Faculty of Science Course Syllabus

Department of Mathematics and Statistics

MATH/STAT 4066/5066

Advanced Statistical Theory I – Fall 2023

Instructor(s): Dr. Edward Susko, Edward.Susko@dal.ca (Office: Room 202 in the Chase Building)

Lectures: Wed and Fri 2:30-4:00 in LSC 206

Office Hours: Wed and Fri 4:00-5:00 (Consult Brightspace)

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

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Course Assessment

Assessment	Weight (% of final grade)	Date
Midterm	20%	Fri, Oct 27, 2:30-4:00 (in class)
Final exam	30%	Mon, Dec 11, 9:30-12:30 (Chase 319)
Assignments	50%	9-10 weekly assignments

Course Content

Probability and Distributional Theory (Appendices A, B)

Statistical Models, Goals and Performance Criteria (Ch 1)

Methods of Estimation (Ch 2)

Measures of Performance (Ch 3)

Testing and Confidence Bounds (Ch 4)

Additional Topics

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.

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 on Missed or Late Academic Requirements

Late assignments received prior to marked assignments being handed back will be accepted with a late penalty of 5%; assignments are usually handed back at the lecture after they were due. Missed tests will be written at a later date if sufficient reason can be given for missing the test.

Course Policies related to Academic Integrity

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty.

The Academic Integrity website (http://academicintegrity.dal.ca) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousie's ***Policy on Intellectual Honesty*** and ***Faculty Discipline Procedures*** is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html