STATISTICS 220H1 F - The Practice of Statistics (Fall 2005)
Course homepage at: http://ccnet.utoronto.ca/20059/sta220h1f

This course (in combination with Sta221S) presents the basic statistical methodology used in many fields of application. The emphasis of this course is on 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 STA (250,255) or STA (257,261). However, STA220+221(or STA220+JBS229) will be accepted in lieu of STA250H as a prerequisite for STA255, after which, (limited) further studies in Statistics may be pursued.

Tutorials - starting Sept. 19-20
Tutorials meet one hour per week. In preparation for tutorial, you should do the weekly assignment, posted on the web page. There will be some brief assessment at each tutorial – perhaps a short quiz based on the assignment, perhaps you'll submit your solutions for one or two assigned questions; perhaps the TA will have other good ideas. The major purpose of the tutorial is to go over the assignment and associated material; no new material will be covered. At the end of term, your TA will submit a grade 0 -10 for you. This grade is meant to be an encouragement and reward to you for keeping up and doing the required work. Make a good, consistent effort and you can expect 9 or 10 out of 10. All TA's will have to submit the same distribution of grades (same % of 10's, e.g.) at the end, so that students are not advantaged or disadvantaged by their TA's approach.

The location of your tutorial will be posted on the course web page and also on the board opposite the Statistics Aid Centre (SS2133), prior to 1pm Sept 19. All records are kept by tutorial so please attend the correct one, as **missing marks** often arise when students attend tutorials they are not enrolled in. If you miss a tutorial/quiz due to illness, late enrolment, etc., bring an appropriate note to your next tutorial - *your TA has full discretionary power* to deal with such matters.

Course Contents
Content, emphasis, etc. of the course is defined by means of the lecture material - *not the texts*. It is important to attend all lectures, as there is normally no simple way to make up for missed lectures (perhaps *obtain another student's notes*). There will also be many lecture examples using Minitab statistical software, which students will be using. *Important announcements, problem sets, additional examples, and other course info will be posted on the course web homepage* (see above). *Check it regularly.*

Required Texts
1. Introduction to the Practice of Statistics (5thed.) - Moore and McCabe (Freeman). Do not purchase the 4rd edition of the text. *I highly recommend* that you buy the text *bundled* together with the Minitab (student release 14) statistical software CD, which gives you Minitab software at *a huge discount* - do not confuse the Minitab CD with the resource CD included with every text. This Minitab software is for Windows, but can also run on a Power Mac with appropriate Windows emulation software.
2. Minitab Workbook (Fall 05) – A. Vukov (Canadian Scholar's Press)
  Avoid some frustration, and order your books online from the bookstore: www.uoftbookstore.com/online/
At the publisher's web site, www.whfreeman.com/ips5e, there are additional learning aids such as online quizzes, supplementary exercises, and interactive applets. A study guide (by M. A. Fligner) for the Moore/McCabe text is also available (order at the bookstore).

Statistics Aid Centre (from Sept. 19)
Your primary source of help with difficulties is your tutor in the scheduled tutorial, but additional assistance can be obtained at the Statistics Aid Centre, Room 2133, in Sidney Smith Hall. A schedule will be posted at the website. Your own TA will be on duty there two hours per week, but you can drop in on any Sta220 TA present.
  Also check out the **New College Aid Centre (room 55B)**, which will have one highly qualified Stats Dept TA (John Sheriff) present at least 8 hours per week, to help with several intro stats courses including STA220.

Additional Help
Student electronic bulletin board (at course web page) – *communicate with other students in the course.*
Dept of Statistics – for general administrative queries only: stats@utstat.utoronto.ca (phone: 416-9783452)

Evaluation
Your final course grade will be composed of a multiple choice Final Exam, a tutorial grade for10% submitted by your TA, and one term test. It your exam grade is higher than your test, it will be Exam=70% & Test=20%, but if your test is higher than your exam, it will be Exam=50% & Test=40%. **The term test is on Oct 26: 6:10-7:55pm**, and 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 is you, submit your course schedule to your lecturer at least 10 days before Oct26. **Programmable calculators are not permitted on tests and exam.** Though tests/exams place a very minor emphasis on formulae, you are allowed a one-sided 8-1/2"x 11" hand-written aid sheet on tests (two-sided on final exam). **You must bring your student identification to term tests as well as the final exam.** The final exam will consist of 30 multiple-choice questions (5 selections each). A correct answer receives 3.33 marks. An unanswered question receives 0.67 marks. The term test is not multiple-choice in nature, and will have mostly short answer type questions. Check the web site (handouts) for examples of exam & test questions.

Missed Tests
There are **no make-up tests**. Should you miss the term test due to illness, you are required to submit to your lecturer or to A. Vukov or to SS6018 (Stats office), within one week, completed by 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 be shifted to the exam.* **If this documentation is not received, your test mark will be zero.**

Calculators
Hand calculators are cheap and useful. Any cheap one with a square root and one memory button will do. Mean, standard deviation, sum, and sum of squares keys may save you a bit of time on occasion, but we do not recommend the purchase of expensive calculators to get keys with special statistical calculations. Tests and exams will be designed so that those calculators give no advantage. We emphasize the use of Minitab software for doing any tedious or complex calculations.

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 www.cquest.utoronto.ca for accounts, rooms, hours of operation, etc. **No previous computing experience is assumed.** With this software, you will analyze the data sets used in the text exercises. The data sets can be found on the CD-ROM accompanying the textbook, and at the publisher's web site www.whfreeman.com/ips5e. It is also possible to lease Minitab (professional version) for short-term use, or to download a 30-day free trial version, via the www.minitab.com website. You can also arrange for short-term lease at www.minitab.com/education (click on e-academy).

   CQUEST computing accounts may be obtained by going to **www.cquest.utoronto.ca** 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 (unfortunately it is not possible to log on to CQUEST's Minitab program from home).

   In nearly every problem set, analyses using Minitab will be assigned - **bring the full computer output to tutorial.** 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 totally unacceptable and harm everyone. E.g., we have found that some students will alter a test paper after it is graded, and try re-submitting it! 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 ensure successful prosecution (photocopying of graded tests, multiple versions of multiple choice exams, etc.). Also, please note the following:

> **Requests for a test remark** will be considered only if you *write your test in ink*.
>
> *Grading oversights* such as addition errors and overlooked work must be reported to your TA *immediately* after your test paper is returned to you. So check it over right away.

Final Comments

For most students, statistics is a new subject. Like most new subjects, it seems difficult at first but simple in retrospect. Many new concepts will be introduced and built upon. The course will be far easier and more useful if you master concepts as they are introduced - similar to learning a new language. Doing the exercises is not like calisthenics or jogging, which are good for you no matter how your mind wanders as long as you go through the motions. Think about the objectives of the study, why a particular method was used, and what has been learned about the original questions that motivated the study!

The lecturers and TA's are there to help. Ask questions! If you have any comments or suggestions about the course, please tell us. We want to know what is good; we want to know when problems are developing. Remember that it takes time for information to travel and for action to be taken. Therefore, if you become aware of any problems, mention this to your instructors right away.

STATISTICS 220F (FALL 2005) - TENTATIVE LECTURE GUIDE

Textbook (IPS 5th edition by Moore/McCabe) chapter references are in parentheses, and indicate when a section or chapter has been finished. Do many of the odd problems in the text for practice (answers are in the back)

Week 1: Introduction to course, overview. Variables, units, measurement. Frequency, relative frequency, cumulative frequency distributions. Histograms. Shapes of distributions, outliers. Stem and leaf plot. Introduction to Minitab   (1.1)

Week 2: Summation notation. Sample mean, median, trimmed mean. Standard deviation. The empirical (68-95-99.7) rule. Calculating mean, standard deviation for grouped data. z-scores. Percentiles. Boxplots.

Week 3: Linear and non-linear transformations of data. Density curves and the normal distribution. Normal probability (quantile) plot. (1.2, 1.3) Bi-variate data: Scatterplot, correlation.

Week 4: The least-squares line, coef. of determination, residual plots, outliers & influential observations; lurking variables, association & causality. Comparing boxplots. (2)

Week 5: Collecting data: Randomized experiments & observational studies. Sample vs population characteristics. Simple random samples and variations. Sampling and non-sampling errors(bias). Designing experiments:comparison, randomization, blocking; factorial design (3)

Week 6: Introduction to probability. Sample space, outcomes, and events. Rules of calculation for probabilities. Conditional probability (with a Bayes example via tree diagram). Statistical independence. Two useful counting rules (combinations, sequences). Estimating probabilities by computer simulations.

Week 7: Discrete random variables and probability functions. Expectation (mean) and variance of random variables and linear combinations (e.g. sums, differences, averages). (4) The binomial distribution, applications, mean and variance (using sums of Bernoulli variables), the sample proportion.

Week 8: Continuous r.v.'s and density functions. The normal distribution and normal approximation of binomial. (5.1) Sampling distributions (worked out directly in a simple case). Distribution of the sample mean (and total). The Central Limit Theorem. (5.2)

Week 9: Margin of error, Confidence Intervals for μ (σ known or large n) and p, and sample size (6.1,8.1). Exact C.I. tables for p. Statistical tests, for μ (σ known) and p. Observed and fixed levels of significance (p-value, α-level). (6.2, 8.1)

Week 10: Decision errors - types I & II, and power (with a z-test calculation). Testing hypotheses via C. I.'s . Statistical vs practical significance. Multiple tests and data snooping. (6.3, 6.4) Test & C.I. for μ with unknown variance: the Student t distribution. Robustness of t procedures (examined via simulations). Power of the t-test (using tables, Minitab).

Week 11: Paired comparison t-test, and a nonparametric (distribution-free) approach - the sign test. (7.1). 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.

Week 12: Comparing designs: paired comparison vs independent groups. Robustness, transformations, power (using Minitab). (7.2) Comparing proportions with z-test. (8.2). Testing equality of two population variances - the F distribution. (7.3)

Week 13: Overview of inferential procedures. Final case study (AZT trials).