



Course & Instructor Information

STA255H1 – Statistical Theory

Lecture Section	Lectures	Tutorial*
LEC0101	Mondays 10-11am in BA 1160 Wednesdays 10am-12pm in BA 1160	Mondays 11am-12pm
LEC0201	Tuesday 3-4pm in MS 2158 Thursday 3-5pm in M S2158	Tuesdays 4-5pm

* Note – Your assigned tutorial section and its location will be posted on Quercus. Tutorials start the week of January 22, 2018.

Instructor: Dr. Bethany White

Associate Professor, Teaching Stream
Department of Statistical Sciences

Instructor Contact Information & Office Hours

All course content or course administration questions must be posted to Quercus Discussions or brought to office hours. These types of inquiries will not be addressed over email. Any messages of a more personal nature (e.g., providing medical documentation for a missed assignment or midterm) should be emailed to the instructor directly through Quercus or brought to Dr. White in her office hours. You can expect a response within about 48 hours (Monday-Friday) to a Discussions posting or to an Quercus message to your instructor.

Note: To discourage cramming, content-related questions posted within the 24-hour period preceding the quizzes, midterm and final exam will not be addressed until after the midterm or final exam. No office hours will be held during these periods either.

Dr. White’s STA255 Office Hours: Mondays 11am (after class)-1pm & Thursdays 1:30-2:30pm in SS 6006 (unless otherwise indicated on Quercus – watch Announcements for notifications about any changes)

Calendar Description

This courses deals with the mathematical aspects of some of the topics discussed in STA220H1. Topics include discrete and continuous probability distributions, conditional probability, expectation, sampling distributions, estimation and testing, the linear model (Note: STA255H1 does not count as a distribution requirement course).

Prerequisite: STA220H1/STA221H1/ECO220Y1 (note: ECO220Y1 may be taken as a co-requisite), MAT133Y1(70%)/(MAT135H1,MAT136H1)/MAT137Y1/MAT157Y1

Exclusion: ECO227Y1/STA257H1/STA261H1/STA247H1/STA248H1

NOTE: The prerequisites are strictly enforced in this course. Special permission to take STA255 will NOT be granted to anyone without the required statistics and calculus courses (or equivalent transfer credits). You will be removed from the course by the department if you do not have the necessary prerequisites.

Course Learning Outcomes

In this course you will:

- model random phenomenon using a variety of discrete and continuous probability distributions,
- use probability distributions to compute probabilities and expected values,
- determine characteristics of random variables (and functions of random variables) using calculus and simulation,
- derive point and interval estimators for STA220 inference procedures and explore their properties, and
- interpret results from STA220-level statistical inference procedures and recognize potential limitations.

Textbook

Devore & Berk (2012) Modern Mathematical Statistics with Applications. 2nd Edition, Springer.

An electronic version is available free-of-charge through the University of Toronto Libraries:

<http://search.library.utoronto.ca/details?8331046&uuid=f5b471dd-de62-4a29-8cd5-e0d00d3fa639#>

Alternatively, a hard copy is available for purchase through the Bookstore.

We will also be using iClickers in lecture. There is flexibility in the grading scheme so that you do not need to use an iClicker if you do not wish to do so. If you wish to participate with iClickers and do not already have an iClicker or a iClicker Cloud subscription for another course, you can purchase either a 6-month iClicker Cloud subscription so you can participate using your own device in class (access card ISBN# 9781319140175) or, an iClicker device so you won't need your own internet-enabled device to participate.

Statistical Software - R

R is a popular open source statistical package that is widely used in both academia and industry. It is available for free download from: <http://cran.ca.r-project.org> for use on Windows, Mac OS X, and Linux (there's even a version on Android). You are **strongly encouraged** to download R so you can use it for this course. You will need to be familiar with R code and output to follow along in class and to interpret it on your STA255 quizzes/exams.

Quercus (Canvas) Course Site

We will be using a new learning management system that is similar to Blackboard (called Canvas). The University of Toronto will be moving from "Portal" to "Quercus" in Fall, 2018, and STA255 has been selected for early adoption. The two lecture sections (L0101 and L0201) will share a common Quercus course site. All questions about the course can be posted on the Discussions area of our Quercus course site and if you need to email the instructor for a more personal reason, you should use the "Conversations" tool in Quercus accessible by clicking on the Inbox icon and selecting the STA 255 "Teachers" as recipients. It is your responsibility to check this Quercus site regularly (especially the Announcements section) and to monitor your utoronto email inbox for messages about the course. Important announcements, information about how to get set up with iClickers/iClicker Cloud and R, information about assessments, textbook readings and recommended practice questions, help (via the Quercus Discussions), your grades, etc. will all be available on the Quercus site and online quizzes will need to be submitted there. Outline lecture slides will also be posted there in .pdf format, 1 slide per page only, by 11:59pm the night before lecture. Alternative file formats will not be available. **Note that complete slides/lecture material used in class will not be posted or distributed in any form under any circumstances.**

As mentioned above, the Discussion Board tool is enabled on the Quercus website. Post questions and respond to your peers' questions about course content (e.g., classes, textbook readings and practice questions, etc.) or general course administration there. It will be monitored on a regular basis. If you email your instructor with a course content or general administration question, you will be directed to the Quercus Discussions. This is an open Discussion Board and an extension of our classroom learning community so please be respectful of one another. Derogatory, discriminatory, or otherwise inappropriate language or topics will be removed and dealt with at the instructors' discretion.

Tutorials

There will be nine (9) one-hour tutorial sessions during the term (starting January 22). The purpose of these tutorials is to provide you with an opportunity to work through problems applying the material learned in class with support from your TA and your peers to deepen your understanding of the course concepts. Although there are no grades for attendance/participation in your tutorials nor tutorial quizzes/assignments, you are strongly encouraged to attend your tutorials regularly and to ask your TA questions during tutorial. **Tutorial room assignments will be posted on Quercus by January 21, 2018.**

Questions & Additional help

Have a course-related question? Need extra help with the material? Here are some options:

- **Have a question about STA255 course material, R, or general administration of the course?**
 - Review the questions already posted on the Quercus Discussions and if your question hasn't already been addressed, post it there with an informative subject line.
 - Visit the instructor's office hours or TA office hours (to be announced on Quercus) or bring your question(s) to your tutorial. **Do not email your TAs.** The TAs are not available by email or for extra help outside tutorials or any office hours they hold.
- **Need to reach the instructor about a private or personal matter (e.g., illness, grades)?** Do not post personal questions in Quercus Discussions! Do not send messages to your instructor's or TA's utoronto email either; instead, to email your instructor, click on the Inbox section of your Quercus page, click on the feather (i.e., quill) icon on the top right of the page to compose your message and select "Teachers" within STA255 as the recipients. Be sure to use an informative subject line. Your instructor will receive this message. Quercus e-mail to your instructor should only be used for emergencies or personal matters. If you email a question to the instructor about course material or course administration, then you will be asked to post your question on the Quercus Discussions – course content and general administration questions will not be answered via email.

Grading Scheme & Assessment Information

Your course grade will be automatically calculated using the grading scheme (of those below) that gives you the highest grade:

Assessment	Scheme 1	Scheme 2	Scheme 3	Scheme 4
Class Participation (iClickers)	5%	5%	0%	0%
Online quizzes (x2)	10% (5% each)	10% (5% each)	12% (6% each)	12% (6% each)
Midterm	35%	25%	36%	26%
Final Exam	50%	60%	52%	62%

No special rounding rules or individual grade adjustments (e.g. to meet GPA cut-offs, minimal requirements for programs, etc.) will be used to calculate course grades. No special reweighting of assessments or extra work will be accepted to account for perceived poor performance, nor to account for any assessment(s) that have been missed without accommodation. There are no exceptions to these policies.

iClickers/iClicker Cloud

iClickers (or iClicker Cloud) will be used to promote engagement and provide feedback on your understanding during classes as well as to provide you with credit on your lecture participation. The information below provides further details. Note that iClicker/iClicker Cloud participation is optional – alternate grading schemes are available for students who do not wish to participate this way (see Grading Schemes 3 and 4 above).

iClicker questions will be asked during lecture. The proportion of questions you answer (starting the week of January 22) will determine the fraction of the available participation grade (5%) that you earn, as shown in the table on the right. There will be around 3 clicker questions per hour of class. However, some classes will have more or fewer questions. Clicker participation only requires that you try; you do not have to get the questions correct to earn this part of your course grade. Notice that you can miss up to 25% of the clicker questions for any reason without affecting your grade. Due to this flexibility, there is no accommodation for missed clicker participation for any reason (e.g., legitimately missed lectures, technical problems, incorrectly registered iClicker/iClicker Cloud).

% Questions answered	Class Participation Mark (/6%)
$0 \leq \% \text{ answered} < 5$	0%
$5 \leq \% \text{ answered} < 25$	1%
$25 \leq \% \text{ answered} < 45$	2%
$45 \leq \% \text{ answered} < 60$	3%
$60 \leq \% \text{ answered} < 75$	4%
$75 \leq \% \text{ answered} \leq 100$	5%

It is your responsibility to register your iClicker device (information will be posted on Quercus) or set up your iClicker Cloud account correctly (information will be posted on Quercus) to ensure that your clicker participation is recorded properly. Use of an iClicker device or iClicker account associated with a UTORid other than your own or granting permission for someone else to submit answers on your behalf in your absence are academic offences and will be dealt with as such.

Online Quizzes

There will be two (2) equally-weighted open-book online quizzes to be completed **independently** (no collaboration permitted – and absolutely no sharing and/or posting of questions and/or answers is permitted) and submitted through Quercus during their availability periods (**Quiz #1 – Fri, Feb 2, and Quiz #2 – Fri, Mar 23**). These quizzes will be available from 12:00am to 11:59PM on their availability dates; once you start the quiz, you will have exactly 60 minutes to complete and submit your answers. There are no extensions on the availability periods under any circumstances. *Refer to the “Missed Quizzes and Midterm” section below for information on how to request accommodation for a missed quiz and what accommodation may be possible.*

Midterm

There will be a **75-minute** midterm during class time the week before Reading Week:

- **10:30am-11:45pm, Wednesday, Feb 28 for section LEC0101, and**
- **3:30pm-4:45pm, Thursday, Mar 1 for section LEC0201.**

The location and information on coverage will be posted on Quercus in advance. You must bring your student identification to the midterm. **You must attend the midterm for the lecture section in which you are officially enrolled – you will not receive credit for the midterm if you write with the other section.**

Refer to the “Missed Quizzes and Midterm” section below for information on how to request accommodation for a missed midterm and what accommodation may be possible.

Final exam

There will be a **3-hour exam (mix of multiple-choice and written answers)** scheduled but the Faculty of Arts and Science during the April exam period. You must bring your student identification to the final exam. Information on coverage, along with some sample questions will be posted on Quercus in advance.

Final exam conflicts (see <http://www.artsci.utoronto.ca/current/exams/conflicts>) and petitions for a deferred exam must be brought to the Faculty of Arts and Science, not your instructor.

Information on how to request a deferred exam due to illness or another valid reason is available at: <http://www.artsci.utoronto.ca/current/petitions/common#deferred>

Calculators

A non-programmable calculator may be useful for the midterm and/or final exam. Any basic calculator will be sufficient (no special functions are necessary). Calculators on phones or other devices equipped to communicate with the outside world (for example, through the internet or cellular or satellite phone networks) will not be permitted during the midterm and final exam.

Marking concerns with Quizzes or the Midterm

Any requests to have a quiz or midterm question regraded must be made in writing directly to your instructor through Quercus (email STA 255 “Teachers” through the Inbox in Quercus) **within one week** of the date the marks were posted on Quercus. To be considered, your message must clearly identify the question you have concerns about, contain a detailed justification for your concern and make specific references to your answer and to the relevant course material. Keep in mind that it is possible for your assignment grade to go down if the regraded mark is lower than your original assignment grade.

Accommodations for Missed Quizzes or Midterm

- If a quiz or your midterm is missed for a valid medical reason, you must email your instructor through Quercus (i.e., email STA 255 “Teachers” in Inbox) immediately, then submit the University of Toronto Verification of Student Illness or Injury form (<http://www.illnessverification.utoronto.ca>) to your instructor through Quercus (i.e., email STA 255 “Teachers” in Inbox) within **one week** of the quiz or midterm. The form will only be accepted as valid if the form is filled out according to the instructions on the form. **The form must indicate that the degree of incapacitation on academic functioning is moderate, serious, or severe in order to be considered a valid medical reason for missing the midterm (and for quizzes, it must cover their entire availability period). If the form indicates that the degree of incapacitation on academic functioning is negligible or mild or does not cover the midterm date or quiz availability period, then this will NOT be considered a valid medical reason.**
- Other reasons for missing a midterm or quiz will require prior approval by your instructor. If approval is not granted in advance for non-medical reasons, then you will receive a grade of 0% for the missed midterm or quiz.
- Note: If you submit an quiz or write the midterm, it will be assumed that you deemed yourself fit enough to do so and your grade will stand as calculated. No accommodation will be made based on claims of medical, physical, or emotional distress after the fact.
- **Accommodation for missed quizzes** - There are no make-ups for quizzes. If accommodation is granted by the instructor for a missed quiz, the weighting for that quiz will be shifted to your final exam; otherwise 0% will be recorded for your missed quiz.
- **Accommodation for a missed midterm** – There is no full midterm make-up. However, if accommodation is granted by the instructor for a missed midterm, then you will be eligible to write an online makeup test. If you are eligible to write it, your instructor will schedule the time and date of the makeup test. The online makeup test will then be worth 10% of your course grade and your final exam will be worth 75%, or 78% of your course grade (depending on which grading scheme maximizes your STA 255 grade). If you miss the online makeup test for a valid reason and request accommodation for that as well, then the full weighting for your missed midterm will be shifted to the final exam. If you miss the online makeup test and

accommodation for it is not granted by your instructor within a week of the missed online makeup test, 0% will be recorded for your missed online makeup test and your remaining midterm weight (i.e., 15%, 25%, 16% or 26%, depending on the grading scheme) will be shifted to your final exam.

Academic integrity

You are responsible for knowing the content of the University of Toronto's Code of Behaviour on Academic Matters at <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>.

Academic offenses will be taken very seriously and dealt with accordingly. For all of the assessments in this course, submitting another person's answer(s) as your own (whether or not they are connected to this course), or providing your own answer(s) to another student for him/her to submit as his/her own is considered as an academic offense and will be reported as such. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact the instructor.

Intellectual Property Statement

Course material (i.e. lecture slides, quiz and midterm questions/solutions and any other supplementary course material available on Quercus) is the intellectual property of your instructor and is made available to you for your personal use in this course. **Sharing, posting, selling or using this material outside of your personal use in this course is not permitted under any circumstances and is considered an infringement of intellectual property rights.**

No videotaping of lectures will be permitted under any circumstances. If you would like to make an audio recording of the lectures in this course, you **MUST** ask permission from your instructor **in advance**. According to intellectual property laws, not asking permission constitutes stealing.

Accessibility Needs

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodation, please feel free to contact Accessibility Services at (416) 978 8060; <http://accessibility.utoronto.ca>

How to Succeed in this Course

- Read this course syllabus in its entirety and understand the course policies.
- Attend and participate in class regularly and take notes (obtain notes from a classmate for any missed classes).
- Attend and participate in tutorials regularly and work through the tutorial problems carefully for any missed tutorials.
- Regularly review class notes and read the textbook.
- If you find that you are having trouble with prerequisite statistics and calculus concepts, review your notes from those courses - this material is assumed to be known so will not be taught again in this course.
- Practice, practice, practice! Work through at least some of the recommended textbook exercises each week to make sure you understand the basic concepts. You need to study and do practice problems frequently (not just in the week before the quizzes/midterm/exam) to keep up in the course.
- Take advantage of the help available & ask questions (lectures, tutorial, office hours, Quercus Discussions).

Course Schedule

This is our tentative schedule for course topics. Some adjustments may be made as the course progresses, depending on the rate at which individual topics are covered. There will be recommended textbook problems posted on Quercus.

Week	Tentative Textbook Coverage (see Quercus for an up-to-date weekly breakdown and the sections covered in each Chapter)	IMPORTANT REMINDERS
<i>Week 0 - Jan 1-7 (partial week)</i>	<i>N/A</i>	<i>No class for L0301 on Thursday, Jan 4</i>
Week 1 - Jan 8-14	Chapter 1: Overview & Descriptive Statistics Chapter 2: Probability	<i>No tutorials</i>
Week 2 - Jan 15-21	Chapter 2: Probability (continued)	<i>No tutorials</i>
Week 3 - Jan 22-28	Chapter 3: Discrete RVs & Probability	Tutorial
Week 4 - Jan 29 – Feb 4	Chapter 3: Discrete RVs & Probability (continued) Chapter 4: Continuous RVs & Probability	Tutorial Online Quiz #1 – Fri, Feb 2 (open 24 hours)
Week 5 - Feb 5-11	Chapter 4: Continuous RVs & Probability (continued)	Tutorial
Week 6 - Feb 12-18	Chapter 5: Joint Probability Distributions	Tutorial
<i>Week 7 - Feb 19-25</i>	<i>N/A</i>	<i>READING WEEK – no classes/tutorials/office hours</i>
Week 8 - Feb 26-Mar 4	Chapter 5: Joint Probability Distributions (continued) Chapter 6: Statistics & Sampling Distributions	Tutorial Midterm L0101 - 10:30am-11:45pm, Wed, Feb 28 Midterm L0201 - 3:30pm-4:45pm, Thurs, Mar 1
Week 9 - Mar 5-11	Chapter 6: Statistics & Sampling Distributions (continued) Chapter 7: Point Estimation	Tutorial
Week 10 -Mar 12-18	Chapter 7: Point Estimation (continued)	Tutorial
Week 11 – Mar 19-25	Chapter 8: Statistical Intervals Based on a Single Sample Chapter 9: Tests of Hypotheses based on a Single Sample	Tutorial Online Quiz #2 – Friday, Mar 23 (open 24 hours)
Week 12 - Mar 26-Apr 1	Chapter 9: Tests of Hypotheses based on a Single Sample (continued) Chapter 12: Regression and Correlation	Tutorial
Week 13 - Apr 2-8 (partial week – classes end Apr 4)	Chapter 12: Regression and Correlation (continued) & Review	<i>No tutorials</i> <i>No class/tutorial for L0101 on Monday, Apr 2</i> <i>No make-up Monday on Apr 5</i>
Exam Period		Final Exam to be scheduled by the Faculty of Arts and Science

