

MATH 323: PROBABILITY

FALL 2021

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Office Hours: TBA

Textbook : *Mathematical Statistics with Applications* (7th Ed)
by DD Wackerly, W Mendenhall III and RL Scheaffer

TARGET SYLLABUS

1. The basics of probability.

- Review of set theory notation.
- Sample spaces and events.
- The probability axioms and their consequences.
- Probability spaces with equally likely outcomes.
- Combinatorial probability.
- Conditional probability and independence.
- The Theorem of Total Probability.
- Bayes Theorem.

2. Random variables and probability distributions.

- Random variables.
- Discrete and continuous univariate distributions: cdfs, pmfs and pdfs.
- Moments: expectation and variance.
- Moment generating functions (mgfs): derivation and uses.
- Named distributions:
 - ▶ discrete uniform,
 - ▶ hypergeometric,
 - ▶ binomial,
 - ▶ Poisson,
 - ▶ continuous uniform,
 - ▶ gamma,
 - ▶ exponential,
 - ▶ chi-squared,
 - ▶ beta,
 - ▶ Normal.

3. Probability calculation methods.

- Transformations in one dimension.
- Techniques for sums of random variables.

4. Multivariate distributions.

- Marginal cdfs and pdfs.
- Conditional cdfs and pdfs.
- Conditional expectation.
- Independence of random variables.
- Covariance and correlation.

5. Probability inequalities and theorems.

- Markov's inequality.
- Chebychev's inequality.
- Definition of convergence in probability.
- The Weak Law of Large Numbers.
- The Central Limit Theorem and applications.

METHOD OF EVALUATION

Please note that the method of evaluation for this class will be **on the following basis only**[‡]:

| | |
|------------------------|--|
| Coursework Assignments | Six assignments (best five to count) |
| Midterm | 1.5 hours 21st October, 2021, 6.30pm – 8.00pm Online, submission via myCourses |
| Final | 3 hours, in-person if conditions allow. |

Final mark for course: the larger of

Version I: 25 % coursework + 25 % midterm + 50 % final

Version II: 25 % coursework + 75 % final

Note: Absence from the midterm exam for any reason will automatically lead to the mark being assigned according to Version II: there will be no make-up midterm exam.

[‡]In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change

If you need special examination arrangements or accommodations, please contact the **Office for Students with Disabilities** at 514-398-6009.

MCGILL UNIVERSITY POLICY STATEMENTS

The following three statements are included in this course outline, in keeping with Senate resolutions:

1. *McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the **Code of Student Conduct and Disciplinary Procedures**. For more information, see*

www.mcgill.ca/students/srr/honest/

[Approved by Senate on 29 January 2003]

2. *In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*

[Approved by Senate on 21 January 2009]

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Alia Sajjad & David A. Stephens.
August 30, 2021