N.B.: You may not be able to get credit for this course if you take or have taken other statistics courses. Be sure to check the ‘Course Overlap’ section under ‘Faculty Degree Requirements’ in the Arts or Science sections of the Calendar.

Textbooks:

There is no single required textbook for the course. We are studying topics rather than sections from a particular book, and you can study these topics from any one of a number of good statistics texts. We will post notes (or chapters from Economic Statistics–see below), but we nonetheless strongly recommend that you buy some textbook to supplement these notes. Two good choices are Newbold, and Larsen and Marx. It should be easy to get used copies of either of these. In the case of the Newbold book, older editions are in fact better.

I will give chapter references for topics below to particular additions of these books, but if you have a different edition it will be easy to see what the corresponding chapters are. I will not be assigning exercises directly from any book so there is no need to worry about the edition for that reason.

In previous years we have used the following texts:


Any recent edition is fine. In the reading list I will refer to this book as LM. In the first term, our aim is to cover as much as possible of Chapters 1-7 of this book. The main reason for considering this text is that it is at a more advanced level than most of the business and economics books available.

However, some people don’t like this book, in part because it has little or no content from economics, and the ordering of topics is also a poor match for the way that we will do things. An alternative that is aimed more directly at economics and business students is:


As I said above, earlier editions are just fine, indeed superior in many ways. Fifth and later editions also have co-authors W.L. Carlson and B. Thorne; first four editions are just Newbold. In the reading list I will refer to this book as SBE. It should be relatively easy to find used copies of this book at quite a low price. Some errors were introduced into later editions of this book, which is one reason we
stopped ordering it. However I will draw your attention to those as we go along, conditional on remembering.

There are many other good general statistics books as well. Some more mathematically advanced general books are noted below.

Whatever text you use, we will supplement this material with some draft chapters of what will I hope eventually be a sufficiently complete text that I can use it for this course. At present I have only 10 chapters drafted. These are referred to in the reading list as ES for Economic Statistics. I want you to read the assigned chapters from Economic Statistics regardless of which other book you use. Chapters 1-14 are posted on MyCourses, and will be updated throughout the term. If you find any errors or unclear parts in these chapters, I would really appreciate it if you would let me know, ideally with a precise page reference so that I can examine and if necessary fix the problem. Don’t be hesitant to mention something because you think that you could be wrong: in any event it will be useful to me to revisit the exposition at a particular point and I will welcome any such suggestions.

In the reading list below, I will indicate a rough correspondence of chapters with topics for each of these three sources. However, for the Newbold book, it is difficult to indicate chapter headings because the textbook producers routinely change the book in such a way as to change the correspondence between chapters and topics. Don’t let this discourage you from buying a used copy of Newbold. The chapter references that I will give are to the 6th edition, I think, but you will in any event figure out the mapping: it’s usually entirely clear which chapter you need to read for a given topic.

The following supplementary references are more advanced, but you may wish to consult them for further reading, review, or problem resolution, or if you have a strong mathematical background you may wish to use MGB as your main book.


Online resources:
You may also wish to supplement the lecture notes and a standard textbook with material from the web. Of course, you need to be very careful in doing this, because many of the things you will find online have errors that would typically have been caught in a published book (although, as I noted above, published books have errors as well). The video or online materials that I have seen tend to be at a very introductory level, which may be of use in guiding your intuition, but would typically not be sufficiently precise to teach you to do the calculations that are necessary. So please don’t rely on these things exclusively. If you do want to look
at an online course, I would suggest trying the one on ED-X (Stat 2.1X-2.3X), a consortium that McGill is involved with, or the lessons at kahnacademy.com. Please let me know of your experience with these if you do try them.

**Administrative notes:**

Required official statements:

*McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/integrity for further information).*

*According to Senate regulations, instructors are not permitted to make special arrangements for final exams. Please consult the calendar, section 4.7.2.1, General University Information and Regulations, at www.mcgill.ca.*

*In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded.*

**Evaluation:**

Evaluation is planned as follows (proportions are of the grade for the term, which will be 50% of the full-year grade):

First term: assignments 10%, December exam 90%, optional mid-term will replace part (20 percentage points) of December weight if written. (So if you hand in the mid-term, it’s 10-20-70 for assignments/midterm/December.) If the optional mid-term is submitted, the grade will be used whether or not it brings up your mark; if you write it and hand it in, it will count. But you can choose not to write it or not to hand it in, with no penalty.

Second term: also 50% of the overall grade for the course. Note that the final (April) examination for the course, while emphasizing second-term material, may include first-term material at the discretion of the second-term instructor. This is a cumulative course and material from all parts of the course are examinable on the final.
Deferred and supplemental examinations:

There is no supplemental examination for the December exam, because it is not a final examination for the course. The supplemental examination for this course, which will be held in August 2020 in accordance with University rules, is for the entire course taken as a whole. That supplemental examination mark replaces all evaluation in the course for those who take it; that is, the supplemental examination is 100% of the supplemental grade.

If the October/November midterm is not taken, there is no deferred examination. As per the scheme given above, the weight of this examination is transferred to the December exam. If the December exam is deferred, the weight of that exam is transferred to the final examination in April. It deferral on the December examination requires a reason which is compatible with the University’s policies, usually an illness. This requires documentation.

If you are booking travel for the holidays, it is your responsibility to be sure that you will be here for the December examination. That means either waiting until the examination schedule is available, or booking travel for the day following the last day of examinations in December.

A numerical grade will be computed for each term. The grade for the year will be the equally-weighted average of the two individual term grades. A final letter grade will be obtained from the overall numerical grade. Any letter grades assigned at intermediate stages are for information only; computations will be based on the underlying numerical quantities. Professor Chaudhuri and I formulate final grades at the end of the year, and do any rounding-off one time only, then.

Transfers from Honours to Major program

Transfers from Honours to Major are routine, although this is an unusual feature within the University: these can be done after the add/drop period. There are two time windows when transfers are permitted. Window 1, up to the end of the week following the mid-term examination in October (or early November, whichever it turns out to be). Window 2, the January add/drop period. After the end of window 2, transferred to 227 is not possible.

If you transfer into 227, the grade will be based entirely on work in that course. The grade from 257 will not be used. Note that this is not necessarily the same arrangement that is used in the microeconomics pairing 250-230; check the Econ 250 course outline for the arrangement that will be made in that case.

In the event that you decide to transfer, be sure to speak with advisors in the Econ department. Lists of advisors for different programs are posted near the fourth-floor office in Leacock.
Office: Leacock 427

Office hours: Mon, Wed 2:30-4:00 or so; the TA will hold some tutorial or office hours as well, to be determined.

If you cannot come during office hours or wait around after class, please make an appointment in class to see me at another time. Please don’t e-mail unless there’s no alternative: my e-mail is clogged with no end of messages, and I have to do mass deletions or I’ll do nothing but answer it all day. Also, thanks to some speech recognition software, my chronic tendinitis problem seems to be getting a little bit better, and I’d like to keep up the progress.

Web postings:

I’m going to try to post and update the following items regularly on the web:
- Course outline (i.e. this)
- Early chapters from ES
- Assignments and answers
- Old exams

Please let me know if things fail to appear in due course.

Laptop policy:

In general, I don’t think it’s a good idea to have laptops open in class. Much of the time, I know that people are on Facebook and it’s distracting for other people in the class who are trying to participate. It’s also not entirely compatible with a scholarly atmosphere; I would like people to be alert and able to ask questions in class if there’s something that they don’t follow.

However I do realize that some people prefer to take notes on their laptops (and I hope that those who do don’t end up like me, with tendinitis – please check those ergonomic guidelines for laptop use). If you are someone who wants to use your computer in class for taking notes, that is fine. In that case, come and speak to me and explain this, and I will trust that you will be doing nothing other than taking notes on your laptop. But unless you have come to clear this with me, please do not open your computer in class. Please turn off cell phones, smartphones and other mobile devices as well, before class starts.
TOPICS

This is a tentative list of topics to be covered; we may not get through all of this, or we may do slightly more. Chapters in LM are for the 4th edition. I’ve listed a few things that I want you to be sure you understand as we get through each section, but this is NOT an exhaustive list, so please don’t say to yourself, ‘oh, I get that, I can skip class.’

0. Introduction
   - LM, Ch. 1
   - SBE, Ch. 1
   - ES, Ch. 1

Some key concepts (introductory ideas only): experimental vs. non-experimental data; modelling, abstraction and learning from approximate models; prediction vs explanation; correlation vs causation

1. Economic and financial data
   - not covered explicitly in LM, SBE
   - ES, Ch. 2

Some key concepts: time series vs. cross-sectional data; aggregate vs. individual data; panel data; non-experimental data; transformations of data including difference, logarithms and their effects when used as transformations; simple graphical representations of data

2. Descriptive statistics
   - not covered in one place in LM, but the commonly-used statistics are described as estimators of the underlying theoretical quantities
   - SBE, Ch. 3 (some material from 2.) (4th edition, Ch. 2).
   - ES, Ch. 3
   - Assignment 1

Some key concepts: features of the distributions of data revealed by simple statistics: not only concepts of the central tendency of data and their dispersion, but also indicators of asymmetry, locations of quantiles, relative frequency of extreme events and different types of risk revealed by these measures

3. Probability
   - LM, Ch. 2
   - SBE, Ch. 4 (4th edition: ch. 3)
   - ES, Ch. 5. (partly complete)
   - Assignment 2
Some key concepts: alternative concepts of probability; concepts such as sample space, outcome, event; axiomatic derivations of basic rules of probability; unconditional and conditional probability; bivariate probability; dependence and independence; Bayes’ Theorem; Tchebychev inequality

4. **Discrete and continuous probability distributions**
   - LM, Ch. 3-4
   - SBE, Ch. 5-6 (4th edition: ch. 4-5)
   - ES Ch. 6-9
   - Assignment 3

Some key concepts: expectation, moments, density and cumulative distribution; particular distributions including the binomial, exponential, normal (Gaussian), $t$, $\chi^2$, $F$, joint distributions including bivariate and multivariate normal; effect of correlation on shape of the bivariate normal density; expectations of functions; (weak) law of large numbers and a simple central limit theorem (CLT) [this is extremely important: don’t make the mistake of thinking that this is some technicality that you can forget, please, or you’ll never really understand the basis of a great deal of statistical inference]

5. **Sampling**
   - LM: not covered in a single place; parts of Ch. 7 are relevant
   - SBE, Ch. 7 (4th edition: ch. 6)
   - ES: this part not written yet
   - Assignment 4 (Computation etc.)

Some key concepts: sample versus population, sampling distributions of sample mean, sample variance and sample proportion in independently and identically distributed data; the case of normally distributed data vs. the more general case of asymptotic distributions based on a CLT

6. **Point and interval estimation**
   - LM, Ch. 5
   - SBE, Ch. 8-9 (5th edition, Ch. 8; 4th edition, Ch 7-8)
   - Assignment 5 if time permits

Some key concepts: estimator, bias, loss functions including the mean squared error (MSE); decomposition of the MSE; confidence intervals; the case of normally distributed data vs. the more general case of asymptotic confidence intervals based on a CLT

7. **Introduction to hypothesis testing**
   - LM, Ch. 6-7
   - SBE, Ch. 10 (5th and 4th editions, Ch. 9)
   - Assignment 6 if time permits
Some key concepts: null and alternative hypotheses; relationship to sampling distributions; general principles and argument behind classical statistical inference; data mining and hypotheses influenced by data