assignments as a single PDF file on Moodle site. **Late assignments will not be accepted.** Assignments contribute 10% to your final grade. Working regularly on the assignments is essential for success in this course.

**Calculators:** Only calculators approved by the Department (with a sticker attached as proof of approval) are permitted for the class test and final examination.
For a list of Approved calculators see
https://www.concordia.ca/artsci/math-stats/services.html#calculators

**Midterm Test:** There will be **one midterm test,** based on the material of weeks 1-6, which will contribute up to 20% to your final grade (see the **Grading Scheme** below). The midterm test will be held on **Wednesday, October 22, 2025, in class.** This exam, as well as 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** ***(Short-Term Absence form or valid medical note required)*** the final exam will count for 90% of your final grade, and the assignments will count for the remaining 10%.

**Final Exam:** The final examination will be 3 hours long and will cover all the material in the course. In order to obtain a good grade, the student **MUST** show that she/he has a THOROUGH understanding of the subject and is good at problem-solving.

**PLEASE 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 Examinations Office's policy that **students are to be available until the end of the final exam period. Conflicts due to travel plans will not be accommodated.**

**Grading Scheme:** The final grade will be based on the higher of (a) or (b) below:

a) 10% for the assignments,
20% for the midterm test,
70% for the final exam.

b) 10% for the assignments,
10% for the midterm test,
80% 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.**

| Week(s) | Chapters |
|---|---|
| **1 & 2**<br><br>Sep. 03<br>Sep. 08<br>Sep. 10<br>Sep. 15 | **Chapter 2: Probability**<br>Introduction<br>Sample Spaces<br>Events<br>The Probability of an Event<br>Some Rules of Probability<br>Conditional Probability<br>Independent Events<br>Bayes' Theorem |
| **3 & 4**<br><br>Sep. 17<br>Sep. 22<br>Sep. 24<br>Sep. 29 | **Chapter 3: Probability Distributions and Probability Densities**<br>Random Variables<br>Probability Distributions<br>Continuous Random Variables<br>Probability Density Functions<br>Multivariate Distributions<br>Marginal Distributions<br>Conditional Distributions |
| **5 & 6**<br><br>Oct. 01<br>Oct. 06<br>Oct. 08 | **Chapter 4: Mathematical Expectation**<br>Introduction<br>The Expected Value of a Random Variable<br>Moments<br>Chebyshev's Theorem |
| **October 13: Thanksgiving Day, University closed.**<br>**October 11 - October 17: Mid-term Break** | |
| **7**<br><br>Oct. 20<br>Oct. 22 | <br><br>**Review**<br>**Midterm Test** |
| **8**<br><br>Oct. 27<br>Oct. 29 | **Chapter 4: Mathematical Expectation**<br>Moment Generating Functions<br>Product Moments<br>Moments of Linear Combinations of Random Variables<br>Conditional Expectations and Conditional Variances |
| **9 & 10**<br><br>Nov. 03<br>Nov. 05<br>Nov. 10<br>Nov. 12 | **Chapter 5: Special Probability Distributions**<br>Introduction<br>The Discrete Uniform Distribution<br>The Bernoulli Distribution<br>The Binomial Distribution<br>The Negative Binomial Distribution and Geometric Distribution<br>The Hypergeometric Distribution<br>The Poisson Distribution<br>The Multinomial Distribution |
| **11 & 12**<br><br>Nov. 17<br>Nov. 19<br>Nov. 24<br>Nov. 26<br>Dec. 01 | **Chapter 6: Special Probability Densities**<br>Introduction<br>The Uniform Distribution<br>The Gamma, Exponential and Chi-square Distributions<br>The Beta Distribution<br>The Normal Distribution<br>The Normal Approximation to the Binomial Distribution<br>The Normal Approximation to the Poisson Distribution<br>**Review** |

**Student Services**
You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

**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: https://www.concordia.ca/conduct/academic-integrity.html" *[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.