

ECO227Y1Y—FOUNDATIONS OF ECONOMETRICS
FALL 2019 & WINTER 2020

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KEY INFORMATION:

Course website: [Quercus](#)

Lecture: Thursdays 2:10–4pm @ ES B149 (Fall) / ES B142 (Winter) [[link to map](#)]

Tutorial: Fridays 10:10–11am @ ES B142 (both terms)

Office hours: Wednesdays 4–5pm @ GE 213 or by appointment
Tuesdays 9:30–10:30am @ GE 313 (TA office hour)

TAs: Tom Stringham & Ben Rommelaere

ESC (Economics Study Centre): GE 110 (drop-in, check schedule [here](#))

DESCRIPTION AND LEARNING OUTCOMES:

This is a rigorous introduction to probability and statistics intended for students interested in the Economics Specialist program. The course assumes familiarity with elementary calculus and will use it extensively. The course provides students with a demanding introduction to probability theory, estimation theory, sampling distributions, hypothesis testing, and simple regression analysis. By the end of the course, students should be familiar with the basic tools used to model uncertainty in economics and finance, to test hypotheses, and to estimate model parameters.

COURSE PREREQUISITES AND CO-REQUISITES:

ECO101H1 and ECO102H1 (or ECO100Y1) are required with a minimum grade of 70%. Students are expected to have had an introductory undergraduate course in calculus. In particular, passing MAT133Y1 with a minimum grade of 63%; MAT135H1 and MAT136H1 with a minimum grade of 60%; MAT137Y1 with a minimum grade of 55%; or MAT157Y1 with a minimum grade of 55% will satisfy the calculus prerequisite for this course. It is also recommended that students be enrolled in second-year courses in linear algebra (i.e., MAT223H1 or MAT240H1) and multivariate calculus (i.e., MAT235Y1; MAT237Y1; or ECO210H1) at the same times as their enrolment in ECO227Y1. See [here](#) for prerequisites policy in the Economics Department.

TEXTBOOKS:

Required: *Mathematical Statistics with Applications*, 7th Edition,
by Dennis D. Wackerly, William Mendenhall III and Richard L. Scheaffer (Brooks/Cole)

Optional: *An Introduction to Mathematical Statistics and its Applications*, 5th Edition,
by Richard J. Larsen and Morris L. Marx (Pearson)

Stats: Data and Models, 5th Edition,
by David E. Bock, Paul F. Velleman, and Richard D. De Veaux

The lectures in this course are based on Wackerly, Mendenhall and Scheaffer, and the tutorials will cover selected exercises in the same textbook. This textbook is available for purchase at the

University of Toronto Bookstore (uoftbookstore.com). Students may also choose to purchase an electronic version of the textbook online. Few copies are available for loan or course reserves at some University libraries. Larsen and Marx is recommended as an additional reading material. The contents of the textbook are closely related to the required textbook and serves as a nice complement. If a student have never taken a Statistics course before, Bock, Velleman and De Veaux is recommended to gain some perspectives on statistical practice and statistical thinking.

PROBLEM SETS:

Weekly problem sets will be posted on Quercus after each lecture, containing a list of exercises in the required textbook. They are selected to help students learn how to apply the concepts and materials covered in the lecture in the previous week. The problem sets will not be graded, however, understanding of the problems is crucial to succeed in this course. Students are recommended to work in groups and discuss the problems. It will help clarify ideas and concepts being covered.

TUTORIALS:

Each lecture will be followed by a tutorial on Friday. During the tutorial, selected exercises from each week’s problem set will be covered. The tutorials are designed for students to review their work on the problem sets. Important concepts used to solve the problems will be emphasized and guidance will be provided. Note that it is crucial for the students to independently work on the problem sets prior to the tutorials.

EVALUATION:

Evaluation	Date & Time	Weight
Midterm test 1	Friday 9:10–11am, Oct. 11	23%
Midterm test 2	Friday 9:10–11am, Nov. 29	23%
Midterm test 3	Friday 9:10–11am, Feb. 14	23%
Final exam	TBA (120 minutes)	23%
Writing assignment	Tuesday, 11:59pm, Mar. 31	8%

Midterm tests and final exam:

The test location may differ from the lecture space (ES B149) depending on the adequacy of the room for test environment. Any location change will be announced during the term. Please be reminded of the following for the day of a test:

- *The midterm tests start at 9:10am on Friday!*
- A non-programmable calculator is permitted for midterm tests and final exam.
- Any distribution tables and functions relevant for the test will be provided.
- Please wait outside of the lecture room until the room is set up for the test.
- Aim to arrive early, at least 10 minutes before the test; no extra time will be given.

Writing assignment:

A short writing assignment (max. 500 words) will be handed out 3 weeks before the due date. Students will be asked to provide a quantitative analysis using real world data set by applying relevant statistical tools covered in class. The assignment will be evaluated based on (1) relevance/validity of the statistical methods for the data set and research question, (2) correct interpretation of the quantitative result and (3) informative and proper presentation of the quantitative result and (4) coherency in delivering the quantitative output using plain

English. The latter emphasizes that the report is aimed for a general audience without acute knowledge of statistics.

TENTATIVE COURSE SCHEDULE:

The chapter numbers in the table below are from Wackerly, Mendenhall and Scheaffer.

Date	Lecture	Topic	Chapters
Probability			
Sep. 5	1	Introduction and Probability Theory I	1-2
Sep. 12	2	Probability Theory II	2
Random Variables and Probability Distributions			
Sep. 19	3	Discrete Random Variables I	3
Sep. 26	4	Discrete Random Variables II	3
Oct. 3	5	Discrete Random Variables III	3
Oct. 10	6	Continuous Random Variables I	4
Oct. 11	-	Midterm Test 1	-
Oct. 17	7	Continuous Random Variables II	4
Oct. 24	8	Continuous Random Variables III	4
Oct. 31	9	Multivariate Probability Distribution I	5
Nov. 7	-	Fall reading week (no class)	-
Nov. 14	10	Multivariate Probability Distribution II	5
Nov. 21	11	Multivariate Probability Distribution III	5
Transformations of Random Variables			
Nov. 28	12	Functions of Random Variables I	6
Nov. 29	-	Midterm Test 2	-
-	-	Winter Break	-
Jan. 9	13	Functions of Random Variables II	6
Sampling Distribution and Point Estimation			
Jan. 16	14	Sampling Distribution and Central Limit Theorem	1&7
Jan. 23	15	Estimation I	8
Jan. 30	16	Estimation II	8
Feb. 6	17	Point Estimators I	9
Feb. 13	18	Point Estimators II	9
Feb. 14	-	Term Test 3	-
Feb. 20	-	Winter reading week (no class)	-
Hypothesis Testing			
Feb. 27	19	Hypothesis Testing I	10
Mar. 5	20	Hypothesis Testing II	10
Simple Linear Regression			
Mar. 12	21	Regression I	11
Mar. 19	22	Regression II	11
Bayesian Methods			
Mar. 26	23	Bayesian Methods I	16
Apr. 2	24	Bayesian Methods II	-
TBA	-	Final Exam	-

COURSE POLICIES:

Missed term work or tests:

A grade of zero will be given to students who do not write the test, unless an appropriate and convincing note is received within one week of the missed test (explaining why the test was missed). Original legitimate supporting documents of absence are required to be submitted in person. Scanned, copied, or e-mailed documents will not be accepted. When a student misses a test for medical reasons, the student shall provide an original copy of a fully completed University of Toronto official “Verification of Student Illness or Injury” form available [here](#). The certificate needs to be completed by a qualified medical doctor whose OHIP number must be provided. In addition, an e-mail notice must be sent to me *on the day of the test*.

Make-up tests will be scheduled based on legitimate medical reasons or acute emergencies. For the first two midterm tests, a make-up tests will be scheduled outside lecture/tutorial hour in January. If a student misses both tests, one make-up test worth the weight of both tests will be scheduled on the same day in January. Any make-up test will only be one hour long. If a student misses the third midterm test with any of the legitimate reasons above, the weight of the test will be allocated to the final exam.

It is by the University policy that there are no “make-up tests” for “make-up tests.”

If a student misses the deadline for the writing assignment, 2 percentage points out of 8 total will be deducted for any additional 24-hour interval of late submission. The penalty may be waived if there are legitimate, documented reasons beyond a student’s control, such as medical issues. No assignments submitted later than 48 hours since submission deadline will be accepted.

Remark requests:

Students can request remarking of their midterm tests by submitting a written statement clearly explaining reasons for the request. The statement should specify which marks are subject to dispute and justify why they deserve more marks. The written statement should be sent by e-mail to me *within one-weeks* from the day on which the term tests are returned to the class. Once the remark request is accepted, *the whole test will be regraded* to ensure consistency.

Communications:

(a) **E-mail:**

The TAs and I will respond to e-mails within 24 hours, except on weekends and holidays, with the following provisions.

- The question should require a one- or two-sentence response (maximum). If it takes more, office hours are the more appropriate venue.
- Students should use the University of Toronto e-mail addresses, i.e., of the form username@mail.utoronto.ca. If a student is a visiting student or does not have a University e-mail address, the student should consult me in person about the issue.
- Begin the heading of the e-mail by identifying the course, i.e., of the form “[ECO227Y] Heading.”
- Do not send attachments of kind. They will be deleted from the inbox immediately.

(b) **Office hours:**

Office hours tend to be crowded near tests, exams, or submission dates. Make sure to use office hours timely and frequently. If the office hours are in conflict with another schedule, students may book an appointment by e-mail or in person.

(c) **Quercus e-mail/messaging system:**

Please do not use the Quercus e-mail/messaging system to contact me or the TAs, none of us will check Quercus inbox.

Accommodations for disability:

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or Accessibility Services at (416) 978-8060; accessibility.utoronto.ca.

Academic misconduct:

Students should note that copying, plagiarising, or other forms of academic misconduct will not be tolerated. Any student caught engaging in such activities will be subject to academic discipline ranging from a mark of zero on the assignment, test or examination to dismissal from the University as outlined in the academic handbook. Any student abetting or otherwise assisting in such misconduct will also be subject to academic penalties. Details about academic integrity can be found [here](#).