

STAT 4200
STATISTICAL INFERENCE 2
WINTER 2010

Instructor: Dr. Yuliya V. Martsynyuk
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Office Hours: Monday 10:30-11:30, Wednesday and Friday 11:00-12:00, or by appointment

Prerequisites: STAT 4100, or consent of the department

References:

- Robert V. Hogg, Joseph W. McKean and Allen T. Craig, *Introduction to Mathematical Statistics*, 6th ed, Prentice Hall, 2005.
- George Casella and Roger L. Berger, *Statistical inference*, 2nd ed, Duxbury, 2002.
note: reserved copies of the references are available in the library

Lectures: Monday, Wednesday and Friday 13:30-14:20 in 316 Machray Hall

- attendance is mandatory
- above references, or their previous additions, serve only as a general basis for the course material
- lecture notes presented in class constitute a self-contained source of the course material
- some problems will be solved in class, and some will be assigned for you to practice (no credit homework)

Tests: There will be four 50-minute closed book tests that will be held during the lecture hours. They will take place every three weeks or so, starting on around January 29, 2010 (approximate date of the first test). Exact dates for each of the tests will be announced in advance in class. The test problems will strongly be related to those that are solved in class and also those that are on your homework.

note: no makeup, early or delayed tests in this course

Evaluation: Final grade is based on:

Term Work (50%): 3 best out of 4 tests

Final Exam (50%): three-hour closed book exam based on the whole term

Course outline:

- **Review of transformations of random variables and random vectors:** transformations of discrete and continuous random variables, cumulative distribution function and probability density function techniques, transformations of bivariate random vectors (discrete and continuous cases), probability density function and moment generating function techniques, transformations of n-variate vectors
- **Confidence intervals:** the Student t-distribution, the Student t-statistic, exact and approximate confidence intervals for a mean, Student (1908)-Probable error of a mean, functional central limit theorem for a Student process and further approximate confidence intervals for a mean, other exact pivots and exact confidence intervals, other asymptotic pivots and large-sample approximate confidence intervals, confidence sets for a mean and

variance, size and coverage probability of a confidence interval, expected length of a confidence interval, confidence intervals for differences in means and proportions, order statistics, quantiles, confidence intervals of quantiles, empirical distribution function, the Glivenko-Cantelli theorem, the Kolmogorov-Smirnov statistic, confidence intervals and bands for an unknown distribution function

- **Hypothesis testing:** statistical hypothesis, test, power function, critical region, type 1 and 2 errors, simple and composite hypotheses, significance level, randomized tests, p-values, chi-square tests, maximum likelihood estimation and tests (single- and multi-parameter cases), bivariate normal distribution and a test of independence
- **Optimal tests of hypothesis:** certain best tests, uniformly most powerful tests, likelihood ratio tests, asymptotic distribution of likelihood ratio tests, other large-sample tests, the sequential probability ratio test
- **Miscellaneous topics** (time permitting)

note: the above is only an approximate outline. It is your responsibility to keep up with what is being done in class and with any changes announced in class.

Voluntary Withdrawal: The voluntary withdrawal deadline is March 19, 2010.

Academic Dishonesty: It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation) can be found at: umanitoba.ca/science/student/webdisciplinedocuments.html or through the Faculty of Science home page at: www.umanitoba.ca/science. Typical penalties imposed within the Faculty of Science for academic dishonesty are also described.

Registration Advisory: *Important Note from the Dean of Science:* It is your responsibility to ensure that you are entitled to be registered in this course. This means that you have:

- the appropriate prerequisites, as noted in the calendar description, or have permission from the instructor to waive these prerequisites;
- not previously taken, or are concurrently registered in, this course and another that has been identified as “not to be held with” in the course description. For example, STAT 1000 cannot be held for credit with STAT 2220.

The registration system may have allowed you to register in this course, but it is your responsibility to check. If you are not entitled to be in this course, you will be withdrawn, or the course may not be used in your degree program. There will be no fee adjustment. This is not appealable. Please be sure to read the course description for this and every course in which you are registered.

Pandemic Advisory: Should major disruptions to university activities occur as a result of a pandemic, the course content, evaluation, and other provisions of this document may be adjusted as the circumstances warrant.