

**Course Outline**  
**Statistical methods for the life sciences**  
**STAT \*6950**  
**University of Guelph, Fall 2015**

**I. General Information**

**Calendar description:**

**STAT\*6950 Statistical Methods for the Life Sciences F [0.50]**

Analysis of variance, completely randomized, randomized complete block and latin square designs; planned and unplanned treatment comparisons; random and fixed effects; factorial treatment arrangements; simple and multiple linear regression; analysis of covariance with emphasis on the life sciences. STAT\*6950 and STAT\*6960 are intended for graduate students of other departments and may not normally be taken for credit by mathematics and statistics graduate students.

**Instructor:** Prof. Julie Horrocks, Department of Mathematics & Statistics  
**Office:** Rm. 437 MACN  
**E-mail:** [jhorrock@uoguelph.ca](mailto:jhorrock@uoguelph.ca) (Put STAT6950 in Subject Line)  
**Office hours:** Wed 1-3 pm in MACN 518

**TA:** Denys Kelly  
[denys@mail.uoguelph.ca](mailto:denys@mail.uoguelph.ca) (marking questions only please!)

**Lecture:** 8:30-9:50 Tuesday & Thursday, MCKN120

**Labs:** 12:30-1:20 Friday, MCKN 117  
Sept 11, Sept 18, Oct 2, Oct 16, Oct 30, Nov 6, Nov 20, Nov 27

**Midterm exam:** Tues Nov 3 8:30-9:50 am (in class)

**Final exam:** Monday December 7, 8:30am-10:30am (Room TBA)

**II. Learning outcomes**

This course is designed to give students experience and confidence in the design and analysis of data within realistic biological research contexts. Students will gain basic practical experience in displaying, summarizing, analyzing and interpreting biological data in applied research contexts using standard statistical methods.

At the end of this course students should:

1. Understand the statistical concepts of bias, variability, and sampling distributions.
2. Select the appropriate statistical method for a given data set.
3. Evaluate the quality of data collected from observational and experimental studies.
4. Design simple studies.
5. Use statistical computer software to explore and analyze data.

6. Understand statistical language as used in the primary biological literature.
7. Interpret statistical results and communicate them to other biologists.

### ***General information on lectures***

- For your convenience, drafts of lecture notes will be posted on Courselink prior to lecture. However, please note that these drafts can differ from the final, corrected versions of the slides, which will be posted on Courselink after lecture.
- If you cannot make a class or lab meeting, it is up to you to arrange to get notes from another student.

### ***General information on labs***

- Labs will be run by TA who will introduce the lab assignment, lead discussion, and give pointers on using the computer software. While we do not take attendance at labs, we strongly encourage you to attend.
- Be sure to save the work you do in the lab (data files, output, word processing) and mail it to yourself before you leave. Alternatively, you can save your work on a memory key.

### **Important Dates**

Sep 10	First lecture
Sep 11	First lab
Mon Oct 12	Holiday
Tues Oct 13	Fall Study Break Day
Oct 30	Midterm Nov 3 in class
Nov. 6	Course drop deadline (40th day classes)
Dec. 2	Last day of classes
Dec. 7	Final Exam 8:30am-10:30am (Location: TBD)

### **IV. Course Resources**

**Recommended Textbook:** The Statistical Sleuth, by Ramsey and Schafer, 3rd edition, 2013, 2002 Brooks/Cole, Cengage Learning.

Note that tests will be open notes and open book.

Resources - on 2 hour Reserve in the McLaughlin Library:

1. Textbook, 2nd edition: Potentially confusing!
2. A First Course in Statistical Programming with R, by Braun and Murdoch, Cambridge University Press, 2007
3. Dalgaard, P. 2008. Introductory Statistics with R, Second Edition. New York, Springer.

**R statistical software:** We will be using the software package R to analyze data in labs. R is freely available. If you wish to download a copy for your personal computer, you can do so at the following website: <http://cran.r-project.org>.

Note that R is not menu-driven. You will need to type in code to manipulate and analyze data

## V. Methods of Assessment

Assessment	Value	Learning Outcomes
Assignments	30%	Due dates: Sept 24, Oct 8, Oct 22, Nov 12 Learning outcomes #1-7
Project	10%	Nov 26 Learning outcomes #1-7
Midterm (open book)	30%	Nov 3, in class Learning outcomes #1, 3, 4, and 7
Final Exam (open book)	40%	Learning outcomes #1-5, 7

**Assignments and Project:** The assignments and project are designed to give you experience in data management, experimental design, graphical methods, and statistical analysis using R, as well as reinforce concepts presented in lectures. The assignments and any required data sets will be posted on Courselink. There will be a maximum of 4 assignments in total, but your lowest assignment grade will be dropped. The project is similar to the assignments, but will cover all preceding material. **Late assignments/project will not be accepted!!!!**

Solutions for all questions will be posted on the course website at 5 pm on the due date. **THEREFORE NO LATE ASSIGNMENTS CAN BE ACCEPTED!**

Discussion often leads to better understanding and so we encourage group thinking. However, we urge you to not divide up the work. You will get the best value if you work together to increase your comprehension and not to do less work. Statistical analysis, data exploration, and the learning of statistical software only comes with experience. Each student must hand in a separate complete assignment, and no part of this should be copied from another student. Academic dishonesty, such as plagiarism (including copying all or part of an assignment) and impersonation is grounds for loss of course credit and dismissal. More information on the subject of academic misconduct can be found at the following website:

[http://www.uoguelph.ca/undergrad\\_calendar/c08/c08-amisconduct.shtml](http://www.uoguelph.ca/undergrad_calendar/c08/c08-amisconduct.shtml)

Completed assignments and projects should be placed in the **orange drop boxes outside the Math/Stats Learning Centre, 3<sup>rd</sup> floor McLaughlin library, by 5:00 pm on the due date.** The box will be labelled "STAT\*6950 Inbox".

Please write your name, student id and section number on the first page of your assignment. **Please write your name only on the back of the last page of your assignment**, and we will staple them closed (for confidentiality reasons).

We will do our best to return the marked assignments in the following lab, but if not, they will be placed in a different orange box, outside the Math/Stats Learning Centre. The box will be labeled "STAT\*6950 Outbox".

You are responsible for answering all of the questions on each assignment because these will help prepare you for the course exams. **However, due to limited TA time, we may not be able to grade all questions.** Solutions for all questions will be posted on the course website at 5 pm on the due date. It is up to you to check the answer sheet to evaluate your performance on the unmarked questions.

**Exams:** There will be one midterm and one final exam in the course. Tests will generally address the following topics: numerical and mechanical skills, your ability to critically evaluate the quality of data (e.g., data collection, experimental method) or of the experimental design and analyses, and the legitimate interpretation of results in a biological context. Students are allowed to use their notes, copies of assignments, a calculator, and the course textbook during the midterm and final. Do not bring laptop computers, cell phones, or smartphones.

## VI. Course Policies

**When You Cannot Meet a Course Requirement:** When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

**Consideration may be granted at the instructors discretion. Please note that consideration for medical, compassionate or university-related conflicts (e.g., varsity sports) may require additional discussion with your program counsellor. Consideration is generally more likely when the student proactively advises the instructor of issues well in advance of deadlines.**

Should you need to miss a test or assignment for religious purposes, please advise the instructors within the first two weeks of classes.

**Academic misconduct:** The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the

University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

**Accessibility:** The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email [csd@uoguelph.ca](mailto:csd@uoguelph.ca) or see the website: <http://www.csd.uoguelph.ca/csd/>

**Calendars:** The calendar is the source of information about the University of Guelph's procedures, policies and regulations that apply to undergraduate, graduate and diploma programs:

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

**Copies of out-of-class assignments:** Keep paper and/or other reliable back-up copies of all out-of-class assignments; you may be asked to resubmit work at any time.

**Course evaluations:** The Math-Stats evaluation will occur in class near the end of term. You may view an example of the MS evaluation sheet here:

<http://www.mathstat.uoguelph.ca/files/TeachevaluationformF10.pdf>

DEPARTMENT OF MATHEMATICS AND STATISTICS

TEACHING EVALUATION PROCESS

- Each course taught by the Mathematics and Statistics Department is evaluated in the last two weeks of the semester. The Evaluation form consists of a set of 7 questions, whose answers are entered on a provided computer sheet, and space for comments. Note that the completed evaluation forms and any comments will not be passed on to the instructor, the Chair, and the Departmental Tenure and

Promotion Committee until after all the final grades have been submitted following the final examination period.

- Your input provides important feedback to the instructor and becomes an important part of the Departmental Tenure and Promotion Committee's teaching evaluation of the instructor.
- Numerical results calculated from the 7 questions are provided to the instructor and are used by the Departmental Tenure and Promotion Committee in making faculty salary and promotion decisions.
- Comments from unsigned evaluation forms are passed only to the instructor after the final grades have been submitted following the final examination period.
- If you wish your comments to also go to the Chair and the Departmental Tenure and Promotion Committee, you must include your clearly legible handwritten signature, with your legibly printed name and student number in the provided spaces. Note that comments that do not include a clearly legible handwritten signature are not allowed to be passed on to the Chair and the Departmental Tenure and Promotion Committee.
- These comments are made available to the Promotion and Tenure Committee only after the faculty member has had the opportunity to read and respond to the contents. Your identity will be made available to the Chair, the Department committee and the faculty member after final grades have been submitted.

**Drop date:** The last date to drop one-semester courses, without academic penalty, is the 40<sup>th</sup> class day: Nov 6 2015. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for dropping courses, see the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

**E-mail communication:** As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly; e-mail is the official route of communication between the University and its students.

**Recording of materials:** Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

**Student responsibilities :** You should plan on spending a minimum of ten hours per week working on this course, in addition to time spent in lectures and tutorials. This time includes reading the required sections of the textbook, reviewing and/or rewriting lecture notes, preparing questions on any material with which you need help, doing practice problems, and working on your lab assignments. The Instructors and TAs will offer as much assistance as possible. However, remember that this is your learning experience, and you will get as much out of this class as you put into it.

## **VII. Campus Resources**

If you are concerned about any aspect of your academic program:

-make an appointment with a program counsellor in your degree program.

<http://www.bsc.uoguelph.ca/index.shtml> or  
<https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

-There are numerous academic resources offered by the Learning Commons including Supported Learning Groups for a variety of courses, and workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.

<http://www.learningcommons.uoguelph.ca/>

If you are struggling with personal or health issues:

-Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.

<https://www.uoguelph.ca/counselling/>

-Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>

-In addition to Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

-The Centre for Students with Disabilities (CSD) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/csd/>