

STA261H1 S LEC0101
Probability and Statistics II
Winter 2024
Course Outline

Lecture Times: Monday 2:00 PM-5:00 PM Room: **WI 1016**

Instructor: **Jesse Gronsbell**

Course E-mail: sta261@utoronto.ca

Note: Do not email me directly.

Office Hours: Monday 4:00-5:00pm **Room:** WI 1016

Course Website: <https://q.utoronto.ca/courses/337658>

Course Description: A rigorous introduction to the theory of statistical inference and to statistical practice. Statistical models, parameters, and samples. Estimation, sampling distributions, and the properties of consistency, bias, and variance. The likelihood function and maximum likelihood estimation. Hypothesis tests and confidence regions. Examples illustrating statistical theory and its limitations. Introduction to the use of R for statistical analysis.

Note: STA261H1 does not count as a distribution requirement course.

Pre-requisite: STA257H1/ STAB52H3/ STA256H5

Co-requisites: MAT237Y1/ MAT257Y1/ MAT257Y5; MAT223H1/ MAT224H1/ MAT240H1/ MATA22H3/ MATA23H3/ MAT223H5/ MAT240H5/ MATB24H3/ MAT224H5

Exclusion: ECO227Y1/ STA238H1/ STA248H1/ STAB57H3/ STA260H5/ ECO227Y5

Recommended Preparation: None

Arts & Science Distribution Category: Science

Arts & Science Breadth Requirements: The Physical and Mathematical Universes (5)

Mode of Delivery: In Class

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department.

Delivery Mode: This course is to be delivered **in person** as specified on the University [Timetable Builder](#) website. In case there is any change in the mode of delivery, the details will be announced on the course website.

Tutorials: Tutorials will be held **in person** every week from the second week. The details are available on the University [Timetable Builder](#) website and the Quercus page. Tutorials will be administered by the TAs to review topics, solve problems and answer questions. The TA contact information will be posted on Quercus.

Textbook: Probability and Statistics: The Science of Uncertainty, Second Edition, by Michael J. Evans and Jeffrey S. Rosenthal [Available online for FREE!](#)

Additional References

- Mathematical Statistics and Data Analysis, 3rd Edition, John A. Rice
- Mathematical Statistics with Applications (7th Edition) by Wackerly, D., Mendenhall, W., and Scheaffer, R. L. 2008.

Statistical Computing: Statistical software R will be used occasionally. No previous computing experience is assumed. Students will not be tested on their expertise on this software. Any code used in the lectures to demonstrate any example will be available on the course webpage for students to practice on their own time. Here are the links to download this open source software:

- For Windows: <https://cran.r-project.org/bin/windows/base/>
- For Mac: <https://cran.r-project.org/bin/macosx/>

After installing R, you can install posit (RStudio) which is available [HERE](#).

Assessments: Your final grade will be based on the following assessments

Quizzes: There will be five quizzes in the course which will be held online and must be completed individually. They will generally consist of problems similar to homework problems or examples worked out in class. They will be administered bi-weekly (starting second week) on Quercus. Each quiz will be available on Quercus from Friday at 11:59 PM until next Sunday at 11:59 PM.

Term Test: The term test will be held in-person during the lecture on Monday, February 26th, 2024 from 2:15 PM-3:45 PM. Other details such as the content and the location will be announced on Quercus approximately a week before the test.

Final Exam: The final exam will be in-person, last 3 hours, and cover all of the course material. The exact date and time will be scheduled and announced by the Office of the Faculty Registrar (OFR).

Type	Due Date	Weight
Quizzes	Bi-weekly (Online)	20%
Term Test	Monday, Feb. 26th, 2:15 PM-3:45 PM (in-person)	25%
Final Exam	April (TBA)	55%

Missed Term Work Policy: Missed quizzes will earn a mark of zero, without exception. Reasons/justification for missing the quizzes will not be accepted.

For missed term test, students must provide valid documentation such as the [Verification of Illness or Injury](#). The documentation must be sent to the course email (sta261@utoronto.ca) within seven days of the missed term test. For more information, Please check [the university policy](#).

Once per semester, each student is allowed to miss work without any documentation. In that case you must fill out the ACORN absence declaration form. The form can be used at most ONCE per semester (once in total for all of your courses, not once per course). The absence you declare can be for a maximum of 7 consecutive days.

There is NO make-up test in this course. For missed term test with valid documentation or absence declaration, the weight will be shifted to the final exam's.

Note: You should check all your course outlines carefully because different courses may have different policies.

Missed Final Exam Policy: If a student cannot attend the final exam, then they should submit a [petition](#) for a [deferred exam](#).

Absence Declaration: The *Verification of Illness* (also known as a doctor's note) is temporarily not required. Students who are absent from academic participation for any reason (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on [ACORN](#) under the Profile and Settings menu. For updates check [University policy for absence declaration](#). Students should also advise their instructor of their absence. Instructors will not be automatically alerted when a student declares an absence. It is a student's responsibility to let instructors know that they have used the Absence Declaration so that you can

discuss any needed consideration, where appropriate. Some instructors may ask their department to confirm absences reported by students to ensure that they have been entered into the system on the dates indicated by a student.

Re-Marking Policy: The course re-mark policy exists to correct mistakes and any request should clearly identify the error (for example, a question that was not marked, or a total incorrectly calculated). Requests to correct such mistakes must be sent by email to the course coordinator. Before you request for a re-mark, please make sure you know the correct solutions posted in Quercus. To be considered for a re-mark,

- the email should include student's full name and ID number, and give a specific, clear, and concise reason for each request, referring to a possible error or omission by the marker.
- students should make such requests as soon as reasonably possible after receiving the work back, but no later than 2 weeks after it was returned.

Note that if a student requests for a re-mark, the entire term test may be re-marked so the new grade may go up, down, or remain the same.

Piazza: Piazza will be used for discussions. This is for student-led discussion. The instructor and the TAs will check Piazza posts on a regular basis and might participate in discussions. Please do not email questions about course content to the instructor/TAs. Instead, post your question on Piazza. Volume of messages increases one or two days before the test. It will not be possible for the instructor and/or the TAs to answer the questions.

Academic Integrity: Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, U of T treats cases of cheating and plagiarism very seriously. The University of Toronto's [Code of Behaviour on Academic Matters](#) outlines behaviours that constitute academic dishonesty and the process for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course, or more than once in the same course, without the permission of the instructor.
3. Making up sources or facts.

4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other [institutional resources](#).

Use of Generative AI: Students may use artificial intelligence tools, including generative AI, in this course as learning aids. However, students are ultimately accountable for the work they submit.

Plagiarism Detection: Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation [website](#). Students may wish to opt out of using the plagiarism detection tool. In order to opt out, contact your instructor by email no later than two (2) weeks after the start of classes. If you have opted out, then specific information on an alternative method to submit your assignment can be found below.

Email Policy: Email is most appropriate for personal questions. Before you send an e-mail, make sure that you are not asking for information that is already on the course outline/ website/announcements, or questions about the course material that are more appropriately discussed during office hours. If you do not get a response, this may be why. If your question is conceptual

and does not require calculations or an elaborate answer, you can ask in office hours or lecture. For all other matters, contact the course coordinator. Please email the course coordinator and TAs using your U of T email address. The subject line should contain the course number, lecture section number, and a relevant subject (indicating what the email is about). Be sure to include your full name and student number in the body of the message. You will not get a response if you email from other email addresses or do not follow the email policy.

Privacy and Use of Course Materials Notifications: Course materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation and are protected by copyright. In this course, you are permitted to download session materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor. For questions about recording and use of videos in which you appear please contact your instructor.

Accessibility Needs: The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact [Accessibility Resource Center](#) as soon as possible.

Students Responsibilities:

- It is up to students to know all course policies and important dates. It is also up to them to know about any important announcements; these will come to their inbox. Check Quercus regularly!
- Students are responsible for their own learning. The instructor/TAs are happy to help you learn, but in the end it is up to you. Use office hours and Piazza often. Keep asking questions until you are satisfied. Ask about big concepts or small details there is no such thing as a stupid question. Always take advantage of extra help and don't wait until it is too late.
- Students must follow the U of T code of Behaviour this means that cheaters will be prosecuted. The Academic Regulations of the University are outlined in the Code of Behaviour on Academic Matters. They are expected to be familiar with, and to abide by, all components of the Code of Behaviour on Academic Matters. Full details can be found [here](#).

Instructor/TAs Responsibilities:

- Lectures will be clearly presented with plenty of examples.
- Tutorials, office hours, and Piazza can help students solve problems and solidify their learning.

- Extra help, remedial and acceleration are available during office hours.
- Students' emails will be answered in a timely fashion by the course coordinator, typically within 48 weekday (business) hours.
- Every student will be treated with fairness and respect. Students who wish to excel are encouraged to consult regularly with the instructor. Students who abuse the U of T code of behavior will be dealt with appropriately.

Lecture Schedule: This schedule is tentative and subject to change. Updates will be posted on Quercus.

Weeks	Topics	Assessments
Week 1 (Jan. 08 - Jan. 12)	Introduction, Sampling Distribution & Consistency	-
Week 2 (Jan. 15 - Jan. 19)	Normal Distribution Theory	Quiz 1
Week 3 (Jan. 22 - Jan. 26)	The Likelihood Function, MLE	-
Week 4 (Jan. 29 - Feb. 02)	Inferences Based on MLE	Quiz 2
Week 5 (Feb. 05 - Feb. 09)	Large Sample Behavior of the MLE	-
Week 6 (Feb. 12 - Feb. 16)	Bayesian Inference	Quiz 3
Reading Week (Feb. 19 - 23)	-	-
Week 7 (Feb. 26 - Mar. 01)	No Lecture	Term Test
Week 8 (Mar. 04 - Mar. 08)	Optimal Unbiased Estimation	-
Week 9 (Mar. 11 - Mar. 15)	Optimal Hypothesis Testing	Quiz 4
Week 10 (Mar. 18 - Mar. 22)	Goodness of Fit Test, Model Checking, Normal Plot	-
Week 11 (Mar. 25 - Mar. 29)	Linear Regression	Quiz 5
Week 12 (Apr. 01 - Apr. 05)	Cont. Linear Regression, Review	-