DEPARTMENT OF BIOLOGY
UNIVERSITY OF TORONTO MISSISSAUGA

BIO360H5S LEC0101
Biometrics I
Course Outline - Winter 2018

Class Location & Time	Mon, 02:00 PM - 03:00 PM IB 110 Thu, 11:00 AM - 12:00 PM KN 137
Instructor	Helene Wagner
Office Location	DV 3048
Office Hours	Mon 3 - 4 pm
Telephone	905-569-4702
E-mail Address	helene.wagner@utoronto.ca
Course Web Site	https://portal.utoronto.ca

Course Description

This course takes students from hypothesis testing to the application of testing means, chi-square tests, regression analysis and analysis of variance in Biology. Students will learn to choose an appropriate statistical test, independently analyze case studies with R software, and write empirical scientific reports. [24L, 12T, 24P]

Prerequisite: STA215H5
Corequisite: None
Exclusion: ECO220Y5; PSY202H5; STA221H5; STA256H5, STA258H5 (SCI)
Distribution Requirement: SCI

The UTM Calendar states that students who lack the prerequisites for a course can be deregistered at any time

Objectives

1. Course Goals: My main objective in BIO360 is to enable students to plan, carry out, report, and evaluate simple research to address a biological research question.

2. Student Learning Objectives: After completing this course, you should be able to:

- KNOW: Know basic statistical concepts and methods.
- THINK: Combine and apply concepts, develop statistical reasoning.
- DECIDE: Analyze problems to select appropriate statistical methods.
- DO: Carry out analysis of case studies and write empirical reports.
- ENGAGE: Appreciate what statistics can do for a biologist.

Required Textbook and Materials

Stats Data and Models, Second Canadian ed., De Veaux, Velleman, Bock, Vukov, Pearson Education. This is the same book used in STA215 this year.

Students who prefer to use the previous edition (first Canadian edition) may do so at their own risk, i.e., they will be responsible for mastering the corresponding content of the second edition.

The UTM bookstore sells a bundle with e-text and MyStatLab. The bundle is not required, though these additional resources may be helpful for individual study purposes.

Supplemental Textbook and Materials

DataCamp course "Inferential Statistics" (see below).

Assessment and Grading Policies

Type	Description	Due Date	Weight

Quiz	Two online review quizzes (1% each)	On-going	2%
Quiz	Chapter Quizzes (9 of 10, 0.5% each) or DataCamp chapters (6, 0.75% each)	On-going	4.5%
Quiz	Decision Tree Quiz	On-going	5%
Assignment	Report assignment and revision (7% + 2%)	On-going	9%
Assignment	Two of six skills assignments (weighted at 7% each)	On-going	14%
Lab	Eight lab quizzes (weighted at 1% each)	On-going	8%
Term Test	Term Test 1	2018-02-01	18%
Term Test	Term Test 2	2018-03-08	18%
Term Test	Term Test 3	2018-03-29	18%
Class Participation	Three class surveys (completion mark of 0.5% each)	On-going	1.5%
Class Participation	Completion mark based on 17 of 20 lectures using iClickers	On-going	2%
		Total	100%

Notes on Assessment Items

- **Review Quiz**zes (2% total) - Two online review (best 1 of 2) quizzes covering the following textbook chapters: Quiz 1:1-8, 10, 12-17. Quiz 2: 1 - 10, 12 - 23.
- **Chapter Quizzes** (4.5% total) - Nine chapter quizzes (best 9 of 10) covering individual book chapters, on Blackboard, due before corresponding lectures.
- **DataCamp R Course "Inferential Statistics"** (4.5% total) - Optional alternative to Chapter Quizzes. Six interactive online chapters provide hands-on training in R programming applied to BIO360 topics.
- **Decision Tree Quiz** (5%) - Blackboard quiz asking students to select an appropriate statistical test for different study designs.
- **Reports** (9% total) - One report per student (7%) and a revision (2%) addressing the specific feedback comments. A grace period of one week will be granted for reports. Turning in an assignment after the grace period, or failing to turn in a report altogether, will result in a score of 0 points. One report assignment and one make-up report assignment will be offered. Any student may opt to submit the make-up assignment report, no special permission will be required. The point for the revision is only available for Report 1.
- **Skills assignments** (14% total) - Students can choose two of five skills assignments, one from each of two Blocks. Tutorials will explain expectations for each assignment.
- **Lab Quizzes** (8% total) - Hand in your lab answer sheet during your practical session. These will be graded for correctness.
- **Term Tests** (54% total) - Tests wiill be Scantron and**written Thursdays during class and tutorial time.** Note on weighting: two highest marks count for 22% each, lowest mark for 10%. If a student misses a term test with appropriate documentation (medical note), the two other term tests will be counted for 27% each. If a student misses more than one term test with appropriate documentation, an oral exam may be held covering the entire course.
    - Term Test 1: covers weeks 1 - 4
    - Term Test 2: covers weeks 5 - 8
    - Term Test 3: covers weeks 9 - 12
- **Class Survey Participation** (1.5% total) - Completion of three anonymous class surveys on Blackboard at beginning, mid, and end of term.
- **In-class Participation** (2% total) - Completion marks will be awarded for each of 20 lectures that use iClickers as audience response system. Best 17 of 20 marks will be counted toward in-class participation. See below for information on opting out.

Teaching Methods and Academic Supports

Teaching Methods

1. **Readings**: You are expected to review relevant topics from STA215 and read assigned new book chapters or other readings for each lecture BEFORE class.
2. **Review Quizzes**: Two online quizzes test your basic understanding of statistical concepts.
3. **Chapter Quizzes**: In-class quizzes (response system) test your understanding of assigned readings.
4. **DataCamp R Course**: This optional (alternative to Chapter Quizzes), interactive R statistical programming online course (6 chapters assigned) helps you practice statistical concepts and develop your R skills at the same time.
5. **Lectures**: Lectures focus on making connections between concepts, developing statistical reasoning, and choosing

appropriate statistical methods.

6. **Tutorials**: Tutorials focus on problem solving and developing skills for applying statistics, which will be assessed in Assignments.
7. **Assignments:** Choose 2 of 5 assignments, one from each Block. Block A assignments ask you to engage with statistics (creative assignment, reflective assignment, virtual experiment), Block B assignments ask you to put everything you have learned together (paper critique, research plan).
8. **Computer Labs**: In 8 computer lab practicals, you will learn how to analyze biological data sets with R and R Commander statistical software. Computer simulations help deepen your understanding of key concepts, and analyses of biological case studies help prepare you for report-based assignments.
9. **Review Labs:** For the 3 term test weeks, TA's will hold review sessions during computer lab time.
10. **Report**: For the report assignment, you will be given a data set and research questions, which you will need to address with the methods learned in the course and write up in the format of a short scientific paper. After receiving specific feedback comments on your report, you will be asked to submit a revised version.
11. **Class Surveys**: Three surveys will collect class data and course feedback, and ask you to reflect on your learning in this course.
12. **Decision Tree Quiz**: This Blackboard quiz will ask you to use the decision tree to select an appropriate test for different research questions.
13. **Term Tests**: Three term tests (in-class, Scantron) will assess your ability to apply statistical concepts and statistical reasoning to biological research questions.

Academic Support

1. **Textbook**: The textbook provides many features that support studying and reviewing.
2. **iClickers**: This course will use iClickers to engage students during class. See below for instructions, including how to opt out.
3. **Problems**: Lectures will discuss exam-style problems. Old exams will be made available on Blackboard.
4. **R statistical software**: R is a powerful programming language for statistical analysis that is free and runs on all platforms. R Commander provides a graphical user interface that facilitates generating and modifying R code.
5. **DataCamp**: This optional interactive online course provides hands-on training in statistical programming with R. See below for instructions, including how to opt in.
6. **Flowcharts**: Several flowcharts will be available on Blackboard to help with choosing and applying statistical methods.
7. **Discussion Board**: the discussion board on Blackboard will be used for inquiries about course logistics, incl. assignments and test. You are encouraged to post statistical questions to dedicated forums for each chapter and contribute answers to your fellow student's questions.
8. **Instructor Office Hours**: Feel free to drop by during office hours (or request an individual meeting by email if you can't make it to regular office hours) to get help on course concepts, statistical problem solving, or how to study for this course.

iClickers

- **Participation mark**: Students who have registered their iClicker for this course receive a participation mark worth 2% of their final course grade. Participation will be based on their top 17 of 20 completion rates for lectures that use Learning Catalytics (starting Jan. 8). For students who opt out of Learning Catalytics, the total weight of their term tests will increase from 54% to 56%. For each student, both versions of the course grade will be calculated (with and without iClicker) and the better mark will be counted.
- **Academic integrity**: DO NOT PARTICIPATE FOR SOMEONE ELSE. It is an academic offence to participate in an audience response system on behalf of someone else. Students should refer to the Code of Student Conduct and the Code of Behaviour on Academic Matters (included in your Academic Calendar) and be familiar with UofT academic integrity policies.

DataCamp

- **Opting in**: Students who want to opt in must complete the opt-in survey on Blackboard by Jan 18. The survey will ask for the email address to be used for registering with DataCamp.
- **Online R statistical programming course**: Six chapters of the interactive course 'Inferential Statistics' will be assigned for online completion. Participating students will collect points for correct answers, and a reduced point value if they require additional hints to get to provide the correct answer.
- **Chapter marks**: The information provided in the survey will be used to match DataCamp completion marks with BIO360 students. For each assigned chapter, the points earned, relative to the maximum, will be counted as the chapter grade.
- **Alternative to Chapter Quizzes**: For each student, both versions of the course grade will be calculated (with Chapter

Quizzes or with DataCamp) and the better grade will be counted. Note: The two cannot be mixed (e.g., you can't do DataCamp for half the term and Chapter Quizzes for the other half).

- **FIPPA:** University of Toronto cares about protecting your privacy and personal information. Information will be stored at DataCamp.com, potentially outside Canada. Consider using a pseudonym and a new email address.

Procedures and Rules

E-Mail Policy

The University's official method of correspondence with students is through their University of Toronto e-mail accounts. It is the student's responsibility to keep his/her @mail.utoronto.ca account active and check it on a regular basis.

All e-mails from students must include your full name and student number as well as have the course code in the subject line.

Re-Mark Policy

Requests for re-evaluation of course work must be made in writing to the instructor no later than one month following the return of the work. Re-evaluation may result in a grade increase, decrease, or no change.

If you request a remarking of an assignment or report, you must send a detailed request via email to the TA who marked your work, with a copy to the instructor.

Religious Observance

Information about the University's Policy on Scheduling of Classes and Examinations and Other Accommodations for Religious Observances is at http://www.viceprovoststudents.utoronto.ca/publicationsandpolicies/guidelines/religiousobservances.htm

Classroom Management

Students are expected to read the assigned reading before coming to class and to carefully read the computer lab outline before lab sessions. Also, students are expected to come to class on time, and to use electronic devices (e.g., phones, tablets, laptops) in class for calculations or note-taking only.

Late Assignments, Extensions and Missed Term Tests

You are expected to complete and submit all assignments on time.

If you miss a **term test**: Concact the instructor by email immediately and follow procedures below.

If you miss the deadline for a **report or assignment**: A grace period of one week will be granted. Turning in a report or assignment after the grace period, or failing to turn in an assignment altogether, will result in a score of 0 points.

No extensions will be granted for online quizzes.

Documentation and Procedures:

1. Declare your absence on ROSI.
2. Contact your professor via email within 48 hours of the missed quiz/test/assignment.
3. Submit an explanation in writing within one week, detailing the University-approved circumstance s, beyond your control, that caused you to miss the quiz/test/assignment. The explanation must be accompanied by proper documentation (originals, in hard copy) and should be submitted to the Department of Biology to Diane Matias (d.matias@utoronto.ca). Include your name, your student number, your @utoronto e-mail address, your phone number, the course designator/ code, and a description of the item you missed (e.g., Quiz #1). The standard U of T Mississauga medical certificate is the appropriate documentation to submit if you were ill.

Note that it is not sufficient simply to visit a doctor's office; the documentation must show that you were incapable of writing the test or completing the assignment, for medical reasons. The medical certificate must include the statement: "[Name of student] was unable to write the test on [date] for medical reasons." Documentation must show the physician was consulted within one day of the test. A statement merely confirming the report of an illness made by a student is not acceptable.

Note that holidays and pre-purchased plane tickets, family plans (unless critical, such as death of an immediate family member), and lack of preparation or too many other tests are not acceptable excuses.

The written explanation and documentation that you submit represents an appeal from you, requesting the opportunity to make up that portion of your grade in some other manner. If an appeal is not received, or if the appeal is deemed unacceptable, you will receive a grade of zero for the item you missed. If the appeal is granted - that is, your reason for missing the test is considered acceptable - then a mechanism for making up the missed item will be offered.

If your appeal is accepted, it may b e considered appropriate to do a weighted average of your other term marks to make up for the missed item, rather than setting a makeup date. If a makeup is offered, the date will be determined by the Department, and you will be notified. The general format and content of the makeup will be similar to the original test, but the specific format and content may not be the same.

Academic Integrity

The code of Behaviour on Academic Matters states that:

> *The University and its members have a responsibility to ensure that a climate that might encourage, or conditions that might enable, cheating, misrepresentation or unfairness not be tolerated. To this end all must acknowledge that seeking credit or other advantages by fraud or misrepresentation, or seeking to disadvantage others by disruptive behaviour is unacceptable, as is any dishonesty or unfairness in dealing with the work or record of a student.*
>
> - University of Toronto Mississauga Academic Calendar

It is your responsibility as a student at the University of Toronto, to familiarize yourself with, and adhere to, both the Code of Student Conduct and the Code of Behaviour on Academic Matters.

This means, first and foremost, that you should read them carefully.

- The Code of Student Conduct is available from the U of T Mississauga website (Registrar > Academic Calendar > Codes and Policies) or in your print version of the Academic Calendar.
- The Code of Behaviour on Academic Matters is available from the U of T Mississauga website (Registrar > Academic Calendar > Codes and Policies) or in your print version of the Academic Calendar.
- Another helpful document that you should read is How Not To Plagiarize, by M. Proctor.

1. Turnitin.com

Normally, students will be required to submit written reports and assignments to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their assignments to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com website.

Students who choose to opt out of using Turnitin.com must do so in writing by email to the course instructor before Jan 29.

2. iClicker

DO NOT PARTICIPATE FOR SOMEONE ELSE. It is an academic offence to participate in an audience response system on behalf of someone else. Students should refer to the Code of Student Conduct and the Code of Behaviour on Academic Matters (included in your Academic Calendar) and be familiar with UofT academic integrity policies.

Additional Notes

Snow day provisions

Blackboard Collaborate:

In case of a snowday, class may be held online via Blackboard Collaborate. Instructions will be sent via Announcement in Blackboard, and the taped lecture will be made available afterwards. Students will be responsible for content covered in any Bb Collaborate lectures.

Term Test 3 backup date:

Should March 29 be a snow day (UTM closure), a shorter version of the term test will be held during class on Monday April 2.

Discussion board and specific email policy for this course

Discussion board:

This course uses the Discussion Board in Blackboard as an important communication platform. Separate forums will be set up for the course in general and for course content as it relates to textbook chapters. Any questions regarding course organization, e.g., assignments, due dates etc. as well as questions regarding course content, e.g., statistical questions, should be posted to the appropriate forum. Students are expected to help answer questions posted to the discussion board as far as possible. Entries will be monitored by the course staff and annotated as necessary within two days from posting, and major issues will be addressed in class or during the tutorials.

Communication rules:

When composing your question or answer for the discussion board, please remember the following rules:

1. Posts are not anonymous.
2. Be short and precise.
3. Make sure you include all essential information.
4. If possible, provide a reference to the source of relevant information.
5. Be polite.

Email policy:

Using the discussion board gives all students access to the same information. Therefore, the instructor will not answer individual emails about course organization or content, e.g., statistical questions. Students should only send emails to the instructor regarding personal issues that cannot be posted on the discussion board, such as if they will have to miss classes or the term test due to a medical condition. Emails will be answered within a maximum of three days.

How to get help on statistics questions: Please,

1. First, refer to the course documents, text book, and relevant discussion board forum on Blackboard.
2. If you can't find an answer yourself, post your question on the corresponding discussion forum. Wait for a fellow student to post an answer, which may be annotated by the course staff within two days. Major issues raised in the discussion forum may be addressed in class or during tutorials.
3. If the discussion did not answer your question, ask your TA in the tutorial session.
4. If still necessary, ask the instructor after class or during office hours.

Other Resources

AccessAbility
The University accommodates students with disabilities who have registered with the AccessAbility Resource Centre. Please let me know in advance, preferable in the first week of class, if you will require any accommodation on these grounds. To schedule a registration appointment with a disability advisor, please call the centre at 905-569-4699 or e-mail at: access.utm@utoronto.ca.
http://www.utm.utoronto.ca/access/

Robert Gillespie Academic Skills Centre
Students can visit the Academic Skills Centre to consult with one of its strategists about understanding learning style, developing study plans for upcoming tests/exams, or discussing papers. Special Diagnostic Assessments are also offered and are designed to help you learn exactly where you stand with respect to critical academic skills.
http://www.utm.utoronto.ca/asc

UTM Library (Hazel McCallion Academic Learning Centre)
The University of Toronto boasts the biggest academic library in Canada and the second biggest in North America. Various services are available to students at the UTM Library and across the UofT library system. Services including borrowing, interlibrary loans, online references, laptop loans and the RBC Learning Commons. For more information, visit http://library.utm.utoronto.ca.

Course Schedule

Week	*Date*	*Lecture Topic*	*Readings*	*Computer Labs*	*Tutorials*
1	Jan 4	Introduction		No Lab	Skills Assignments
2	Jan 8	Statistical inference	17		
	Jan 11	Inference about a mean	20	R work flow	Problem Solving
3	Jan 15	Testing two means	21		
	Jan 18	Paired samples	22	Testing means	Problem Solving
4	Jan 22	Non-parametric tests	29		
	Jan 25	Decision tree A		Non-par. tests / R1	Report Writing
5	Jan 29	Randomness & Probability	9		
	Feb 1	**TEST 1**		Review	**TEST 1**
6	Feb 5	Null models & distributions	23		
	Feb 8	Chi-square tests		Chi-square tests	Problem Solving
7	Feb 12	Power & sample size	18		
	Feb 15	Epidemiology & odds ratio	Reading 1	Type I / II errors	Skills Assignments
8	Feb 26	Experimental design	11		
	Mar 1	Confounding variables		Power analysis	Planning Research
9	Mar 5	Decision tree A - E			
	Mar 8	**TEST 2**		Review	**TEST 2**
10	Mar 12	Regression inference	24		
	Mar 15	Regression wisdom		Regression	Decision Tree
11	Mar 19	One-way ANOVA	25		
	Mar 22	Multiple comparisons		ANOVA	Problem Solving
12	Mar 26	Two-way ANOVA	26		
	Mar 29	**TEST 3**		Review	**TEST 3**
13	Apr 2	To be announced			

Last Date to drop course from Academic Record and GPA is March 14, 2018.

Every attempt will be made to follow this syllabus, but its content are subject to change, according to the rules as outlined in the

UTM Instructor's Handbook, section 3.2.2.