

**Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Intermediate Statistical Theory — STAT/MATH 3460
Winter 2020**

Instructor(s): Hong Gu hgu@dal.ca
Lectures: MWF 14:35–15:25 (LSC-COMMON AREA C236)
Laboratories: None
Tutorials: None

Course Description

This course provides an intermediate level coverage of statistical theory to provide a framework for valid inferences from sample data. The topics covered include sampling distribution, main methods for point estimation and their properties including bias, variance, mean squared error, consistency, efficiency, and MVUE; interval estimation for unknown parameters, including the mean, differences of two means, variances, and proportions; hypothesis test including Neyman-Pearson lemma, significance and power, likelihood ratio test and tests for mean, variance, contingency tables, and goodness-of-fit. Some basic Bayesian inference is also covered in this course.

Course Prerequisites

STAT/MATH 3360

Course Objectives/Learning Outcomes

- Derive the moment estimates and maximum likelihood estimates (MLE) for a probability model with one or two parameters, including for censored data.
- Understand and apply the knowledge of several properties of estimators, including unbiasedness, efficiency and consistency.
- Learn important sampling distributions including chi-square distribution, t distribution and F distribution.

- Derive the confidence intervals for means, difference between means, proportions, difference between proportions, variances and ratio of two variances based on the corresponding sampling distributions.
- Master the basic concepts in hypothesis testing, including type I error, type II error and power, and calculate the power function for the composite hypotheses.
- understand the concept of the most powerful test and derive the Neyman-Pearson Lemma.
- Use likelihood ratio test to derive the tests concerning means, variances, proportions, and tests for several binomial probabilities, multinomial probabilities, independence for contingency tables and goodness of fit test.
- Understand and apply the chi-square approximation for likelihood ratio statistics for simple and composite hypotheses.
- Understand the basic Bayesian inference and can calculate the posterior densities and the posterior predictive distributions for Normal, Binomial and Poisson models.

Course Materials

Textbook: “John E. Freund’s Mathematical Statistics with Applications”
(Eighth Edition) by Irwin Miller and Marylees Miller, published by Pearson

Course website: <http://www.mathstat.dal.ca/~hgu/Stat3460/>

Course Assessment

Component	Weight (% of final grade)	Date
Midterm Exam	40	28th February (1-3pm, venue TBA)
Final Exam	60	Scheduled by Registrar
Assignments	0	8 assignments, approximately weekly

Other Course Requirements

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)	D	< 50
A-	(80–84)	B-	(70–72)	C-	(55–59)	D	(50–54)

Course Policies

In order to encourage students to finish assignments independently, the assignment marks will not be used to account for any percentage of the final grade. Thus copying assignment solutions elsewhere won't give you more marks for the final grade, but will make you lose a chance for independently thinking through the problems. This training is necessary for you to be able to handle the different problems in exams.

Nevertheless, handing in assignments on time is mandatory. **One percent of the final grade will be deducted for each assignment not handed in on time.** Late assignments are not accepted.

All students must use the Student Declaration of Absence form for missed academic requirement in this course (except for the final exam). Each student is permitted to use the form with a maximum of three times.

Course Content

A detailed course schedule is available online at **Course website:** <http://www.mathstat.dal.ca/~hgu/Stat3460/>.

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 don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner perhaps through a restorative justice process. If an informal resolution can't 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

Other important information

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 Students 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>