# ECO220Y1Y, Introduction to Data Analysis and Applied Econometrics

**Economics Department, University of Toronto, Summer 2023**

**Prof. Murdock (May/June); Sobia Jafry & Quinlan Lee (July/August)**

## 1 Welcome and Intro to ECO220Y1Y from Prof. Murdock

Welcome to my favorite course! You have the chance to gain essential analysis and exposition skills – ours is a practical course – and learn about what many economists really do. If you're curious about how to analyze data, which kinds of questions researchers ask in a variety of economic fields, and how to present and interpret results, then this is the course for you. You'll need to hone your preexisting reading, writing, and quantitative analysis skills. While some of the new skills are challenging and require substantial practice, your TAs and instructors are your allies. Your classmates are also your allies: make an extra effort to socialize and form new connections. Working together we can be successful.

The three sections – LEC0101, LEC0201, and LEC0301 – share this syllabus. All sections do the Data Analysis Course Module (DACM) where you dive into real data and research and replicate key findings. Prof. Murdock teaches the first half of the course (May and June) and runs DACM. Sobia Jafry (LEC0101) and Quinlan Lee (LEC0201/LEC0301) teach the second half of the course (July and August).

## 2 Learning Objectives: Expected Depth of Understanding

(1) Translate between plain English and statistical terms and concepts: identify key information regardless of wording and distinguish incorrect statements from correct ones

(2) Select and apply a suitable quantitative approach to a new situation while making your reasoning clear: may require sentences, hypotheses, equations, calculations, fully-labeled graphs, diagrams

(3) Proficiently read output from various statistical software packages including Stata

(4) Use Excel to analyze data and replicate published results

(5) Correctly interpret quantitative results for a non-technical or technical audience

(6) Draw valid statistical conclusions and steer clear of common pitfalls

(7) Explain what would change if a researcher made different choices or the data changed

(8) Identify the underlying assumptions in quantitative analyses and figure out how violations affect conclusions and interpretations

(9) Read and critically evaluate analyses without being dazzled by data, methods or jargon

(10) Effectively apply course concepts to a wide range of contexts from popular press articles to papers in peer-reviewed academic journals

(11) Assess available data or propose a data collection plan to address a research question

(12) Craft compelling, concise, precise, clear, and coherent written arguments

## 3 For Everyone: Accessibility, Absences, and Help

If you require accessibility accommodations, register with both https://studentlife.utoronto.ca/department/accessibility-services/ and Accommodated Testing Services (ATS): https://lsm.utoronto.ca/ats/. Everyone may use the Academic Success Centre.

***You must declare ALL absences on ACORN:*** **ACORN Absence Declaration**.

For complex/challenging situations, you must ***work with your College Registrar***. They give guidance and, when appropriate, contact your professors for you while guarding your privacy. This requires *working closely with* your College Registrar, and not merely having them restate your requests to your professors. For significant challenges, work with your College Registrar immediately. Also, there are limits to what we can accommodate: in some cases the only viable option is to drop our course.

## 4 Academic Integrity

Please do not create a horrible situation for yourself, your classmates, your TAs, and your instructors. Even if you are suffering stress, far behind, facing failure, and/or lacking self-confidence, cheating is not worth it. Infractions can take many, many agonizing months to resolve and sanctions can be severe. We must all work together supporting the integrity of our course and U of T. Read this link and sublinks https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity.

## 5 Required Readings and Textbook

Section 14 lists the readings and Quercus gives each unit's assignment. For our required textbook – *2020 Business Statistics, Fourth Canadian Edition* by Sharpe, De Veaux, Velleman, and Wright – you may buy:

- the eText directly from Pearson for $64.99 (ISBN 9780136964032),
- the print textbook from Pearson with an access code for the eText for $217.99 (ISBN 9780136726548),
- a used copy of the *Fourth Canadian Edition*. Older editions or the US / international editions are not good substitutes: they are missing topics and do not match the numbering in our book. However, the *Third Canadian Edition* is an acceptable substitute: only some end-of-chapter exercises differ.

Note that MyLab Statistics is *neither* required nor recommended: we do not use it. Also, be advised that our textbook highlights important points with boxes (sometimes in the margins): take the boxes seriously, including "Just Checking." Similarly, don't skip "What Can Go Wrong?"

## 6 Prerequisites

Administrators will remove anyone missing prerequisites. Note that instructors cannot waive prerequisites.

## 7 Required Lecture Videos with Prof. Murdock (May/June)

For each unit, required videos and slides are on Quercus. Complete readings before the videos. Watch the lecture videos before the workshop on that unit.

## 8 Class Meeting Times

During regular class times on Mondays, Wednesdays, and Thursdays we meet (in person) for workshops/lectures/tutorials, DACM practicums, or term tests. The only exception is Monday, May 8th: instead of meeting, read this syllabus and work on the Unit 1 and 2 readings and lecture videos.

Do not schedule any conflicts during your ACORN time slots or during exam periods. We do not allow attending with another section nor do we make accommodations for missed work because of conflicts.

During May and June with Prof. Murdock, required workshops give you a chance to practice your skills, collaborate with others, and work with mini case studies. Complete the unit's reading and lecture video before your workshop. Expect to solve questions, write, and interact with your classmates and the instructional team. Bring pencils, erasers, your TCard, and the course aid sheets. You *must* attend with your ACORN section. See the Workshops page on Quercus.

During July and August with Sobia Jafry and Quinlan Lee, instead of pre-recorded lecture videos and workshops, expect live lectures with chances to ask questions.

Throughout the summer, required DACM practicums give you a chance to learn practical data analysis skills and to reinforce your understanding of our core course curriculum. Bring your laptop with an up-to-date installation of Microsoft 365 ProPlus. Be prepared to actively work with others and write. Complete the assigned readings in the DACM Handbook ahead of time. You *must* attend with your ACORN section.

## 9 Ungraded Homework

Each unit has ungraded homework – end-of-chapter textbook exercises and required problems – and solutions on Quercus. For more on solutions to textbook exercises, see Quercus.

## 10 Summer Workload

Expect spend about 17 hours a week on our course. The summer is more than twice as fast: *one* summer course has a weekly workload of just over *two* courses in the regular academic year.

## 11 Student Hours (and no e-mail)

Use student hours, which are hosted by our instructional team, for your questions. TA hours focus on questions about course curriculum and skills. Instructor hours are also for questions about course curriculum and skills as well as for personal matters. See the Student Hours page on Quercus for the latest schedule.

Note that our course does **not** use e-mail. If you have concerns of any nature, speak to the instructional team during class time – we have three meetings per week – and/or use Student Hours. For any remark requests (see Section 12.4): you *must* use the appropriate MS Forms, *not* e-mail. For any missed work (see Section 12.5) and for issues for term tests you *must* use the appropriate MS Forms. Missed work is *not* handled via e-mail.

# 12 Course Grades and Marking

| Assessment | Weight | Estimated Date(s), Time* |
|---|---|---|
| Term Test #1 | 18 % | Monday, May 29, 11:10am-1pm** |
| Term Test #2 | 18 % | Monday, June 19, 11:10am-1pm** |
| Term Test #3 | 18 % | Monday, July 24, 9:10am-11am (L0101), 11:10-1pm (L0201/L0301) |
| Participation (May & June) | 6 % | Workshops are May 10 to June 15, and you *must* attend with your ACORN section for credit |
| DACM Practicums | 6 % | May 31, June 7, June 14, July 13, July 27, August 10, and you *must* attend with your ACORN section for credit |
| Final Exam | 34 % | Three hours and cumulative TBA by A&S: August 17 to 25 |

* Both dates and times are approximations: assessments may be plus/minus hours and/or days.

** Students in L0101 or L0301 with a *direct* ACORN conflict must complete Conflict Tests, which is an MS form, after 9am on Monday, May 15 and before 9am on Tuesday, May 23. We do not accept conflicts for those in L0201 and everyone still must write a test that day.

## 12.1 Term Tests and the Final Exam

At term tests and the final exam we give you aid sheets. Ahead of each, we post announcements on Quercus. For a missed test, see Section 12.5.1. The final exam is cumulative [1] and includes DACM.

## 12.2 Workshops and DACM Practicums

*Quality* matters for marks in workshops and DACM practicums. Arrive on time, well prepared, and ready to actively engage throughout. For DACM practicums, bring your laptop with an up-to-date installation of Microsoft 365 ProPlus: we use Excel. Immediately contact The Information Commons Help Desk with any technical issues around your devices, software, Quercus, or connectivity. Practicums also give you opportunities to work with course skills and writing, not only Excel analysis skills. For workshops and practicums, work is returned via Crowdmark: check your U of T e-mail. Any behaviors negatively affecting your peers, TAs, and/or your instructor – such as academic integrity concerns or failing to follow instructions – can lead to an overall mark of **zero**. For a missed workshop or practicum, see Section 12.5.2.

## 12.3 Grading of Term Tests and the Final Exam

Marks reflect any adjustments to raw scores such as adding points or not counting an unduly difficult/ confusing question. Marks, not raw scores, measure your performance. For partial credit, part of your answer must be correct, directly relevant to the question, and not contradicted elsewhere in your answer.

## 12.4 Remark Requests

For term tests, remark requests must: (1) Be submitted to Remark Test, which is an MS form, (2) Explain WHY more points are justified, (3) Be submitted within TWO WEEKS of the test's return to the class. Your mark may remain unchanged, go up, or go down. These are given a fair look: TAs are *not* seeking to penalize those with genuine marking concerns. Requests are reviewed *after* the two-week deadline, not

[1] Why have a *cumulative* final exam? Pedagogically, revisiting earlier material aids learning and long-term retention of skills. Practically, it allows the final to have a higher weight and be an opportunity to rebound.

immediately. We will *not* consider any remark requests after the deadline. We do **not** accept remark requests for workshops or DACM practicums: see Section 12.5.2 if you are unhappy with a mark.

## 12.5 Missed Work and Accommodations

Complete work as scheduled in Section 12. Any missed work earns a mark of zero. This section explains accommodations for: illness, injury, personal/family problems, religious reasons, extracurricular conflicts, late enrollment in the course, travel issues, accessibility concerns, and/or other challenging situations beyond your control. ***For significant challenges, work with your College Registrar immediately.***

### 12.5.1 Missing a Term Test

For a missed term test, complete BOTH of these steps.

**First Step:** Complete Missed Term Test, which is an MS form. ***Submit <u>WELL BEFORE</u> the test.*** Submit the form ***as soon as you know you will miss a test***. For example, it is **not** acceptable to submit the MS form the day before with a scheduled surgery as the reason. We do NOT wish to see documents from doctors or others. All questions in the MS form are *required*, including a copy of your **ACORN Absence Declaration** and a current copy of your ACORN timetable.

**Second Step:** Write *all* other tests as scheduled. Write a *cumulative* make-up test. Within four business days after the date of the missed test, we write to your U of T e-mail. Subsequent e-mails may clarify the date, time, and location of the make-up. Students are expected to be available when classes are in session and during the exam periods. We do not accommodate a missed make-up test.

Accommodations for missing more than one test are *extremely limited*: **(1)** a ***College Registrar*** contacts the instructor after working *extensively* with a student – see Section 3 – and formally requests an accommodation on the student's behalf or **(2)** *more than one* conflict *not* related to injury, illness or personal/family problems where we are contacted by the student *very far in advance* (e.g. an athlete who notifies us in early May of conflicts with international competitions). In these *limited situations*, we will consider whether accommodations can still meet all course requirements or whether the student must be advised to drop the course and retake it when able to complete the required work.

### 12.5.2 Automatic Accommodations for Workshops and DACM Practicums

To accommodate people or miss, arrive late, or have any problems for a workshop for reasons beyond their control, we automatically drop the lowest three workshops. For DACM practicums, we automatically drop the lowest one. These are for situations entirely outside your control: do not miss for any potentially avoidable reasons. These are *automatic*: please do *not* contact us about missing a workshop or practicum.

## 12.6 Rebounding from Failures & Handling Ambiguity: Message from Prof. Murdock

Even though none of us enjoy them, failures are an expected part of learning and growth. We do *not* mark you as a person or you as a student: we only mark your submitted work. How do you react to a poor mark? Instead of feeling discouraged or frustrated, try reflecting on how that poor mark came to be and what is within your control to change going forward. If you're unsure of the causes, speak with your

instructors or your TAs, and especially earlier in the course when there is time to adjust.

Let me share a true story. In my first term in the College of Agriculture and Life Sciences at Cornell, I enrolled in Calc II using my AP credit for Calc I from high school. I found the course challenging and studied many hours. My only activities were studying, working in the dining hall, and the necessities of life (eating, sleeping, etc.). I went to the professor's office hours every week at 8am. I thought the first test went pretty well and then I got my marked paper back. At Cornell, numeric marks had no meaning: everything was curved. I waited for the professor to write the letter grades for each range of marks on the chalk board. He never it made it as low as my mark: I wasn't even close to a D-. I remember walking around campus in a daze and crying behind a building. But then I asked for help. The registrar worked with me to switch me into Calc I. I went to see my new professor to catch up. I ended up with top marks, became a math major, and transferred to a new school. So what is the point of this story? It's not that everything we fail at will ultimately become a great success. Sometimes we need to ask for help and adjust our approach. Sometimes we will ultimately find some measure of success, just not yet.

Practicing economists often fail and there are few "right answers." Many research endeavors have false starts, dead ends, and months of wasted work. There are also well-publicized examples of economists making a small coding error that means their headline empirical results are wrong. Further, people entering their second year of university often think in dualistic terms. Dual means two and symptoms are thinking in terms of black/white or right/wrong. Almost all empirical results in economics are subject to some debate: there is no one correct answer (even if many answers are definitely incorrect). While our course will often be on firm ground, we do venture into real research where we have to deal with shades of grey and ambiguity.

We cannot offer individual opportunities to rebound. In other words, we cannot change the marking scheme or offer bonus assignments upon request. While some may perceive this as being "strict," our goal is to be fair and kind. It is not fair to make exceptions only for those who contact us: many are not comfortable asking. Further, we cannot build fair individual-level marking schemes in a large course. Finally, in many cases where extraordinary accommodations would be needed, the ultimate outcome is failing or dropping the course. It is not kind to carry on without a realistic chance of an acceptable outcome.

## 13 Should You Pay for Tutoring or Study Services? How to study?

The supports and resources necessary for your success are already paid for by your tuition (with the exception of our textbook), including your TAs, instructors, and the many resources on Quercus.

Be careful with paid services with marketing approaches that may prey on your worst fears or may promise top marks with less work: real learning is hard and requires a sustained effort. Also, outside services have contributed to students being sanctioned for academic infractions. In contrast, services provided by U of T are safe for you to use. Also, please be aware that in May of 2022 U of T sued Easy EDU.

Instead, when studying, use posted solutions with care. Construct your own *full* replies for homework. Work with old tests and exams in test-like conditions to hone your skills and assess the required depth of understanding. If you cannot solve a question, turn to your notes and course materials. Only as a *last resort*, ask a person or look at the solutions. Use solutions to *grade* your own answers.

## 14 Topics and Required Readings

Required readings include supplements created for our course (marked in boldface below and available on Quercus) and our textbook. Chapter numbers reference our textbook and any exclusions are noted. We finish through Chapter 11 in May/June and the rest in July/August.

- ***Prerequisite Review for ECO220Y1Y, Summer 2023*** pages 1 - 42
- ***The DACM Handbook for ECO220Y1Y, Summer 2023*** pages 1 - 182
- Chapter 1: *An Introduction to Statistics*
- Chapter 2: *Data*
- Chapter 3: *Surveys and Sampling*
- Chapter 4: *Displaying and Describing Categorical Data*
- Chapter 5: *Displaying and Describing Quantitative Data*
- Chapter 6: *Scatterplots, Association, and Correlation*
- SW11: Chapter 1, *Economic Questions and Data* pp. 1 - 13 from *Introduction to Econometrics, Third Ed.*, 2011, by James H. Stock and Mark W. Watson
- Chapter 7: *Introduction to Linear Regression*
- ***Logarithms in Regression Analysis with Asiaphoria for ECO220Y1Y, Summer 2023*** pages 1 - 27
- Chapter 8: *Randomness and Probability*
- Chapter 9: *Random Variables and Probability Distributions* (Excluding Sections 9.7 *The Poisson Distribution*, 9.12 *The Exponential Distribution*, and "Normal Probability Plots" pp. 280-2)
- ***Normal Table: Read it, Use it for ECO220Y1Y, Summer 2023*** pages 1 - 8
- Chapter 10: *Sampling Distributions*
- Chapter 11: *Confidence Intervals for Proportions*
- Chapter 12: *Testing Hypotheses About Proportions*
- Chapter 13: *Confidence Intervals and Hypothesis Tests for Means*
- Chapter 14: *Comparing Two Means*
- Chapter 18: *Inference for Regression* (Excluding "How does the Normal probability plot work?" pp. 607-8)
- Chapter 19: *Understanding Regression Residuals*
- Chapter 20: *Multiple Regression*
- Chapter 21: *Building Multiple Regression Models* emphasizing Sections 21.1 *Indicator (or Dummy) Variables*, 21.2 *Adjusting for Different Slopes – Interaction Terms*, and *Quadratics* (online) (Excluding "Residuals and Standardized Residuals" and "Influence Measures" pp. 737-9)

Also, an optional (and recommended) reading, sometimes referenced in lectures, is "Belief in the Law of Small Numbers" by Amos Tversky and Daniel Kahneman published in 1971 in *Psychological Bulletin* (**TK71**).[2]

[2]This is an academic journal article co-authored by a winner of the Nobel prize in economics.