**STAT 4507 A/STAT 5501 W**

Statistical Inference/Mathematical Statistics II

**TENTATIVE COURSE OUTLINE**

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| **Term:** | Winter 2022 |
| **Instructor:** | Dr. Natalia Stepanova |
| **E-mail:** | nstep@math.carleton.ca |
| **Website:** | https://carleton.ca/brightspace/ |
| **Office:** | 5229 HP |
| **Phone:** | 613-520-2600, ext. 1272 |
| **Office hour**: | Tuesday, 12:00 noon – 1:00 pm, or by appointment |
| **Lectures:** | Tuesday, 10:05 am – 11:25 am Room: Southam Hall 404 |
| | Thursday, 10:05 am – 11:25 am Room: Southam Hall 404 |
| **Grades:** | Final Exam: 50% Midterm Test: 30% Assignments: 20% |
| **Text:** | *Statistical Inference*, 2nd ed., by George Casella, Roger L. Berger |
| **References:** | *Testing Statistical Hypotheses*, by E. L. Lehmann; *A First Course in Mathematical Statistics,* by G. Roussas; *Mathematical Statistics*, by P. Bickel and K. Doksum |

There will be **four** assignments. All assignments count towards the term mark. Late assignments will not be accepted. Due dates for assignments are tentatively scheduled for February 17, March 10, March 24, April 7. There will be also problem sets. They will be given for your practice and will not be counted towards the term mark. There will be one **80-minute** midterm test written in class during regular lecture hours on Tuesday, **March 8**.

**Important Notes:**

1. Assignments, problem sets and their solutions, as well as announcements will be posted on Brightspace. Students should check the course web page on Brightspace on a regular basis.

2. **All materials created for this course** (including assignments, posted solutions, etc.) **remain the intellectual property of the instructor.** These materials are intended for the personal and non-transferable use of students registered in the current offering of the course. **Reposting, reproducing, or redistributing any course materials**, in part or in whole, without the written consent of the instructor, **is strictly prohibited**.

**Assignments, midterm test, and final exam policies:**

1. Assignments are **mandatory**. Be sure to write your own solutions and show all of your work (i.e., include every step). **All assignments count towards the term mark.** You are expected to work on your assignments consistently once they are released. As a result, you will never be granted an exemption from an assignment, even for a legitimate medical reason, and no extra credit assignments will be available. Assignments submissions will be handled in-person (i.e., in class).

2. Midterm test is **mandatory.** There will be no make-up tests.

3. Three-hour **closed-book** final exam will be scheduled by Carleton University.

4. In normal circumstances, students with **illness during the span of time a test or exam is offered** might be granted an exemption only if they provide a copy of the Carleton University Medical Certificate https://carleton.ca/registrar/wp-content/uploads/med_cert.pdf that has been completed and signed by a physician covering the period in question. It is understood during the current COVID-19 situation, a medical note by a physician may be difficult to obtain. The Registrar's Office's self-declaration form for academic accommodations https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf can be used for any short-term medical issue. If you miss midterm test, you may elect to submit the self-declaration form instead of obtaining a medical note, in which case the instructor might consider shifting the weight of the test to the final exam.

The course topics below include Chapters 8 and 9 in the text, and some other topics of the classical theory of hypothesis testing.

## COURSE TOPICS

**Part I: Hypothesis Tests.** General concepts of the Neyman-Pearson testing hypotheses theory; uniformly most powerful (UMP) tests for testing a simple hypothesis against a simple alternative; UMP tests for testing certain composite hypotheses, UMP unbiased tests; Bayesian tests, minimax tests. Tests in parametric models (likelihood ratio tests, chi-square tests, Bayesian tests) and their properties. Tests in nonparametric models (sign, rank, and permutation tests, Kolmogorov-Smirnov and Cramér-von Mises tests) and their properties. Asymptotic relative efficiency of tests.

**Part II: Confidence Sets.** Definition of a confidence set and some examples; construction of confidence sets (pivotal quantities, inverting acceptance regions of tests, Bayesian intervals); criteria for selecting interval estimators, properties of confidence sets, asymptotic confidence sets.

**Objectives of the course:** the course is designed to present in depth the basic ideas and methods of the classical Hypothesis Testing Theory whose knowledge is required in various fields of modern Statistics. It is anticipated that through reading the course materials, attending lectures and office hours, and solving homework problems the students will acquire valuable skills in constructing efficient testing procedures in parametric and nonparametric settings.

**Academic Accommodation**

You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website http://www2.carleton.ca/equity/accommodation/.

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website http://www2.carleton.ca/equity/accommodation/.

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website for the deadline to request accommodations for the formally-scheduled exam (if applicable) at http://www2.carleton.ca/pmc/new-and-current-students/dates-and-deadlines/. You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/.

**Academic Integrity:** The University states unequivocally that it demands academic integrity from all its members. Academic dishonesty, in whatever form, is ultimately destructive to the values of the University. Students who violate the principles of academic integrity through dishonest practices undermine the value of the Carleton degree. Dishonesty in scholarly activity cannot be tolerated. Any student who violates the standards of academic integrity will be subject to appropriate sanctions.

**Important dates:**

- January 10, 2022: Winter term classes begin.
- January 24, 2022: Last day for registration. Last day to change courses or sections for winter and fall term courses.
- January 31, 2022: Last day to withdraw from winter term courses with a full fee adjustment.
- February 18, 2022: April examination schedule available online.
- February 21, 2022: Statutory holiday. University closed.
- February 22-25, 2022: Winter break, no classes.
- March 16, 2022: Last day to request formal exam accommodations for April examinations to the Paul Menton Centre for Students with Disabilities.
- April 12, 2022: Last day of winter term classes. Last day for academic withdrawal from winter term courses.
- April 14-28, 2022: Final examinations in winter term courses will be held.
- April 15, 2022: Statutory holiday. University closed.