

**STA221H1S: The Practice of Statistics II - Winter 2018**  
**Department of Statistical Sciences - University of Toronto**

**Lectures:** Mondays 3:10pm – 5pm and Wednesdays 3:10pm – 4pm in SF1105

**Instructor:** Asal Aslemand

**Office Hours:** Mondays and Wednesdays 1:00pm – 2:30pm in SS (TBA)

**E-mail Address:** asal.aslemand@mail.utoronto.ca

**Note:** Please use your U of T email address when sending me an e-mail

**Tutorial Times:** Wednesdays (Starting January 17<sup>th</sup>) 4:10pm – 5pm

**Tutorial Information, Teaching Assistants' Office Hours & Location:** Please See Page 6 (TBA).

**Welcome to STA221.**

**Course Description:**

This course is a continuation of an introductory course in statistics. In the first week of the course, we will review some basic statistical concepts that we need to build on their ideas throughout the term. We will cover statistical methodologies that enables us describe relationships between two categorical variables (chi-square test of independence), two quantitative variables (simple linear regression), and a quantitative variable and a categorical variable with more than two classifications (multiple regression). We will also cover the concept of Analysis of Variance (ANOVA) and its application in designed experiments: Completely Randomized Design, Randomized Block Design, and Factorial Experiments. Additionally, we will introduce nonparametric statistical procedures.

The emphasis in this course will be on the application of statistical methods to real data. You will learn how to read and interpret statistical information, explore and analyze data using appropriate statistical methodologies, and check the validity of conclusions drawn from statistical analyses.

**Course Text Book:**

McClave, J., & Sincich, T. (2017). Statistics (13<sup>th</sup> Edition). Pearson, Inc.

**Statistical Software:**

We will use R Studio (its free version) for performing basic statistical analysis.



- ❖ You need to first download R (a free statistical package) from: <https://www.r-project.org/>
- ❖ Then, download R Studio (its free version) from: <https://www.rstudio.com/>
- ❖ I will provide you with video instructions regarding how to download R on your computer and any course activity that you need to use R to complete it. The instructions will be posted on portal.

**Calculator:**

You will need a very basic (non-programmable) calculator for this course (for quizzes, test, and exam). One that allows you to add, subtract, multiply, divide, and take a square root. **Note:** Phone calculators or any other communicating devices are **NOT** allowed during quizzes, midterm test, and final exam.



## Course Components:

- **Lectures:**

Three hours a week class times will be used to cover important course materials and will guide you through statistical examples to develop your statistical literacy, reasoning and thinking. Every week we will build on the materials that we discussed in the previous week. This means that statistical ideas are logically connected. I highly recommend that you attend the lectures regularly.

- **Weekly Tutorials (Preparations and Quizzes):**

Tutorials start on Wednesday, January 17<sup>th</sup>. There are 11 tutorials scheduled in the course. On a weekly basis I will post – in “Tutorial Preparation” content folder – information regarding your upcoming tutorial preparation. These include a set of practice problems, which are related to previous week’s lecture contents. Some of the assigned problems require that you use R to analyze a set of data. You need to bring the printouts of your statistical analyses, which we refer to these as R outputs, to your tutorial. I will provide you with the necessary instructions – both in text and video formats – that you need for completing the weekly R activities.

In the weekly tutorial preparation folder, you will also be guided to bring a written reflection of a statistical activity. This might be either an activity from the practice problem that you used R to analyze a particular data or it might be specific component-reflections based on Read and Reflect task (see below for Read and Reflect component-information). The weekly written reflections are short (no longer than one-page). The purpose of this is to provide you with the opportunity to discuss your weekly tasks with your peers and practice your *statistical-talks* - communication skills.

Specifically, the structure of your weekly tutorial is as follow:

- In the first 10 minutes, in small-groups (with three to four students), you will read your written reflection to your peers. Your TA will help facilitate these statistical-talks. Your TA will also help facilitate discussion regarding the weekly assigned practice problems. It is recommended that you think about the practice problems prior to your tutorials so that you can ask specific questions or discuss main ideas regarding the assigned statistical activities.
- In the last 15 minutes, there will be a short quiz given based on the previous week’s assigned practice problems and the R activities. Quizzes are open book; You can use your lecture notes, your tutorial notes, and the course textbook. You will be asked to refer to your R outputs, circle numbers (statistical information) and hand in your outputs with your quiz to your TA. Please note that you can only refer to your own notes and R outputs (not your classmate’s notes).

- **Read & Reflect on a Research Paper:**

You can work individually or with other students (maximum of four students) preferably from your tutorial. Your task is to select a research paper that includes a quantitative method section. You will read and reflect on your selected paper’s data collection, representation, analysis, and interpretation. A guideline about how to reflect on your paper is provided in a separate document and is uploaded in the “Read & Reflect” folder on our Portal page for the course. Once you refer to that document, you will learn that there are seven components to consider for this task. These components are divided into three due dates (Refer to course assessment section regarding these due dates). Each reflection will be submitted in a written format (one page is the required length). Your reflections should be short, clear, and concise (a paragraph for each component-reflection is sufficient).



- **Midterm Test and Final Exam:**

A midterm test (duration: 1 hour and 45 minutes) is scheduled during our class time, which is based on topics that we cover from weeks 2 to 6 in the course. A final exam (duration: 3 hours) will be scheduled during the exam period, which covers the entire course (weeks 2 to 12). The test and final exam are closed book; You are allowed “cheat sheet(s)”: **one** for the midterm test, and **two** for the final exam, but no other books/notes. The cheat sheet(s) must be handwritten by you and you may use both sides of the sheet(s). You need to have a calculator for the test and the final exam.

**Course Assessments:**

Type	Number of Occurrence	Due Dates	Weight
Quizzes	11 (best 10 of 11 are counted)	Weekly (Starting Jan 17 <sup>th</sup> )	10%
Read & Reflect	3	1. Components 1 & 2 are due in Tutorials: Wednesday, January 24 <sup>th</sup>	2%
		2. Components 3, 4, & 5 are due in Tutorials: Wednesday, Feb 7 <sup>th</sup>	3%
		3. Components 6 & 7 are due in Tutorials: Wednesday, March 28 <sup>th</sup>	5%
Midterm Test	1	Monday, March 5 <sup>th</sup> (in class)	30%
Final Exam	1	TBA (Scheduled During Examination Period)	40%
<b>Total</b>			<b>100%</b>

**Missed Tutorials and/or Midterm Test:**

- There are no makeup quizzes or makeup test.
- If you miss a quiz, it will become your lowest quiz mark (mark of zero), but it will be the one you drop.
- If you miss more than one quiz or if you miss the midterm test with a valid reason in order to be excused you must submit to me (Asal) an appropriate documentation (e.g., U of T medical certificate) within one calendar week of the missed tutorial and/or missed midterm test.
- U of T medical certificate can be retrieved from this link:  
[http://www.illnessverification.utoronto.ca/document/Verification%20of%20Student%20Illness%20\(VOI\)%20-%20Oct%2027%202016.pdf](http://www.illnessverification.utoronto.ca/document/Verification%20of%20Student%20Illness%20(VOI)%20-%20Oct%2027%202016.pdf) Please, print on it your name, student number, course number, and the date.
- If the midterm test is missed for a valid reason, its weight will be shifted to the final exam. In that case, your final exam will account for 70% of your total course grade.
- If a tutorial is missed for a valid reason, I will still drop your lowest quiz mark (among remaining quizzes) and will calculate your quiz average accordingly.
- If you miss (with a valid excuse) a tutorial that had Read and Reflect components due in it, please notify me as soon as possible so that I can grant you extension to complete your work during the term.
- Note that I will put the **code: “-1”** for an excused missed assessment (e.g., quiz, midterm test) in your Grade Centre (Portal). This code means that at the end of the term, I will not take that missed grade into your course grade calculation.

**Midterm Test Remark Policy:**

Requests for test remaking must be submitted to me (Asal) at the time that the test is returned back to you and no later than two weeks after the test return. The request must contain a justification and will only be considered for test which was written in ink.

**Tentative Weekly Lecture Coverage:**

Week	Chapter Content	Chapter
1	Introduction to the Course Data; Statistics Fundamental Elements of Statistics Types of Data Collection The Role of Statistics in Critical Thinking & Ethics Introduction to R and R Studio Statistical Analysis with R Studio	Review
2	<i>13.1 Categorical Data and the Multinomial Experiment</i> <i>13.2 Testing Categorical Probabilities: One-way Table</i> <i>13.3 Testing Categorical Probabilities: Two-way (Contingency) Tables</i> <i>13.4 A Word of Caution about Chi-Square Tests</i>	Ch. 13. Categorical Data Analysis
3	11.1 Probabilistic Models 11.2 Fitting the Model: The Least Squares Approach 11.3 Model Assumptions 11.4 Assessing the Utility of the Models: Making Inferences about the Slope $\beta_1$ <i>Read and Reflect Components 1 &amp; 2 Due in Tutorials: Wed, Jan 24<sup>th</sup></i>	Ch. 11. Simple Linear Regression (SLR)
4	11.5 The Coefficients of Correlation ( $r$ ) and Determination ( $R^2$ ) 11.6 Using the Model for Estimation and Prediction 11.7 A Complete Example (of Simple Linear Regression); Introduction to Analysis of Variance (ANOVA)	Ch. 11. Simple Linear Regression
5	12.1 Multiple Regression Models 12.2 Estimating and Making Inference about $\beta$ Parameters 12.3 Evaluating Overall Model Utility 12.4 Using the Model for Estimation and Prediction <i>Read and Reflect Components 3, 4 &amp; 5 Due in Tutorials: Wed, Feb 7<sup>th</sup></i>	Ch. 12. Multiple Regression & Model Building
6	12.5 Interaction Models 12.6 Quadratic and Other Higher Order Models 12.7 Qualitative (Dummy) Variable Models	Ch. 12. Multiple Regression & Model Building
<b>Reading Week: Feb 19<sup>th</sup> - Feb 23<sup>rd</sup></b>		



Week	Chapter Content	Chapter
7	12.8 Models with Both Quantitative and Qualitative Variables 12.9 Comparing Nested Models	Ch. 12. Multiple Regression
8	<i>Midterm Test: Monday, March 5th (Based on Weeks 2 to 6 Contents)</i> 12.10 Stepwise Regression 12.11 Residual Analysis: Checking the Regression Assumptions 12.12 Some Pitfalls: Estimability, Multicollinearity, Extrapolation	Ch. 12. Multiple Regression & Model Building
9	10.1 Elements of a Designed Experiment 10.2 The Completely Randomized Design: Single Factor 10.3 Multiple Comparison of Means Appendix B1. & Appendix B5.	Ch. 10. Analysis of Variance: Comparing More than Two Means
10	10.4 The Randomized Block Design Appendix B2.	Ch. 10. Analysis of Variance
11	10.5 Factorial Experiment Appendix B3. <i>Read and Reflect Components 6 &amp; 7 Due in Tutorials: Wed, March 28<sup>th</sup></i>	Ch. 10. Analysis of Variance
12	14.1 Introduction: Distribution-Free Tests 14.2 Single-Population Inferences 14.3 Comparing Two Populations: Independent Samples 14.4 Comparing Two Populations: Paired Difference Experiment 14.5 Comparing Three or More Populations: Completely Randomized Design 14.6 Comparing Three or More Populations: Randomized Block Design 14.7 Rank Correlation	Ch.14. (Online) Nonparametric Statistics

### Stats Aid Centre (SS623) – Teaching Assistants’ Office Hours:

The Teaching Assistants for our course will hold weekly office hours in room SS623, which is located in Sidney Smith Basement, level “G”. I highly recommend that you visit any our course TA or me (Asal in: TBA) on a regular basis regarding weekly assignments and course concepts.

- Please note that all tutorial times are scheduled on Wednesdays at 4:10pm – 5pm.
- Tutorials start on Wednesday, January 17<sup>th</sup>.
- There are three tutorial sections in this course.
- Students are assigned to a tutorial section by their last names alphabetically.

Tutorial Room	Student Last name Beginning with letter(s)	Teaching Assistant (TA)	TA Office Hours in SS623
GB220	A - G		
BA1200	H – Shi		
BA1220	Si – Z		

### Accessibility Centre:

Students with diverse learning styles and needs are welcome in this course. If you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible at [accessibility.services@utoronto.ca](mailto:accessibility.services@utoronto.ca) or visit <http://www.accessibility.utoronto.ca> I will work with you and U of T Accessibility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential.

### Academic Integrity Statement:

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, the University treats cases of cheating and plagiarism very seriously. The University of Toronto’s Code of Behaviour on Academic Matters outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Please refer to the following U of T sites related to:

Code of Behaviour on Academic Matters: <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>

Academic Integrity: <http://academicintegrity.utoronto.ca/>

### Final Note:

I appreciate your *effort* and *willingness to work hard* on statistical concepts that we will cover in this course. Try to stay on tasks and attend all lectures, tutorials, and visit office hours. Research has shown that motivation to achieve is determined by extent in which one *values* the reward of *succeeding at a task* (e.g., learning statistics will better enable me understand research in my field of study), and having a *growth mind set* [believing that by working hard on doing a task (e.g., statistical problems) abilities (e.g., ability to doing statistics) can be developed]. Thus, the best learning strategy in this or any course is to work regularly throughout the term. Also, keep in mind that learning quantitative methods is not just about doing maths and calculations, however, it is about understanding concepts. Make sure that you know why you are doing a statistical calculation and what the results will tell you; when in doubt seek help from me (Asal) or your Teaching Assistants. I wish you all the best in this course.