

GEOG 9226B – Design, Analysis & Interpretation of Quantitative Biological Research Course Outline: Winter 2019

1. Course Information

1.1. Classroom Location:

Fridays 9-11am
SSC 2424

1.2. Contact Information:

Instructor: Robert Bailey
Office: off site – course operating remotely via Adobe Connect
Email: Robert.Bailey@uoit.ca

The Department of Geography strives at all times to provide accessibility to all faculty, staff, students and visitors in a way that respects the dignity and independence of people with disabilities. Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2147 for any specific question regarding an accommodation.

More information about “Accessibility at Western” is available at: <http://accessibility.uwo.ca>

2. Mandate

Course Description

This course is dedicated to equipping students to both use and critically review the use of quantitative methods in biological research. It only brings theoretical aspects of “stats” into play to discuss and help students understand the analytical and presentation choices we make and the interpretation we have for our results.

3. Learning Outcomes and Acquired Skills

Students who successfully complete the course will know how to:

- create a conceptual model for a research project
- design an observational or experimental research study that incorporates the concept of power (the ability to detect deviations from a null hypothesis)
- analyze univariate and multivariate data from a biological research study
- effectively present analyses of univariate or multivariate data from a biological research study
- critically assess the results and interpretation of statistical analyses used in a biological research study
- consider alternatives to the hypothesis-testing paradigm for analyzing quantitative **data**

...and show proficiency with the following software tools:

- Adobe Connect web conferencing
- MS PowerPoint
- MS Excel
- R statistics software (including customizing scripts)

4. Preparation

It might be useful for you to refresh your basic stats prior to starting the course. Carnegie Mellon University has quite a good MOOC stats course called Statistical Reasoning. If you want to try some or all of it, check it out at their Open Learning Initiative website...

<https://oli.cmu.edu/learn-with-oli/see-our-free-open-courses/>

5. Software and other Resources

We will use Adobe Connect web conferencing software to complement face-to-face discussions and lectures. I will keep all resources on a Google Drive with which you will have access. Data will be assembled and analyzed using Microsoft Excel and the statistical and graphics software known as R, which is available as a free download for Windows, Mac, and UNIX operating systems. I prefer R Studio, but get any version of R that you like. <http://www.rstudio.com/ide/download/>

I should stress that although we will use R a lot, this is not a course in how to use R. I will help you do what you have to do to get the (assignment) job done, but I will not spend hours explaining how to do things. Often, students in the course show ME how to do something better or easier! If you like books, you may find any of the following texts useful for both learning and using R and general guidance on statistical matters we will deal with in the course:

Burnham, K.P., and D.R. Anderson. 1998. Model selection and inference: a practical information-theoretic approach. Springer. Available from amazon.ca for about \$180.

Cohen, J. 1977. Statistical power for the behavioral sciences. Revised edition. Academic Press. Available used from amazon.ca for about \$35.

Crawley, Michael J. 2005. Statistics: An introduction using R. Wiley. Available from amazon.ca for about \$45.

Green, R.H. 1979. Sampling design and statistical methods for environmental biologists. Wiley. Available from amazon.ca for about \$40.

Kabacoff, Robert I. 2011. R in Action: Data analysis and graphics with R. Manning. Available from amazon.ca for about \$45.

Mayo, D.G. 2018. Statistical inference as severe testing: how to get beyond the statistics wars. Cambridge University Press. Available from amazon.ca for about \$70.

Tufte, Edward R. 2001. The visual display of quantitative information. 2nd Edition. Graphics Press. Available from amazon.ca for about \$50

6. Lecture/Lab Meetings

We will blend the lecture and lab components of the course into a two-hour video conference on Friday 9-11am each week. These will be recorded and available for viewing on Adobe Connect.

Week	Date	Subject
1,2	Jan 11	Fundamentals <ul style="list-style-type: none"> • Best/worst data figure from each student's experience • Why parents shouldn't teach their kids to drive and supervisors shouldn't teach their grad students stats • Assembling data for use in your assignments
3,4	Jan 25, Feb 1	Statistical Modeling <ul style="list-style-type: none"> • General Linear Model • Assumptions of linear models • Categorical Data Analysis
5,6	Feb 8, Feb 15	Study Design <ul style="list-style-type: none"> • What is power and why is it important? • Designing and assessing the design of a research study
7	Feb 22	Reading Week - work on your assignment!
8,9	Mar 1 Mar 8	Multivariate Analysis <ul style="list-style-type: none"> • Classification • Ordination (NMDS, PCA) • MANOVA, DFA • Factorial MANOVA
10	Mar 15	Other ways of thinking <ul style="list-style-type: none"> • Bayesiana • Neural networks • requests
11	Mar 22	Student Presentations I
12	Mar 29	Student Presentations II
13	Apr 5	Student Presentations III

7. Lab Assignment Schedule

Week	Date	Activity
1	Jan 11	Hand Out Lab Assignment 1: <i>Conceptual model, collecting and inputting data, a first look at the data</i>
3	Jan 25	Hand Out Lab Assignment 2: <i>Dealing with Assumptions, Study Design</i>

Week	Date	Activity
		Hand In Lab Assignment 1 (11:59pm Monday 28 January)
5	Feb 8	Hand Out Lab Assignment 3: <i>Multivariate Analysis</i> Hand In Lab Assignment 2 (11:59pm Monday 11 February)
7	Mar 1	Hand Out Lab Assignment 4: <i>Other Ways of Thinking</i> Hand In Lab Assignment 3 (11:59pm Monday 4 March)
12	Mar 22	Hand In Lab Assignment 4 (11:59pm Monday 25 March)

Students are responsible for material covered in the lectures as well as the assigned chapters/sections in the text. Students are **REQUIRED TO COMPLETE ALL COMPONENTS** of this course. There are no exceptions to this. Extra assignments to improve grades **will NOT** be accepted.

Grades will not be adjusted on the basis of need. It is important to monitor your performance in the course. Remember: You are responsible for your grades in this course.

8. Evaluation

There are four assignments and a presentation.

Assignments **TOTAL** = 80%

Assignments 1-4 are each worth 20% of your final mark. You are encouraged to discuss the assignments with the professor and each other, but you are totally responsible for producing your final product for submission. Bob marks all of the assignments.

Presentation = 20%

Each student will choose a published paper (approved by the professor) and present a 15m PPT show highlighting the design, analysis, and interpretation of the quantitative aspect of the study.

Presentations will be by video conference during the final three weeks of the course. The presentation mark is the mean of Bob's mark and the mean of the class observers.

9. University Policy Regarding Illness

9.1. Illness

Please visit the link to the university policy for more information.

<http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=- Page 12>

If you feel that you have a medical or personal concern that is interfering with your work, you should contact your Instructor, Graduate Program Administrator, Supervisor, or SGPS.

9.2. Attendance

It is expected that students will be present at all classes. The professor does not provide access to lecture notes. Students are encouraged to obtain missed lecture notes from a fellow student.

10. Scholastic Discipline for Graduate Students

For the complete policy and regulations see: http://grad.uwo.ca/current_students/regulations/13.html

11. Procedures for Appealing Academic Evaluations

Students may appeal an academic decision or ruling in accordance with the appeal procedures set out below. Students have a right to appeal to their graduate programs and, if unsuccessful, to the Vice-Provost (Graduate and Postdoctoral Studies). Some decisions may be appealed further to the Senate Review Board Academic. The Vice-Provost's rulings in academic matters are final unless overturned or modified on appeal to the Senate Review Board Academic (SRBA).

For the complete policy and regulations see: http://grad.uwo.ca/current_students/regulations/13.html

12. Support Services

12.1. Support Services

Student Support Services can be reached at: <http://westernusc.ca/services/>

Student Development Services can be reached at: <http://www.sdc.uwo.ca/>

Students who are in emotional/mental distress should refer to Mental Health@Western http://www.health.uwo.ca/mental_health/ for a complete list of options about how to obtain help.

12.2. Short Absences

If you miss a class due to minor illness or other problems, check your course outline for information regarding attendance requirements and make sure you are not missing a test or exam. Cover any readings and arrange to borrow the missed lecture notes from a classmate.

12.3. Extended Absences

If you expect to be away from campus for an extended amount of time, please make prior arrangements with your course instructors and/or supervisor.

For the complete policy on registration, see: http://grad.uwo.ca/current_students/regulations/4.html

12.4. Academic Concerns

If you are in academic difficulty, it is strongly recommended that you see your Graduate Program Administrator, Supervisor, or SGPS.

13. Other Information

For a list of Graduate Regulations, please visit:

http://www.grad.uwo.ca/current_students/regulations/index.html

For The University of Western Ontario Senate Regulations, please see the Handbook of Academic and Scholarship Policies at: http://www.uwo.ca/univsec/academic_policies/index.html