STA305H1 L0101/1004H L5101: Design and Analysis of Experiments: Summer 2020

Tuesdays and Thursdays 2 pm to 5 pm Toronto Time (EDT)

Teaching Team

Course Instructor: Michael J. Moon `moon@utstat.toronto.edu`
TAs: Sebastian Calcetero | Rebecca Christensen | Tiffany Fitzpatrick | Yingshi He | Michael Prashad
Office Hours: Time TBD via BB Collaborate

Course Content

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

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 Available From	Quiz Due
Tues Jul 7	Introduction (Syllabus Scavenger Hunt Quiz) Review of Mathematical Statistics	Tues Jul 7 Thur Jul 9	Tues Jul 14 Tues Jul 14
Thur Jul 9	Comparing Two Groups	Tues Jul 14	Fri Jul 17
Tues Jul 14	Power and Sample Size	Thur Jul 16	Mon Jul 20
Thur Jul 16	Introduction to Causal Inference	Tues Jul 21	Fri Jul 24
Tues Jul 21	(TBD)	-	-
Thur Jul 23	Design of Observational Studies	Tues Jul 28	Fri Jul 31
Tues Jul 28	Comparing More than Two Groups	Thur Jul 30	Mon Aug 3
Thur Jul 30	Introduction to Factorial Design	Tues Aug 4	Fri Aug 7
Tues Aug 4	(TBD)	-	-
Thur Aug 6	Blocking in Factorial Design	Tues Aug 11	Fri Aug 14
Tues Aug 11	Fractional Factorial Design	Thur Aug 13	Mon Aug 17
Thur Aug 13	(TBD)	-	-

Course Structure

There will be **live lecture sessions on every Tuesday and Thursday from 2 pm to 3:30 pm in Toronto Time (EDT) via BB Collaborate on Quercus**. The lecture sessions will be recorded and available on Quercus after each session. The remaining half of the scheduled meeting times will be used for review sessions and technical workshops as needed. The after-lecture sessions will NOT be recorded.

In addition to the lecture sessions, you are required to complete **mandatory readings available on the course website** at `https://mjmoon.gitlab.io/sta305`. You will find a corresponding module on the website for each topic listed above. I will provide links to each module on Quercus as well.

For each module on Quercus, you will also find **an online quiz** as specified on Modules Schedule. You are expected to complete mandatory readings prior to taking each End-of-Module Quiz. 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.

Learning online is very different from learning in a traditional in-person lecture courses. If you are new to learning online, please check out the university's checklist for learning online at `https://onlinelearning.utoronto.ca/is-online-learning-for-me/`.

Textbook

The course will closely follow the online textbook *Taback, N. (2019) Design of Experiments and Observational Studies.* available at `https://scidesign.github.io/designbook/`. All mandatory reading materials will be available at the course website `https://mjmoon.gitlab.io/sta305/`. 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.

Dean, A., Voss, D., and Draguljič, D. (2017) Design and Analysis of Experiments. Springer, 2nd Ed. UofT Library link at `http://go.utlib.ca/cat/11431241` Also available at `https://link.springer.com/book/10.1007%2F978-3-319-52250-0`.

Rosenbaum, P.R. (2010) Design of Observationl Studies. Springer. UofT Library link at `http://go.utlib.ca/cat/7890274`

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

Imbens, G.W. and Rubin, D.B. (2015) Causal Inference for Statistics, Social, and Biomedical Sciences. Cambridge University Press. UofT Library link at `http://go.utlib.ca/cat/10127748`

Computing

We will use R for all examples. R is freely available for download at `http://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 write your own R codes. I will post resources on using R on Quercus and on the course website at `https://mjmoon.gitlab.io/sta305/resources/#r`

I strongly recommend using RStudio Cloud `https://rstudio.cloud/` or RStudio Desktop `https://www.rstudio.com/products/rstudio/`. There will be a RStudio Cloud Workspace for the course where you will be able to share your assignment codes with the teaching team for troubleshooting.

Communication Policy

Please contact me via Quercus Inbox or email at `moon@utstat.toronto.edu` 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.

The preferred method of direct communication is Quercus Inbox. If you choose to email, please use your *utoronto.ca* email address and include [**STA305**] (or [**STA1004**]) in the subject line. 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/summer2020/sta305l0101100415101`

Grading Scheme

Item	Available From	Due	Weight
	Quizzes (20%)		
Syllabus Scavenger Hunt Quiz	(See Modules Schedule for Dates)		2%
End-of-Module Quizzes	12:01 am	11:59 pm	$9 \times 2\%$ each
	Assignments (30%)		
Assignment 1	Jul 18, 12:01 am	Jul 24, 11:59 pm	15%
Assignment 2	Aug 1, 12:01 am	Aug 7, 11:59 pm	15%
	Project (50%)		
Plan	Jul 28, 12:01 am	Aug 3, 11:59 pm	10%
Peer Feedback	Aug 5, 12:01 am	Aug 10, 11:59 pm	5%
Video	Jul 28, 12:01 am	Aug 17, 11:59 pm	15%
Report	Jul 28, 12:01 am	Aug 17, 11:59 pm	20%

All times listed are in Toronto Time (EDT).

All quizzes will be administered on Quercus. All assignment and project submissions will be submitted on Quercus. No email submissions will be accepted.

Grades for End-of-Module Quizzes, Syllabus Scavenger Hunt Quiz, and Assignments will be posted on Quercus within 5 days after the due dates. Numerical grades for the project will not be posted on Quercus. Written feedback will be returned on Quercus within 1 week 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 or Project from your peers or tutoring services. You may seek assistance from your peers and the teaching team via Piazza or refer to the official Peer Feedback for help on the project.

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

There will be no regrading for all End-of-Module Quizzes and Syllabus Scavenger Hunt Quiz. For Assignments, please send me the regrading inquiries via Quercus Inbox or email 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.

Extension and Late Submission Policy

No extensions will be given for End-of-Module Quizzes, Syllabus Scavenger Hunt Quiz, or Project Peer Feedback. Extension requests for Assignments and other Project components with valid reasons will only be considered if they are submitted in writing to the instructor by email or Quercus Inbox at least 3 days prior to the due dates. Valid extension requests will receive up to 2 days of extension.

All late submissions for End-of-Module Quizzes, Syllabus Scavenger Hunt Quiz, and Project Peer Feedback will receive 0 grades. Late submissions for other project components and Assignments will lose 10% of the earned grade if received within 24 hours of the deadline or receive 0 grades otherwise.

Exceptions

If you face exceptional circumstances including medical, personal, family, or other unavoidable reasons, please contact me via Quercus Inbox or email as soon as possible. You may be asked to provide documentation depending on the nature of the circumstance and the University's policy around medical absence documentation.

If you miss a course work due to exceptional circumstances, you may be asked to take an oral test or write an individual technical report in place of the missed work. If you do not contact me within 1 week after the deadline, you will receive a 0 grade for the component.

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.

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; `https://studentlife.utoronto.ca/as`.