

STAT 450 (MAST 672/881), Sec. C
Mathematical Statistics
Fall 2020

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Delivery Method: Online (via **Zoom**: link will be provided on Moodle course page).

Office Hours: (via **Zoom**: link will be provided on Moodle course page) Thursdays, 17:00-18:00 & Fridays, 14:00–15:00; questions by email anytime; **please send email from your email account, not from Moodle.**

Prerequisite: STAT 250; STAT 349 previously or concurrently.

Description: Derivation of standard sampling distributions; distribution of order-statistics; estimation, properties of estimators; Rao-Cramer inequality, Rao-Blackwell theorem, maximum likelihood and method of moments estimation, Neyman-Pearson theory, likelihood ratio tests and their properties.

Text: *Introduction to Mathematical Statistics*, 8th Edition, by R.V. Hogg, J.W. McKean and A.T. Craig, Pearson, 2019. (*However, 6th or 7th Editions are also ok.*).

The digital version of the textbook will be available at:

<https://www.bkstr.com/concordiastore/home>

Note: Students should order textbooks as early as possible, especially for print versions in case books are backordered or there are any shipping delays.

Reference: (for problems, examples etc) *Statistical Inference* (2nd Edition), by G. Casella and R. L. Berger, Duxbury.

- Final Grade:** The final grade will be based on the higher of (a) or (b):
- Assignments (*about* 4) 10%, midterm exam (**FRI., 23 OCT. 2020**) 20% and final exam 70%.
 - Final exam 100%.

Assignments and exams will be take-home and posted on Moodle; once posted, *assignments* will be due in 2 weeks (tentative), *midterm* in 3 hours (tentative), *final*: to be decided.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

- Note:**
- All assignments should be done **independently**.
 - MAST 672/881 students will be given additional assignment/exam problems.

- Topics:**
- Distribution of functions of several random variables (distribution function and change of variable techniques), sampling distribution of mean and variance of a sample from Normal (μ, σ^2) distribution: *Sec. 2.2, 2.7*.
 - Distribution of order statistics and sample quantiles: [**6th Edition:** *Sec. 5.2.1- 2*, **7th Edition:** *Sec. 4.4.1-2*].
 - Estimation: unbiasedness, Cramér-Rao lower bound and efficiency, method of moments and maximum likelihood estimation, consistency, limiting distributions [**6th Edition:** *Sec. 4.1, 6.1, 4.2, 4.3 – 4, 6.4*, **7th Edition:** *Sec. 4.1, 6.1, 5.1 – 5.3, 6.2, 6.6*].
 - Sufficiency, minimal sufficiency, completeness, UMVUE, Rao-Blackwell and Lehman-Scheffe theorems: *Sec. 7.2 - 7.8*.
 - Hypothesis testing [**6th Edition:** *Sec. 5.5, 6.3 6.5*, **7th Edition:** *Sec. 4.5, 6.3, 6.5*].
 - (*time permitting*) Bayesian inference [**6th Edition:** *Sec. 11.2.1 – 2*, **7th Edition:** *Sec. 11.2.1 - 4*].

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This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." [*Undergraduate Calendar, Sec 17.10.2*].

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