STA305H1F LEC0101: Design and Analysis of Experiments
Summer 2022

Mondays and Wednesdays 1 pm to 4 pm
BA 1160

Land Acknowledgment

We wish to acknowledge the land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Teaching Team

Course Instructor: Osvaldo Espin-Garcia, PhD
TAs: Hang Zhang | Marc Sicova | Navona Calarco | Yao Li
Office Hours: Held via Zoom. Instructor and TA office times will be posted later in the course website.

Course Content

This course will provide an introduction to the design and analysis of experiments. Students will be exposed to statistical methods used in the design and analysis of scientific experiments and observational studies.

The learning objectives of the course are:

- To understand the ideas, principles, and considerations that are common to the design and analysis of scientific studies including statistical design of experiments and observational studies;
- To develop a toolbox of statistical methods for the design and analysis of experiments and observational studies; and
- To identify appropriate uses and interpretations of experimental designs and observational studies, including their strengths and limitations.

Modules Schedule

Date	Module	Quiz Posted	Quiz Due
Mon May 9	Introduction Review of Mathematical Statistics	Mon May 9	Thu May 12
Wed May 11	Comparing Two Groups	Wed May 11	Sat May 14
Mon May 16	Power and Sample Size	Mon May 16	Thu May 19
Wed May 18	Introduction to Causal Inference	Wed May 18	Sat May 21
Fri May 20	Assignment 1 posted. Due **Mon May 30**		
Mon May 23	Victoria Day (No classes)	-	-
Wed May 25	Propensity Score Methods	Wed May 25	Sat May 28
Mon May 30	Design of Observational Studies	Mon May 30	Thu Jun 2
Wed Jun 1	Comparing More than Two Groups (1)	-	-
Mon Jun 6	Comparing More than Two Groups (2) Last day to drop F courses	Mon Jun 6	Thu Jun 9

Wed Jun 8	Introduction to Factorial Design	Wed Jun 8	Sat Jun 11
Fri Jun 10	Assignment 2 posted. Due **Mon Jun 20**		
Mon Jun 13	Blocking in Factorial Design	Mon Jun 13	Thu Jun 16
Wed Jun 15	Fractional Factorial Design	Wed Jun 15	Sat Jun 18
Mon Jun 20	(TBD) Last day to add or remove a CR/NCR option in F courses	-	-

Textbook

The course will closely follow the online textbook *Taback, N. (2022) Design and Analysis of Experiments and Observational Studies using R.* available at `http://designexptr.org`. Below are other optional texts that you may find helpful.

Box, G.E.P., Hunter, J.S., and Hunter, W.G. (2005) Statistics for Experimenters: Design, Innovation, and Discovery. Wiley. 2nd Ed. UofT Library link here.

Dean, A., Voss, D., and Draguljiċ, D. (2017) Design and Analysis of Experiments. Springer, 2nd Ed. UofT Library link here.

Rosenbaum, P.R. (2010) Design of Observationl Studies. Springer. UofT Library link here.

Wu, C.F.J. and Hamada, M.S. (2009) Experiments: Planning, Analysis, and Optimization. Wiley, 2nd ed. UofT Library link here.

Imbens, G.W. and Rubin, D.B. (2015) Causal Inference for Statistics, Social, and Biomedical Sciences. Cambridge University Press. UofT Library link here.

Montgomery, D.C. (2013) Design and analysis of experiments. John Wiley & Sons, Inc. UofT Library link here.

Computing

We will use R for all examples. R is freely available for download at `https://cran.r-project.org` for Windows, MacOS, and Linux operating systems. For quizzes and assignments, you will need to know how to interpret output from R and understand R codes.

RStudio is a fantastic integrated development environment (IDE) for R. It is freely available at `https://www.rstudio.com/products/rstudio/`. I am assuming that students have different comfort levels when using R. I will provide you with the R syntax for all examples in lecture, which should be sufficient for you to complete the course activities.

You are encouraged to access R/RStudio through https://jupyter.utoronto.ca/ by logging with your UTORid. The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text `https://jupyter.org`. To get started using R/RStudio in a Jupyter notebook, see this and this pages.

Communication Policy

Please contact me via the course email at `sta305@utoronto.ca` for administrative inquiries including regrading, deadline extensions, etc. For questions on course materials, I encourage you to use Piazza. More details on using Piazza are provided in Online Discussion Board section below.

When communicating via email, emails sent from addresses other than *utoronto.ca* address will be ignored.

Online Discussion Board

You will have the option to use Piazza for class discussion. If you decide not to use Piazza, it will not disadvantage you in any way, and will not affect official University outcomes. If you choose not to opt-into Piazza then you can ask questions or discuss course material with the instructor during office hours.

Be sure to read Piazza's Privacy Policy https://piazza.com/legal/privacy and Terms of Use https://piazza.com/legal/terms carefully. Take time to understand and be comfortable with what they say. They provide permissions for substantial sharing and disclosure of your personal information held by Piazza, which affects your privacy. If you decide to participate in Piazza, only provide content that you are comfortable sharing under the terms of the Privacy Policy and Terms of Use.

The Piazza system is highly catered to getting you help fast and efficiently from classmates, the TAs, and the lecturers. Rather than emailing questions to the teaching team, we encourage you to post your questions on Piazza. To sign up for the discussion forum click on the link: https://piazza.com/utoronto.ca/summer2022/sta305.

Grading Scheme

Item	Available From	Due	Weight
Quizzes (See Modules Schedule for Dates)	5:00 pm	11:59 pm	20% top 8 of 10 (2.5% each)
Assignment 1	May 20, 5:00 pm	May 30, 11:59 pm	15%
Assignment 2	Jun 10, 5:00 pm	Jun 20, 11:59 pm	15%
In-person Final Exam	3-hour exam TBD by FAS		50%

All times listed are in Toronto Time (EDT).

All Quizzes will be administered on Quercus. You will have unlimited number of attempts for all Quizzes with randomly assigned questions for each attempt. More details on each Quiz will be posted on Quercus.

Instructions on how to submit the assignments will be provided on Quercus. No email submissions will be accepted.

Grades for Quizzes, and Assignments will be posted on Quercus within 7 days after the due dates.

Academic Integrity

The University of Toronto treats cases of academic misconduct very seriously. Academic integrity is a fundamental value of learning and scholarship at the university. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that your degree is valued and respected as a true signifier of your individual academic achievement.

The University of Toronto's Code of Behaviour on Academic Matters https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019 outlines the behaviours that constitute academic misconduct, the processes for addressing academic offences, and the penalties that may be imposed. You are expected to be familiar with the contents of this document.

Specifically for this course, potential offences include, but are not limited to sharing the quiz materials with

your peers and obtaining unauthorized assistance on Assignments from your peers or tutoring services. You may seek assistance from your peers and the teaching team via Piazza.

All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code of Behaviour on Academic Matters. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me.

Regrading Policy and Deferred Exams

There will be no regrading for all Quizzes. For Assignments, please send me regrading inquiries via the course email (sta305@utoronto.ca) no later than 2 days after receiving the grades with detailed reasoning for the inquiry. I may ask for a one-to-one online meeting if more details are required. Note that your grade after the regraded assessment may be higher, the same, or lower than your original grade.

Regrading requests and deferrals on the final exam must go through the Dean's office, which is responsible for overseeing the final exams and instructors cannot grant these (see https://www.artsci.utoronto.ca/current/faculty-registrar/exams-assessments/exam-viewing and https://www.artsci.utoronto.ca/current/faculty-registrar/exams-assessments/exam-recheck-or-reread for more details).

Extensions, Late and Missing Submissions Policy

No extensions will be given for Quizzes. Extension requests for Assignments with valid reasons will only be considered if they are submitted in writing to the instructor by email at least 3 days prior to the due dates. Valid extension requests will receive up to 2 days of extension.

All late submissions for Quizzes will receive 0 grades. Late submissions for Assignments will lose 20% of the earned grade per day. For example, if an assignment is due at 11:59pm, and is submitted at 12:00am, then it will lose 20% of the earned grade. If it is submitted at 12:00 of the following day, then it will lose 40% of the earned grade, and so on.

Missing Quizzes will receive 0 grades. The weight of at most one missing Assignment submission will be redistributed towards the final (i.e., 65%). Two missing Assignment submissions will result in a 0 grade on Assignment 1.

Religious Accommodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. If you anticipate being absent from class or missing a major course activity due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

Student Well-being

Here are some additional resources to keep in mind especially if experiencing hardship:
https://studentlife.utoronto.ca/department/health-wellness,
https://mentalhealth.utoronto.ca/my-student-support-program.