DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
MATH/STAT 4066/5066
Advanced Statistical Theory I
Fall 2020

Instructor(s): Dr. Edward Susko, Edward.Susko@dal.ca

Lectures: Lectures will be pre-recorded and posted on BrightSpace in advance of the lecture times MW 2:30-4:00.

Office Hours: You can contact me via email. I will be available for virtual meetings starting at 2:30 on Mondays via Microsoft Teams. Such meetings will only take place if at least one person requests a virtual meeting.

There are no planned synchronous components.

Course Description

This class, together with STAT 5067.03 provides a solid basis in the theory of statistical inference. After a review of some probability and distribution theory, the Bayesian and classical theories of estimation and testing are introduced.

Course Prerequisites

STAT3460 or instructor's consent

Learning Objectives

In statistical settings where transformations of random variables are of interest, students will be able to derive properties of the probability distributions of the transformations. Students will understand the difference between parametric and nonparametric statistical methods. Students will understand how decision theory is used to define optimal estimation and how to derive optimal estimators and predictors. Given a statistical model, students will know how to apply the major parametric statistical methods for estimation. Given a quantity of interest in a population, students will know how to obtain a non-parametric estimator of the quantity. Students will understand how uniformly minimum variance unbiased estimation gives a different criterion for optimal estimation than decision theory and how to determine if an estimator is uniformly minimum variance unbiased. Given a hypothesis test of interest, students will know how to determine whether a uniformly most powerful statistical test exists and what the test is. Students will know how to use optimal tests to derive optimal confidence interval construction procedures.

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Course Materials

- Mathematical Statistics: Basic Ideas and Selected Topics (2nd Edition). Peter J. Bickel and Kjell A. Doksum.

Course Assessment

Component	Weight (% of final grade)	Date
Assignments	50%	9-10 weekly assignments
Tests	50%	5 tests. Each 1.5 hours long
Test 1	10%	Wed, Sep 30
Test 2	10%	Wed, Oct 21
Test 3	10%	Wed, Nov 04
Test 4	10%	Wed, Nov 25
Test 5	10%	Mon, Dec 14

Assignments will be handed out weekly on Mondays (starting in Week 2 – Sep 14) and due at 9:30 am on Tuesday the next week.

Tests will be available for 24 hours starting at 9:30am on the day of the test.

Handwritten submissions of tests/assignments are fine but should be converted to a single pdf document and then uploaded. Additional time is being allowed for this purpose.

Tests can be submitted up to 1 hour after the test ends but will receive a late penalty of 30%. Tests submitted directly to me will also receive a late penalty of 30%.

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

This course follows the university policy on “missed or late academic requirements due to student absence” for assessments:

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

Students experiencing a short-term absence which results in an assessment being missed must do the following:

- Contact the instructor(s) by e-mail prior to the scheduled due date of the assessment,
- Complete a Student Declaration of Absence Form within 3 calendar days of the last day of absence.

Late assignments will not be accepted.

It is expected that each student will write up their assignments independently.

Students can use course material, including lecture notes, text and assignments in completing tests. The use of internet content and assistance from others is not allowed.

Course Content

Probability and Distributional Theory
Statistical Models, Goals and Performance Criteria
Methods of Estimation
Measures of Performance
Testing and Confidence Bounds
Additional Topics