

## Department of Biology Course Outline

### SC/BIOL 4085, Quantitative Methods in Biology Winter, 2017

#### Course Description

Practical applications of advanced statistics used in biological research, including analysis of variance, regression, and multivariate statistics. Three lecture hours, three laboratory hours. One term. Four credits.

#### Prerequisites

Prerequisites: SC/BIOL 2060 3.0, or equivalent with permission of the instructor.  
Exclusions: SC/BIOL 4085 3.0; SC/MATH 4585 3.0; AP/ADMS 3330 3.0; HH/PSYC 3030 6.0; AP/POL 3300 6.0. NCR Note: Not open to any student who has taken or is taking AP/SC/MATH 2131 3.0 or any other MATH course with a third digit 3 at the 3000 level or higher.

#### Course Instructors and Contact Information

Dr. Roberto Quinlan, rquinlan@yorku.ca, x40076

#### Schedule

Mondays, Wednesdays, Fridays 1.30 – 2.30 pm, LSB 107  
Lab Mondays 2.30 – 5.30 pm, DB 2027

#### Evaluation

Mid-term exam: 20%  
Assignments: 50% (there is an assignment associated with each lab)  
Final exam: 30%

#### Important Dates

Classes commence 06 January, last day of class 05 April, exam period commences 07 April, Winter Reading Week 20-24 February.

NOTE: for additional important dates such as holidays, refer to the "Important Dates" section of the Registrar's Website at <http://www.yorku.ca/yorkweb/cs.htm>

## Resources

Textbook: None. Course content will come from a variety of sources including primary and secondary literature, lecture material, websites from reputable sources.

## Learning Outcomes

Upon successful completion of this course, students should be able to:

*See details in Course Content below.*

## Course Content

This course involves the practical applications of advanced statistical techniques on specific types of datasets that are generated in biological research, with a focus on ecology and evolution. Statistics are a tool used by biologists, and the primary aim of this course is for you to gain some experience in using the diverse toolkit of statistics beyond what you would have encountered in your introductory statistics course. Students gain a more detailed knowledge of statistical approaches commonly encountered when reading primary literature. Through practical exercises and assignments in a computer lab, students become more familiar with statistical techniques covered in lecture.

Topics covered include (*and are not limited to*):

- 1) Review of major topics from introductory statistics course: experimental design, distributions, probability,  $t$ -test, ANOVA, correlation, simple linear regression
- 2) Resampling: bootstrapping; jack-knifing
- 3) Power analysis
- 4) ANOVA: additional details (e.g. Repeated Measures ANOVA, *post-hoc* tests, etc).
- 5) Multivariate ANOVA (MANOVA); Analysis of Covariance (ANCOVA)
- 6) Regression techniques: multiple linear regression (MLR); logistic regression; weighted-averaging regression (WA)
- 7) Distance statistics: (dis)similarity measures and associated tests
- 8) Cluster Analysis and Classification (e.g. Discriminant Analysis)
- 9) Ordination techniques: indirect and direct gradient analysis
- 10) Analysis of time series data

## Experiential Education and E-Learning

Lab assignments consisting of conducting statistical tests on data generated in the lab (collected by students).

## Other Information

## Course Policies

**Missed midterm:** Students who miss a test or exam due to an illness or emergency must notify Dr. Quinlan via email within 48 hours, and provide supporting documentation to Dr. Quinlan, via the undergraduate Biology office, within 5 calendar days. A midterm missed due to medical circumstances must be supported by an Attending Physician's Statement, which can be downloaded from: [http://www.registrar.yorku.ca/pdf/attend\\_physician\\_statement.pdf](http://www.registrar.yorku.ca/pdf/attend_physician_statement.pdf).

**Late assignments:** material submitted late will be levied a penalty of 30% per day.

## University Policies

### Academic Honesty and Integrity

York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards.

There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at - <http://www.yorku.ca/academicintegrity/>

### Access/Disability

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Students in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Counselling & Disability Services - <http://cds.info.yorku.ca/>

Counselling & Disability Services at Glendon - <http://www.glendon.yorku.ca/counselling/personal.html>

York Accessibility Hub - <http://accessibilityhub.info.yorku.ca/>

### **Ethics Review Process**

York students are subject to the York University *Policy for the Ethics Review Process for Research Involving Human Participants*. In particular, students proposing to undertake research involving human participants (e.g., interviewing the director of a company or government agency, having students complete a questionnaire, etc.) are required to submit an *Application for Ethical Approval of Research Involving Human Participants* at least one month before you plan to begin the research. If you are in doubt as to whether this requirement applies to you, contact your Course Director immediately.

### **Religious Observance Accommodation**

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete an Examination Accommodation Form, which can be obtained from Student Client Services, Student Services Centre or online at

[http://www.registrar.yorku.ca/pdf/exam\\_accommodation.pdf](http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf) (PDF)

### **Student Conduct in Academic Situations**

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - <http://secretariat-policies.info.yorku.ca/policies/disruptive-and-or-harassing-behaviour-in-academic-situations-senate-policy/>