

# STAT 305 Introduction to Statistical Inference

## Course Syllabus

### COURSE INFORMATION

Course Title	Course Code Number	Credit Value
Introduction to Statistical Inference	STAT 305	3.0

### PREREQUISITES

Either (a) one of STAT 200, STAT 203, BIOL 300, STAT 241, STAT 251, COMM 291, ECON 325, FRST 231, PSYC 218, PSYC 366 and one of MATH 302, STAT 302; or (b) a score of 65% or higher in one of MATH 302, STAT 302. The Department recommends that students meet the prerequisite through option (a).

### COREQUISITES

None

### CONTACTS

Course Instructor(s)	Contact Details	Office Location	Office Hours
Natalia Nolde	natalia@stat.ubc.ca	ESB 3156	TBA

### OTHER INSTRUCTIONAL STAFF

TBA

### COURSE STRUCTURE

In lecture sessions, an in-class activity followed by peer discussion and i-Clicker questions will replace at least part of the lecture component. The in-class activities created for the course are useful tools to enhance student learning, and, as research shows, are far more effective than even the most polished traditional lectures on the same topics. We will **not** cover every detail of the course notes. You will get the most out of class by reading **before** class, and working through problems and doing further reading are necessary activities to supplement the classes.

**Labs:** There will be weekly labs. You are required to work with your classmates; TAs will be there to provide guidance. The lab questions will help prepare you for the quizzes and exams, requiring you to work through a statistical problem from start to finish, justifying each step of your work. Labs will be structured to help you improve your ability to work as part of a group.

**Suggested questions:** Questions will also be suggested approximately weekly. Suggested questions will NOT be collected or marked. Brief answers are often in the course text, and some answers may be taken up in office hours. No other solutions will be provided. If you cannot get started with a question or are stuck at some point in the solution, please see one of the teaching team during office hours. We are here to help YOU successfully complete the problem; it does not help you if we do the problem for you. See us as often as you need to keep making progress. Working together in groups for these questions is allowed.

and indeed encouraged. One purpose of all assignments is to prepare you for the quizzes and final, where similar questions will appear. The suggested questions are not part of assessment but are also an (essential!) aid to learning by doing.

### SCHEDULE OF TOPICS

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We will start with a review of some necessary concepts from probability, including moment generating functions, and then develop a mathematically and conceptually integrated framework for statistical estimation and inference. This framework will include ideas such as the basic properties of statistical estimators; maximum likelihood estimation and frequentist inference; Bayesian inference; likelihood-based hypothesis tests; and applications to categorical data and comparisons between groups. Throughout the course, we will encounter these ideas in the context of real statistical problems taken from various areas of science.

The class-by-class schedule including topics and reading from the course pack will be posted on Canvas, along with the dates of the quizzes.

### LEARNING OUTCOMES

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By the end of the course, you will have mastered the conceptual framework and technical tools that form the foundation for most practicing statistical scientists: statistical estimation and inference. You will know how to specify a probability model for a real-world problem, frame it as a statistical model, and apply the appropriate statistical inference methods (e.g., likelihood methods, Bayesian methods, confidence intervals, and hypothesis testing) to inform the analysis of the problem. In short, you will have the foundation to be a statistical scientist.

### LEARNING MATERIALS

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**Required text:** “STAT 305, Introduction to Statistics Inference” by Welch, W.J. (August 14, 2019, edition). A physical copy may be purchased from the bookstore.

**Course website:** [canvas.ubc.ca](https://canvas.ubc.ca)

**Other:** We will use iClicker Cloud.

### ASSESSMENTS OF LEARNING

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- Quizzes: 45% (3 × 15% each)
- Labs: 10%
- In-class activities (iClicker questions): 5%
- Final: 40% (you must pass the final exam to pass the course)

### UNIVERSITY POLICIES

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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 observances. Details of the policies and how to access support are available on the UBC Senate website: <https://senate.ubc.ca/policies-resources-support-student-success/>.

## ACADEMIC INTEGRITY

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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. All students are expected to follow UBC's Academic Honesty and Standards policy

(<https://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0#15620>).

Breach of the academic integrity policy may, at a minimum, result in a grade of 0 on the relevant assessment or may result in more serious consequences.

Please see UBC's Academic Calendar for detailed policies on Academic Misconduct: <http://calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,0>

### What is academic integrity?

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work; nor should you help others to do the same. For example, it is prohibited to: share your past assignments and answers with other students; work with other students on an assignment when an instructor has not expressly given permission; or spread information through word of mouth, social media, websites, or other channels that subverts the fair evaluation of a class exercise, or assessment.

### Why is academic integrity important?

The course teaching team, UBC, and the scholarly community at large share an understanding of the ethical ways that we use to produce knowledge. A core practice of this shared value of academic integrity is that we acknowledge the contributions of others to our own work, but it also means we produce our own contributions that add to the scholarly conversation: we don't buy or copy papers or exams, or have someone else edit them. We also don't falsify data or sources, or hand in the same work in more than one course.

### What support is available?

Feel free to ask me about academic integrity. Part of my job is to guide your growth as a scholar, and I would much rather you ask for clarification than unintentionally engage in academic misconduct, which has serious consequences. If you are unsure about what constitutes academic misconduct, please reach out to me via email.

Sometimes students who are experiencing a lot of stress feel the only way to deal with a situation is to cheat. Please do not do this. Talk to me, and I am sure we can work something out together.

## OTHER COURSE POLICIES

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- There will be no make-up quizzes and exams. Students who have a legitimate reason for missing a quiz will have its weight transferred to the final exam. For the case of the final exam, students will need to apply for standing deferral through their faculty office and write the deferred final in the next offering of the course or during the official deferred exam period coordinated by Enrolment Services.
- Quiz and lab remark requests need to be made in writing within one week of the return of the marked work.

- **Academic concession**
  - You may need to request an academic concession for medical reasons, on compassionate grounds, or in certain cases of conflicting responsibilities. Please refer to UBC's policy on [Academic Concession](#) for details.

To apply for an academic concession, please inform your instructor as soon as possible.

- **If you are ill**

Please don't come to class if you have an illness that could be transmitted to your classmates (e.g., a respiratory infection). In this class, the marking scheme is intended to provide flexibility so that you can prioritize your health and still succeed. Please inform your instructor if you are ill; you will not lose participation marks if you miss a small number of classes due to illness. If you are ill for a long period of time, please contact your instructor to discuss, and apply for an academic concession.

## GENERATIVE AI TOOLS

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The use of generative artificial intelligence (AI) tools, including ChatGPT and other similar tools, to complete or support the completion of any form of assignment or assessment in this course is not allowed and would be considered academic misconduct. A major emphasis of this course is going between statistical concept and mathematical calculation/computation, which requires that you think through each step of statistical analysis. Using generative AI tools undermines this.

You are welcome to use AI tools to support your study and understanding of ideas in the course. As AI tools become embedded in more products (e.g., search engines), in some cases it will be unavoidable. If you are unsure, ask whether you would be using the tool to complete something for which you will be assigned a grade. If the answer is "yes", then using the tool is forbidden. If you are still unsure, please ask the teaching team.

## WEATHER CONTINGENCY PLAN FOR CLASS SESSIONS AND EXAMS

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In-person, on campus activities may need to be cancelled due to issues such as weather conditions (e.g., snow). The most up-to-date information about cancellations will be posted on [ubc.ca](http://ubc.ca). Please check [ubc.ca](http://ubc.ca) often during times when an extreme weather event could disrupt our course activities. If in-person classes or exams are cancelled, the following contingency plans will take effect. The uncertainty that comes with extreme weather events can be stressful. I will try to communicate with you about weather-related class cancellations as early as possible through Canvas announcements. Here is what you can expect in the event an in-person class session, quiz, or exam is cancelled:

**In case in-person classes are cancelled due to weather:** If in-person activities are cancelled due to weather or other environmental conditions, class and labs will be held online. The Zoom link will be posted on Canvas. For those unable to participate in an online class on short notice, I will provide a lecture recording that is posted to Canvas.

**If weather impacts a quiz, we will reschedule:** Please see Canvas for rescheduling notifications. It is likely the quiz will take place at the next class session.

**If you are registered to write exams at the Centre for Accessibility**, I encourage you to reach out to your CFA advisor well in advance to discuss the weather contingency plan for this course.

**If you have any questions or concerns about this weather contingency plan**, please come talk to me. Discussing any issues prior to the cancellation is helpful so we can work out a plan in advance.

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## LEARNING ANALYTICS

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Learning analytics includes the collection and analysis of data about learners to improve teaching and learning. This course will be using the following learning technologies: Canvas, Piazza and iClocker Cloud. Many of these tools capture data about your activity and provide information that can be used to improve the quality of teaching and learning. In this course, I plan to use analytics data to:

- View overall class progress
- Review statistics on course content being accessed to support improvements in the course
- Track participation in discussion forums
- Assess your participation in the course

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## COPYRIGHT

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All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the Course Instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline. It is not permitted to record lectures.

We are working hard to provide all the materials you need to succeed in this course. In return, please respect our work. All assignment instructions, quiz questions and answers, discussion questions, announcements, PowerPoint slides, audio/video recordings, Canvas modules, and any other materials provided to you by the Teaching Team or in the textbook are for use in this course by students currently enrolled. It is unacceptable to share any of these materials beyond our course, including by posting on file-sharing websites (e.g., Course Hero, Google Docs). It is unacceptable to copy and paste sentences from the textbook (e.g., definitions) into for-profit software (e.g., Quizlet) for use in studying. Respect the Teaching Team and textbook authors' intellectual property and follow copyright law.