STA220H1 F (LEC0201) - The Practice of Statistics I - Fall 2012

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Course Objective

This course (in combination with STA221H) presents the basic statistical methodology used in many fields of application. It emphasizes concepts and techniques and will be useful to students who seek to gain an understanding of the use of statistics in their own fields. Students seeking a more theoretical or mathematical development of the subject should consider STA250+255 or STA 257+261.

Tutorials

Tutorials begin Sept 17. Be sure to register for a tutorial section at ROSI. Tutorial rooms will be posted on the course web site prior to Sept 17. Problem assignments will be posted on the course web site. They are due at tutorials, for discussion only.

Texts/Software:

(1) *Stats: Data and Models, First Canadian Edition,* by DeVeaux, Velleman, et al (Pearson). **Do not purchase U.S. editions of the text.**
(2) Minitab Workbook 2012 Revised & Updated, by A. Vukov (CSPI). Do not purchase earlier versions.

We strongly recommend **that you buy the DeVeaux text *bundled together* with Minitab software (student release 14), which gives you the Minitab software at *a big discount.* Don't confuse the Minitab software installation CD with the text resource DVD which is included with every text. Note that Minitab software runs only on the Windows operation system. Minitab software will also be available to everyone via the CQUEST computing labs on campus (see *Computing* below).**

You can avoid some frustration, by ordering online from the bookstore:

Statistics Aid Centres

Your primary source of help with difficulties is your TA in the scheduled tutorial, but additional assistance can be obtained at the Statistics Aid Centre, Room 1091, in Sidney Smith Hall. Your own TA will be on duty one hour per week, but you may drop in on any of the TAs for the course. Schedules will be posted on the course web page. Also, check out the New College Stat Aid Centre in Wetmore Hall 68A (enter from Huron St), where experienced Statistics TAs will hold regular hours.

Evaluation

Your tutorial grade is worth 15% of your final grade. The remaining portion of your grade will be equal to either {0.35 x Term Test + 0.50 x Final Exam}, *or* {0.15 x Term Test + 0.70 x Final Exam}, whichever is higher.

Quizzes

Quizzes will be given in tutorial. Your TA will record your mark for each quiz. So be sure to attend the correct tutorial, and to know your TA's name. ***If you miss a tutorial/quiz due to illness, late enrolment, etc., please discuss with your TA, and not your lecturer or the course coordinator.*** *Your TA has full discretionary power* to deal with, and adjust tutorial grades for, such things. If ill, bring some proof.

Midterm Test/Final Exam

The date and time of the term test are: TBA. It will be written in various rooms across campus - check the course web page later for locations. There will be an alternative writing time, for those with *proof of a conflict*: If this applies to you, be sure to submit your course schedule to your lecturer *2 weeks before the test date.* . **Programmable calculators are not permitted on tests and exam.** A one-sided 8-1/2"x 11" aid sheet, hand-written, is allowed on the test (two-sided on final exam). **You must bring your student identification to term tests as well as the final exam.** The day and time for the final exam will be announced later.

Missed Tests

There are **no make-up tests**. Should you miss the term test due to illness, you must submit to your lecturer or to SS6018 (Stats office), within one week, completed by yourself and your doctor, **the 'U of T Student Medical Certificate'**, obtainable from your college registrar, the Office of the Faculty Registrar (*SS1006*), the Stats Dept. office, or the Koffler health service. The test's weight will then be shifted to the final exam. **If this documentation is not received, your test mark will be zero.**

Computing

Students will be using, on a weekly basis, the Minitab Statistical Computing Software, either at home (if you purchase the student version of Minitab bundled inexpensively with the text), or at the CQUEST computing facilities at the University of Toronto - go to for info about accounts, rooms, hours of operation, etc. You will use this software to analyze data sets used in the text exercises. These data sets can be found on the DVD accompanying the textbook, at the web site or at . It is also possible to lease Minitab (professional version) for short-term use at (click on *Pricing and Licensing*), and to download a 30-day free trial version from the website. CQUEST computing accounts may be obtained by going to and clicking on '***Request an Account***'. If you do not purchase and install Minitab on your home computer, you will need this CQUEST account to use Minitab at CQUEST sites on campus (it is not possible to log on to CQUEST's Minitab program from your home). Stick to the CQUEST rooms in Ramsey Wright Bldg.

You will use Minitab on every assignment. **Always bring to tutorial the full computer output,** along with your written answers. Computing problems frequently arise, so do your assignment early, and be prepared to come back another day, if the printer gets jammed, etc. Expect no special consideration by your TA for 'technical' problems' unless you have made repeated verifiable attempts to do the assignment, sought help, etc.

Academic Offences

Academic offences are unacceptable, and harm everyone. Offenders are caught, and **sanctions can be severe** - zero in the course with annotation on the transcript for several years; suspension for a year; even expulsion. Various measures, announced and unannounced, will be taken throughout the year to reduce their incidence and to insure successful prosecution when they do occur (e.g. photocopying of students' tests, multiple versions of multiple choice exams). In addition, please note the following:

(i) ***Oversights in marking on a test paper*** (e.g. addition error, overlooked work) must be brought to the attention of the T.A. **immediately** - during the tutorial class when test papers are returned

(ii) ***Regrading requests*** will only be considered for ***term tests*** which are written in ***ink***

Accessibility Needs

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns, please contact Accessibility Services as soon as possible: or

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Textbook (SDM 1st Cdn edition by DeVeaux, et al) chapter references are in parentheses.

Do many of the odd problems in SDM for practice (the answers for these are at the back of the text)

Week 1: Introduction to course, overview. Cases and variables, categorical & quantitative variables. Worksheet organization of data. Relative frequency distribution. Bar charts & Pie Charts for categorical variables. Two way tables; marginal and conditional distributions. Simpson's paradox. Introduction to Minitab. (2-3)

Week 2: . Quantitative variable plots: Dotplots, histograms, stem and leaf plots. Shapes of distributions, outliers. Summation notation. Sample mean, median, mode (modal class), trimmed mean. Resistant measures. Standard deviation. The empirical rule. Calculating mean & standard deviation for grouped data. (4)

Week 3: Percentiles. 5-number summary and boxplots. Comparing distributions. Z-scores. Linear and non-linear transformations of data. Density curves and the normal distribution. Normal probability (quantile) plot (5-6)

Week 4: Bivariate data: Scatterplots & correlation. Cautions. The least-squares line, coefficient of determination, residual plots, outliers & influential observations; lurking variables, association & causality. (7-9)

Week 5: Collecting data: Observational studies and randomized experiments. Sample vs population characteristics. Random samples (SRS, stratified, systematic, cluster & multistage). Sampling and non-sampling errors. Bias. Designing experiments: comparison, randomization, blocking, factorial design. (12-13)

Week 6: Probability and relative frequency. Sample space, outcomes, and events. Rules of calculation for probabilities. Conditional probability (with a Bayes example via tree diagram). Statistical independence. Estimating probabilities by computer simulation. (11, 14-15)

Week 7: Two useful counting rules (combinations, sequential operations). Discrete random variables and probability functions. Expectation (mean) and variance of random variables and linear combinations (e.g. sums, differences, averages). The binomial distribution, applications, mean and variance (using sums of Bernoulli variables), the sample proportion. (16-17)

Week 8: Continuous random variables and density functions. The normal approximation of binomial. Sampling distributions. Distribution of the sample mean (and total). The Central Limit Theorem. (17-18)

Week 9: Margin of error, Confidence Intervals for μ (σ known / large n) and p (large sample), and sample size. Exact and Plus 4 confidence intervals for p. Statistical tests of hypothesis: observed and fixed levels of significance (P-value, α-level). Tests for μ (σ known) and p. (19-20)

Week 10: Decision errors - types I & II, and power (with a z-test calculation). Testing hypotheses via confidence intervals. Statistical vs. practical significance. Multiple tests and data snooping. Test & C.I. for μ with unknown variance: the Student t distribution. Robustness of t procedures (via simulations). Power of the t-test (using graphs or Minitab). (21, 23)

Week 11: Two independent samples: large sample z-test & C.I. for comparing the means. Small sample t-tests comparing two population means: pooled & unpooled variance procedures. Paired comparison t-test, and a nonparametric (distribution-free) approach - the sign test. (24-25)

Week 12: Comparing designs: paired comparison vs. independent groups. Robustness, transformations, power (via Minitab). Comparing proportions with z-test. Final case study (video: the AZT trials). Overview of inferential procedures. (24-25, 22)