Department of Mathematics & Statistics
Concordia University

STAT 450 (MAST 672/MAST 881), Sec. C

Mathematical Statistics

Fall 2025

All available lecture notes will be posted on Moodle. Assignments will be online via Moodle.

Instructor: Dr. A. Sen
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Class Schedule: Wednesdays and Fridays, 10:15-11:30 AM, in H-1011 (SGW).
Mid-term break: From October 11 to October 17.

Office Hours: Thursdays, 14:00-15:30, subject to change; 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 score will be the maximum of (a), (b), (c):

a) Assignments (4) 10% + midterm exam (**FRI., 24 OCT. 2025, <u>in class</u>**) 20% + final exam 70%
b) Assignments (4) 10% + final exam 90%
c) Final exam 100%

Assignments will be <u>online</u> and posted on Moodle; once posted, assignments will be due in 2 weeks (tentative), to be uploaded on Moodle. **Midterm** and **Final exams** will be in person (Final according to the schedule posted by the University). **No make-up assignments or midterm.**

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:

1. 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.*
2. Distribution of order statistics and sample quantiles: [**6th Edition:** *Sec. 5.2.1- 2,* **7th Edition:** *Sec. 4.4.1-2].*
3. 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].*
4. Sufficiency, minimal sufficiency, completeness, UMVUE, Rao-Blackwell and Lehman-Scheffe theorems: *Sec. 7.2 - 7.8*.
5. Hypothesis testing [**6th Edition:** *Sec. 5.5, 6.3 6.5,* **7th Edition:** *Sec. 4.5, 6.3, 6.5].*

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You may wish to access the many services available to you as a Concordia student. An overview of these resources can be found here: https://www.concordia.ca/students/services.html

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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: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

Behaviour
All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

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In the event of extraordinary circumstances and pursuant to the Academic Regulations the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.