STAT 300 - Intermediate Statistics for Applications

Winter Term 2 (January - April 2021)

Aims and objectives: The course aims to be a second course in statistical science, reinforcing and extending ideas encountered in a typical first course in the discipline. The course will expose learners to a wide range of applied statistical methodology, complementing concepts appearing in their first course. Detailed learning objectives for the course will be available on-line on Canvas course page.

Prerequisites: Pre-requisites: One of STAT200, STAT203, STAT241, STAT251, BIOL300, COMM291, ECON325, ECON327, FRST231, POLI380, PSYC218, PSYC278, PSYC366, or equivalent

Teaching style: This course is delivered with a flipped-classroom approach, where little time is devoted to seminar-style lectures. Instead, students learn by directly engaging with the material, for example through in-class group activities. See below for more detail.

Instructor: Dr. W. A. Lasantha Premarathna (Email: wpremara@stat.ubc.ca). Please use the email only for personal matters that you would want to discuss with the instructor. Please use **office hours** and **Piazza Discussion Board** for questions regarding assignment problems/text book problems/labs class note examples etc.

Class Room: Classes moved to online
Scheduled class time: 3:00pm-3:50pm (Monday, Wednesday and Friday)
(time indicated in this syllabus is in Vancouver time. If you are in a different time zone, please adjust accordingly)

Instructor Office Hours: online office hours (Zoom links are found through the zoom tab)

- 10:00am - 11:00am on Monday
- I will also be available for some time after the lectures on MWF

Head TA: Harper Xiaolan Cheng (harper.cheng@stat.ubc.ca)

Teaching assistants & TA office hours: To be announced, please check the Canvas course page.

Course Website: **canvas.ubc.ca**
Please check the **Canvas** website regularly to keep up-to-date with the course. Everything you need will be available through Canvas and you should get familiar with all the tabs as soon as possible.
If you have any problems related to technical issues, please use **?Help** (see the left side menu in the Canvas course page) to report the problem or to contact IT service.

COVID: Due to the COVID-19 pandemic the lectures and labs will be taking place online via zoom. The class will be synchronous with iClicker questions, but will be recorded for those that may not be able to attend. COVID is challenging for all of us, and some students are in different time zones. As such, we have designed different marking schemes that take into accounts that some students may not be able to attend some parts of the class. At the end of the term, the grade for each student will be calculated with the three schemes, and the best grade will be given to the student.

Course Assessment: Note: while we will use the scheme that provides each student with the best grade, we can only show one scheme on Canvas. The scheme displayed on canvas is scheme 1.

Assessment	**Date**	**Percentage**		
		Scheme 1	**Scheme 2**	**Scheme 3**
Class question (iClicker Cloud)		6%	3%	0%
WeBWork (x10)	See the schedule	13%	15%	16%
Labs (x10)	See the schedule	10%	10%	10%
Written Assignments (x2)	See the schedule	12%	14%	15%
Midterm	Friday, March 12 (During the class time)	24%	18%	14%
Final Exam (must to pass the final exam to pass the course)	Online exam To be scheduled by Classroom Services. Exam schedule is released about 3 weeks before exams **Exam period:** April 18-29	35%	40%	45%

Bonus points**:** There will be opportunities for bonus points, e.g., points will be given to the top 10 students that provide the best answers on Piazza.

Policy regarding missing the midterm:
1. There will be no make-up exam
2. Students who miss an exam should notify the instructor prior to (if possible) or immediately after the exam. Students must supply a supporting document (for example, a doctor's note will be sufficient in case of a medical emergency) within one week of the day of exam.

Deferred Exam Policy if you miss the Final Exam:
The policy (UBC policy) is that students who miss the final exam MUST report to their faculty advising office within 72 hours to apply for deferred standing. They must also notify the instructor to receive instructions as to when they will write their deferred final. But they will not be granted a deferred final unless they are granted deferred standing by their faculty advising office.

iClicker cloud: We will be using iClicker Cloud in lectures. iClicker Cloud is a response system that allows you to use your own computer or mobile device to respond to questions posed by instructors during class, and you will be graded on your participation and performance. You need to set up an iClicker Cloudaccount and add STAT 300 as a course to this account. To do so, please follow https://lthub.ubc.ca/guides/iclicker-cloud-student-guide for details. For us to be able to assign you your participation grade, you must link your iClicker account to Canvas. To do so, click the iClicker sync button on Canvas and follow the instructions. We know COVID may cause many students to miss class due to illness, family issues, personal reasons, and internet connection problems. As such, we will exclude 8 iclicker sessions from your final grade. These will either be 8 missed classes or the 8 classes with your lowest grades. Also note that one of the grading schemes does not include iClicker grades to accommodate, as much as possible, students in other time zones. You do not need to contact the instructor if you miss class, these concessions will be made by default. Lectures will be recorded and available through the zoom→Cloud Recordings tab on Canvas.

Piazza Discussion Board:
You can use "Piazza Discussion Board" to post your questions. This is where you can discuss ideas, strategies, and resources for solving the problems with your classmates. Please DO NOT POST ANSWERS to the questions in the WeBWork assignments/written assignments and Labs before the due date. Instead, share your thoughts and approaches to solving the problems. Asking others how to solve a problem without first trying to solve it yourself will not be beneficial for your learning. TAs will not give the solution for assignments questions before the due date. But they will surely give hints as needed and let you know the correct directions. If you need more clarification, its always better to contact TAs or me during our office hours. Don't expect TAs will answer all your questions posted in Piazza page. We are holding lots of online office hours. I highly encourage you to use online office hours. TAs are available on Zoom. Please go to "General Information: Labs" under "Labs" or "TA Office Hours (online)" to see when TAs are available during each day from Monday to Friday. If you have any problems or feedback for the developers, email team@piazza.com.
The 10 students that have answered the most statistics-related questions in a way that explains concepts well but does not reveal the answer to an assignment, lab, or WEBWork question will get a bonus 1% added to their grade.

Access Piazza: Please go to **"Piazza"** in the left menu in the Canvas course page and it will open in a new window. Then you can sign up for the class page.

WeBWork:
I will let you know when it is available to you all. WeBWorks start the second week of class. I will post canvas announcements when WeBWorks assignments are posted.

Access WeBWork: Please go to **"WeBWork"** in the left menu in the Canvas course page.

Labs: Lab assignments start the second week of class. Lab materials will be posted on Canvas course page and you need to submit individual lab handout to Crowdmark. You will have at least 5 days to submit your solutions to Crowdmark. Please read more information about lab under "Labs" in Canvas course page.

Crowdmark: Crowdmark is an online grading and analytics application. You need to submit (upload) your answers to assignments/labs in Crowdmark. Graded assignments will also be available one week after the due date. I will provide Crowdmark link when assignments are posted. You also will receive an email when a Crowdmark assignment available. If you cannot see STAT 251 course in Crowdmark, you are probably using the wrong email address. Then try with your other emails. The correct email will show you the STAT 300 course. If you still have problems, please contact lt.hub@ubc.ca . Do not use multiple email addresses to access Crowdmark. If you use multiple emails, your grade will not be correctly sync with the Canvas grade book. **Access Crowdmark:** you can see where to upload your assignment when they are ready. You will be able to access Crowdmark only when the first assignment (lab or written assignment) is available there.

Teaching methods: This class uses a flipped-classroom approach, where students engage with course material before class and participate in activities during class time. Classes of approximately fifty minutes of duration will occur three times a week, with sets of notes being available from Canvas in advance. In all sessions, an in-class activity will replace at least part of the lecture component. Guided reading or other activities may be set at the end of one lecture to be completed prior to the next. On-line pencasts are available covering some of the course material. There will be required lab sessions most weeks. Canvas will include detailed material covering the course content, plus other sundry resources like solutions to exercises when appropriate and an on-line forum. A calculator will be necessary for many of the activities, so please bring one to class. The current education literature suggests that the flipped classroom model can increase student performance in tests, quizzes, and homework, as well as improve students' understanding and retention of new material. To learn more about the flipped classroom model, go to: http://flexible.learning.ubc.ca/research-evidence/research-articles-2/flipped-classroom

Programme of work: The study time should total around eight hours per week. So in addition to the contact hours, it is essential that learners spend no less than four hours per week on self-study for the course. It is suggested at least two hours per week are spent on revising and assimilating

the material covered in the lectures or on guided reading, and at least two hours should be spent attempting the exercises and assignments that are set.

Recommended texts: There is no core text, but there are numerous books that cover at least some of the material in this course, and it is suggested you try the UBC library stock to find those that suit you. There are few books that aspire to support a second course in Statistics. A good one though is

- Ramsey, F.L. and Schafer, D.W. (2013): The Statistical Sleuth: A Course in Methods of Data Analysis (3rd edition). Brookes/Cole.

It is likely that the textbook used for a pre-requisite course will cover some of the material in this course. In particular, later chapters of

- Moore, D.S. and McCabe, G.P. (2012): An Introduction to the Practice of Statistics. (7th edition).Freeman.

include content relevant to this course. Similarly other introductory texts are useful in containing parts of the content of the course, such as

- Walpole, R.E, Myers, R.M., Myers, S.L. and Ye, K. (2007): Probability and Statistics for Engineers and Scientists. Pearson/Prentice Hall.
- Whitlock, M. and Schluter, D. (2008): The Analysis of Biological Data. Roberts and Company.

There are useful books available electronically via the library. These include the following which provide details for implementing methods used using the statistical software package R:

- Ekstrom, C. T. (2012): The R Primer. Chapman and Hall/CRC
- Hay-Jahans, C. (2012): An R Companion to Linear Statistical Models. Chapman and Hall/CRC
- Hothorn, T. and Everitt, B.S. (2010): A Handbook of Statistical Analyses Using R. (2nd edition) Chapman and Hall/CRC

Searching for additional readings: Many of the activities, assignments, etc are based on studies published in scientific articles. These articles will be referenced in the activity and you can find them on-line using the title of the article or the last names of the authors as keywords. If you are on campus, you can find these either by using Google scholar (scholar.google.ca) or through the UBC library search engine (www.library.ubc.ca). If you are off-campus, it might be easier to use the UBC library search engine. But if you want to use Google scholar, you can use UBC library EZ-proxy tools available at services.library.ubc.ca/electronic-access/connect/ezproxy-toolkit.

Lecture Schedule: Below is a provisional guide to the lecture slots available. It is possible the material covered in the classes will differ slightly from the description below.

1. Introduction, motivation, review of fundamental ideas
2. Review of fundamental ideas
3. Nonparametric methods: The sign test.
4. The rank sum test.
5. The Kruskal-Wallis test.
6. Permutation tests.
7. The power of hypothesis tests.
8. The Chi-squared test of goodness-of-fit.
9. Goodness-of-fit for contingency tables.
10. Investigating the fit of a model.
11. Fisher's exact test.
12. Probability plots for model fitting: Normal scores plots
13. Introduction to the bootstrap
14. Bootstrap testing and interval estimation
15. Experimental design review: response variables, factors, blocking.
16. ANOVA: Review of concepts.
17. Analysing variance by breakdown of sums of squares.
18. Multiple comparisons
19. Interaction in two-way ANOVA
20. Inference in two-way ANOVA
21. Contrasts
22. Selected alternative designs: nested, factorial and fractional design
23. Review
24. Midterm test
25. Review of regression concepts
26. Sums of squares in regression
27. Properties of estimators in regression
28. Multiple linear regression
29. Curve fitting via regression
30. Residuals in regression
31. Dummy variables in regression
32. Odds ratios for 2x2 tables
33. Introduction to logistic regression
34. Introduction to time series: descriptive methods
35. Smoothing time series
36. Review

Academic Integrity: Class Policies on Exams and Assignments
Exams:

- The exams are open book (details will be provided later).
- Students are not permitted to communicate with any individuals for assistance either in person, online, via telephone, social media, or any other mode of communication during exams. And also questions, part questions, or attempted solutions must not be shared by any student. Failure to comply with these rules will result in an automatic 0 for this exam, and additional serious academic penalties.

Assignments/Canvas quizzes/WeBWork/Labs:

- Discussion of ideas leaned in class is encourage (with other students, TAs or the instructor). This helps the leaning process. But individual work turned in by each student should be your own work. Do not copy or paraphrase solutions from other students or from other sources. Do Not provide your solutions to another student. Failure to comply with these rules will result in an automatic 0 for your work, and additional academic penalties.

Academic Honesty and Standards:

http://www.calendar.ubc.ca/Vancouver/index.cfm?tree=3,54,111,958

Academic Misconduct:

http://www.calendar.ubc.ca/Vancouver/index.cfm?tree=3,54,111,959

Disciplinary Measures:

http://www.calendar.ubc.ca/Vancouver/index.cfm?tree=3,54,111,960

Statement regarding online learning for international students
The Provost's office has developed the following statement pertaining to the potential restrictions to international students' online learning experiences as a result of remote learning:

During this pandemic, the shift to online learning has greatly altered teaching and studying at UBC, including changes to health and safety considerations. Keep in mind that some UBC courses might cover topics that are censored or considered illegal by non-Canadian governments. This may include, but is not limited to, human rights, representative government, defamation, obscenity, gender or sexuality, and historical or current geopolitical controversies. If you are a student living abroad, you will be subject to the laws of your local jurisdiction, and your local authorities might limit your access to course material or take punitive action against you. UBC is strongly committed to academic freedom, but has no control over foreign authorities (please visit http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,33,86,0 for an articulation of the values of the University conveyed in the Senate Statement on Academic Freedom). Thus, we recognize that students will have legitimate reason to exercise caution in studying certain subjects. If you have concerns regarding your personal situation, consider postponing taking a course with manifest risks, until you are back on campus or reach out to your academic advisor to find substitute courses. For further information and support, please visit: http://academic.ubc.ca/support-resources/freedom-expression

Note:

- Please check the Canvas course page regularly.
- No late submission (WeBWork/Written Assignments/Labs/Exams/Canvas Quizzes) will be accepted.
- You are allowed to discuss lab assignment/WeBWork/ Written Assignment questions with other students via Piazza discussion board. But DO NOT post answers in the Piazza page.
- Grades change request forms (for midterm and assignments) should be submitted within one weeks after grade released/post solution on canvas page. Remarking request should only be raised when you are sure that the markers have made a mistake in marking your paper when you compare your paper with marking scheme. Remarking is not meant to give students a way to ask for more marks
- I will not be able to answer your questions about assignment problems/text book problems/ class note examples etc. by emails as I have 600+ students in my classes this term. Please use **online office hours** and **Piazza Discussions** for those kind of questions**.** Please use the instructor email only for personal matters (eg. if you are going to miss the midterm exam/lab due to some unavoidable circumstance etc. or some other important matter related to the course) that you would want to discuss with the instructor. We are always there to help you guys during our (TAs and mine) online office hours.
- Zoom is used for midterm and final exam invigilation. If you don't have a webcam on your computer, you can use your phone/ipad/tab for the zoom invigilation.

Reach Out for Success

University students often encounter setbacks from time to time that can impact academic performance. Discuss your situation with your instructor or an academic advisor. Learn about how you can plan for success at: www.students.ubc.ca

For help addressing mental or physical health concerns, including seeing a UBC counsellor or doctor, visit: https://students.ubc.ca/health-wellness

UBC policies and resources to support student success: UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available at https://senate.ubc.ca/policies-resources-support-student-success.