DALHOUSIE UNIVERSITY
Inspiring Minds

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Probability — STAT/MATH 3360
Fall 2018

Instructor(s):	Hong Gu	hgu@dal.ca	Office: Chase 101
Lectures:	TR 13:05–14:25	(Studley SIR JAMES DUNN 101)	
Laboratories:	None		
Tutorials:	None		

Course Description

The concepts and application of probability. Topics include the classical discrete and continuous distributions, including the binomial, hypergeometric, multinomial, Poisson, uniform, exponential and normal; definitions and properties of random variables; independence; sums of independent random variables, including the law of large numbers and central limit theorem; conditional probability; and the bivariate normal distribution. Examples will be taken from the natural and physical sciences.

Course Prerequisites

STAT/MATH 2060 and MATH 2001

Course Objectives/Learning Outcomes

- Apply the basic principal of counting, permutations and combinations for counting the number of different ways that a certain event can occur.

- Calculate probabilities for various events when sample space having equally likely outcomes.

- Calculate probabilities using the definition for conditional probability, independence, multiplication rule, Bayes' theorem and the law of total probability.

- Calculate probability mass functions, cumulative distribution functions, the expected value and variance for discrete random variables.

- Calculate the expectation of sums of random variables.

- Understand various properties of a continuous random variable, including uniform distribution, normal distribution and exponential distribution.

- Derive the distribution of a function of a random variable given probability density function or probability mass function of the random variable.

- Calculate probabilities and marginal distributions based on joint probability functions.

- Calculate the joint probability distribution of functions of random variables.

- Calculate the probability density functions or cumulative distribution functions for sums of independent random variables.

- Calculate the conditional probability mass function and conditional probability distribution function.

- Using the property of expectation of sums of random variables to solve expected value problems or calculate probabilities.

- Calculate moment generating functions for either a discrete random variable or a continuous random variable and compute moments of a random variable by differentiating the moment generating function of the random variable.

- Use Markov's inequality, Chebyshev's Inequality and Chernoff bounds to obtain bounds on the probabilities of some events.

- Solve probability problems for large samples by applying Central limit theorem, the weak law of large numbers or the strong law of large numbers.

Course Materials

Textbook: "A First Course in Probability" (Ninth Edition)
by Sheldon Ross
published by Prentice Hall, 2013
Course website: http://www.mathstat.dal.ca/~hgu/Stat3360/

Course Assessment

Component	Weight (% of final grade)	Date
Midterm Exam	30	16th October (in class)
Final Exam	55	Scheduled by Registrar
Assignments	15	8 assignments, approximately weekly

Other Course Requirements

Course Work and method of assessment

There will be a midterm exam and a final exam. The midterm will be held in class on **Tuesday 16th October**, and should cover the material in Chapters 1–5. This may be changed, depending on the progress in lectures. There is no make-up exam for the midterm. If the missed midterm is due to illness, the weight for the midterm will be transferred to the final exam. If there is no decent reason for the missed midterm, the midterm grade will be zero.

The final exam will be scheduled by the Registrar's Office during the examination period: Dec. 6th to 16th. Students need to provide doctor's notes or other evidence for absence for the final exam, in which case a make-up final can be arranged.

There will also be (approximately) weekly homework assignments, which must be handed on due dates in the lecture. After this, I will put the model solutions on the course website. **No credit can be given for late homework.** The assignment weights will be shifted to the rest of the assignments if the missed assignments are due to illness. The overall homework mark will be made up of an average of the weekly homework marks.

The homework sheet will be divided into 2 sections: The *basic questions* section tests the basic concepts covered in the course: everyone should be able to do all these questions. The *standard questions* section has questions where the concepts covered in the course can be applied to more realistic situations, or questions which involve a stronger theoretical insight; these questions are mostly straightforward, though there may be the occasional tricky question included. There may also be some *bonus questions* section which includes questions either more challenging, or else raising interesting or important issues that are not central to this course.

Sometimes a question will be started on one sheet, but continued on the following sheet, after the relevant material has been covered. In this case, the full question will be given on the earlier sheet, but the parts that should only be attempted with the later sheet are clearly marked, and are repeated on the later sheet.

Grades will be determined by performance in the exams and the weekly homeworks. The midterm exam counts for 30%, the final counts for 55%, while the homework counts for the remaining 15%. You must pass the final exam to obtain a passing grade in the course.

Weekly Readings

Since class time is limited, I will be using it for explaining concepts and going over examples, rather than reading through the textbook. You should therefore read through the relevant sections of the textbook *before* the lecture, in order to gain the full benefit from the lecture. The sections of the textbook that will be covered each lecture will be listed on the website. This list may be updated from time to time, depending on the progress made in earlier lectures.

Sections of the text covered

We expect to cover most of the material in Chapters 1–8 in the textbook.

Conversion of numerical grades to Final Letter Grades follows the
Dalhousie Common Grade Scale

A+	(90–100)	**B+**	(77–79)	**C+**	(65–69)	**D**	(50–54)
A	(85–89)	**B**	(73–76)	**C**	(60–64)	**F**	< 50
A-	(80–84)	**B-**	(70–72)	**C-**	(55–59)		

Course Policies

Credit cannot be given for late assignments. The assignment weights will be shifted to the rest of the assignments if the missed assignments are due to illness. There is no make-up exam for the midterm. If the missed midterm is due to illness, the weight for the midterm will be transferred to the final exam. If there is no decent reason for the missed midterm, the midterm grade will be zero. For the above weight transfer to apply, students need to provide the **Student Declaration of Absence form** for missed academic requirement in this course.

Students need to provide doctor's notes or other evidence for absence for the final exam, in which case a make-up final can be arranged.

Students need to finish all assignment questions independently, collaboration or copying assignment solutions from any other sources are not allowed and thus deemed as plagiarism for this course.

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Information: `https://www.dal.ca/dept/university_secretariat/academic-integrity.html`

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation

as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia). Information: `https://www.dal.ca/campus_life/academic-support/accessibility.html`

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students dont follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal mannerperhaps through a restorative justice process. If an informal resolution cant be reached, or would be inappropriate, procedures exist for formal dispute resolution. Code: `https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html`

Diversity and Inclusion - Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness Statement: `http://www.dal.ca/cultureofrespect.html`

Recognition of Mikmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mikmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca). Information: `https://www.dal.ca/campus_life/communities/indigenous.html`

Important Dates

in the Academic Year (including add/drop dates)
`https://www.dal.ca/academics/important_dates.html`

University Grading Practices

`https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html`

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

Student Resources and Support

Advising

General Advising: https://www.dal.ca/campus_life/academic-support/advising.html
Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html
Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html
Black Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html
International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/
Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
Copyright Office: https://libraries.dal.ca/services/copyright-office.html
Fair Dealing Guidelines: https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html
Student Advocacy: https://dsu.ca/dsas
Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: `https://www.dal.ca/dept/safety/programs-services/biosafety.html`
Chemical Safety: `https://www.dal.ca/dept/safety/programs-services/chemical-safety.html`
Radiation Safety: `https://www.dal.ca/dept/safety/programs-services/radiation-safety.html`

ScentFree Program: `https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html`