

## Department of Biology Course Outline

SC/BIOL 3250 4.00 Experimental design for environmental and evolutionary biology  
Fall 2015

### Course Description

This course examines advanced concepts associated with the design and implementation of experiments in environmental and evolutionary biology. Both basic and applied designs are described and major contemporary developments summarized.

### Prerequisites

SC/BIOL 2060 3.00 or an equivalent statistics course.

### Course Instructors and Contact Information

Lectures: Dr. Lortie, lortie@yorku.ca

Labs: Ally Ruttan aruttan@rogers.com

Please contact instructor and your lab assistant directly to book appointments for office hours.

### Schedule

Lectures: Thursday 11:30am 180 minutes in LSB 106

Labs: TH 2:30pm 180 minutes LUM 124

### Evaluation

#### Overview

Lectures valued at 55% & labs at 45% to correspond with relative effort and time required.

Excepting the only test, ALL other evaluation components are designed to ensure you generate useful, public products to begin to develop student portfolios of meaningful work.

#### Lecture component

Lecture Test	25%
Grant Proposal	20%
PechaKucha Presentation	10%

#### Lab component

Lab report (report, data, meta-data, figures)	25%
Systematic review (review, data, meta-data)	20%

*Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.*

## Important Dates

### Lecture component

Oct 22, 2015 Lecture Test  
Nov 19, 2015 Grant Proposal  
Nov 26 & Dec 3 PechaKucha Presentations

### Lab component

Nov 5, 2015 Lab Report on your independently design group experiments  
Dec 3, 2015 Systematic Review on approved topic of choice

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

Lecture material	Slides provided by instructor
Textbook	'Experimental design for the life sciences', third edition, by Ruxton & Colegrave, Oxford University Press.
Lab manual	Provided by Instructor
Readings	Provided by instructor and teaching assistants
Software	figshare.com, plot.ly, myexperiments.org, GitHub, Open Science Framework

## Learning Outcomes

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

- (1) Understand the core concepts of experimental design for any natural science experiment.
- (2) Understand key terminology, semantics, and experimental design philosophies.
- (3) Critically assess experiments.
- (4) Provide visual heuristics and workflows for experiments.
- (5) Be able to design & execute an effective experiment.
- (6) Be able to publish a dataset in a public repository with well-articulated meta-data.
- (7) Be able to clearly write a well-structured manuscript suitable for publication in PeerJ pre-prints.
- (8) Understand the difference between systematic reviews and meta-analyses.
- (9) Be able to do a systematic review, analyse the research, and summarize in a manuscript suitable for publication in PeerJ pre-prints.
- (10) Be able to present a succinct presentation of a grant proposal for a viable research project.

## Course Content

Experiments are a powerful tool to understand, manage, and explore the world around us. This course will provide you with the terminology and concepts you need to be competitive and effective in research and employment. The lectures include exploration of the key terminology and ideas you need to process experiments. You will also practice design experiments in the lecture. In the labs, you will do a field experiment you design from scratch. You will also do a systematic in the labs to ensure you are familiar and capable in handling this pivotal knowledge synthesis tool. There is also a significant focus on open science, collaboration, and data/workflow sharing.

### Lectures

The first 6 weeks of lectures are traditional professor-lead instruction presenting and discussing the assigned textbook. This component of the lectures provided you with the critical elements, ideas, tools, and terminology you need to design experiments. A standard short and long-answer test will be used to evaluate performance. **The long-answer questions will be provided in advance of the test.**

The next 6 weeks of lecture focus on pragmatic primary research that both the instructor and students identify associated with their individual research interests. The primary purpose of this component of the lectures is to **provide you with the opportunity to generate a novel, useful research proposal on the topic of your choice.** This also perfectly complements the concurrent focus of the labs in the course on the same topic as the systematic review. Presentations will be PechaKucha (<http://www.pechakucha.org>), and a shark tank model will be used to provide rapid, effective feedback to students.

### Labs

Learn by doing. The **first component of the labs is student-lead group research experiment** on an environmental/ecological/evolutionary experiment designed by the students. Once designed, a total of 3 weeks is provided to collect data. An additional week is then available to meet with teaching assistant and ensure analyses are correct. Then another week is provided for writing.

The second component of the labs focuses on **systematic reviews** (design, analysis, and interpretation). Students are instructed on how to do them and then provided with an opportunity and guidance in doing one, individually on a topic of their choice (approved by teaching assistant). This latter component is designed to ensure students have an undergraduate, rewarded/graded opportunities to explore an advanced topic they are truly interested in for personal or professional reasons. The systematic review is useful for graduate research and employment within the field of choice. This work is also leverage for the grant proposal in the lectures and also the PechaKucha presentations. Consequently, **students are provided with a graded set of opportunities to immerse in an advanced research topic of their choice.**

## Experiential Education and E-Learning

Experiential education. Student will be provided with hands-on, highly practical field and lab experience in experimental design and data handling. In the lectures, we will also very actively design experiments.

E-learning. Students will be provided with the opportunity to explore data repositories and evaluated on use of data sharing tools. Twitter and a discussion blog will also be use to facilitate open discovery and connection of principles. Students will also be provided with the opportunity to further research skills using online bibliographic databases to do knowledge synthesis.

## Other Information

### EXPECTATIONS

Attendance is mandatory because the lectures will provide an opportunity for the students not only to listen to summary lectures of the readings by the professor but to also engage in the active design of experiments. In the lectures, we will work together to design many of the test questions (but not the answers). All information presented in class including information not provided on lecture slides and the additional resources is testable.

## Course Policies

If the in-class test is missed for a valid, well documented reason, the student will NOT receive a grade of 0 for that evaluation tool if the following conditions are met (1) the course director is notified within one week of the evaluation, and (2) all relevant documentation is provided within one week in person at the next lecture. Alternative assignments/evaluations are also not available in the lab component of the course. If the teaching assistant and lab administrator are notified within one week and relevant documentation is also provided at the time, the lab administrator will note the valid absence from submission of lab work and your lab component will be differentially weighted to avoid penalty for valid absence. However, to complete the course, you must complete at least 30% of each of the evaluations in the lectures and 20% of the lab work.

To promote fairness and student responsibility, all in class exercises are due on the dates specified on the course website. A 20% penalty will be applied for the first day the exercise is late and 5% every day thereafter. Students who anticipate being unable to submit the exercises on the due date are encouraged to submit early.

Grades on exercises and exams are not negotiable. Every reasonable action is made to ensure multiple assessments of the assignments before conveying grades to assure consistency across the entire class. Thus, the course director should only be contacted if there is calculation or clerical error present.

Students are not allowed to record lectures or lab tutorials using their own devices.

## 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.

Student's 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/>