

## Department of Biology Course Outline

### Biol 4390.3 Population Genetics Winter, 2017

#### Course Description

Evolution is the key to the fascinating and incredibly diverse forms and functions we observe in nature. This course will explore the evolutionary processes that control the fate of novel genetic variants arising from mutation in natural populations, mainly chance (i.e. genetic drift) and natural selection. After an introduction to the theory underlying population genetics and molecular evolution, we will focus on current topics in the field, including how to detect the signatures of selection on the genome, and how the phenotype evolves. Students completing BIOL4390 will gain a solid understanding of the evolutionary process, which will help them pursue careers in academia (e.g. evolutionary genetics and ecology), biomedicine (e.g. understanding the role of genetic diversity and disease susceptibility in Humans), and agriculture (e.g. improving domesticated animal and plant stocks using artificial selection).

#### Prerequisites

SC/BIOL 2040 3.00 or SC/BIOL 2040 4.00; SC/BIOL 2060 3.00 (or equivalent).

#### Course Instructors and Contact Information

Dr. Amro Zayed  
Associate Professor  
Department of Biology  
Tel.: 416-736-2100 x 20213

#### Schedule

M,W,F: 9:30 to 10:30 am, ACW 205

#### Evaluation

Weekly Quiz each Friday (N=12)  
Assignments (N=3)

36% (3 % each)  
64% (21⅓ % each)

### Important Dates

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.

Relevant course information and links to peer-reviewed papers will be posted on the course's moodle website

### Learning Outcomes

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

1. Gather and summarize population genetic datasets
2. Carry out and interpret analyses to estimate relatedness, inbreeding, gene flow, and population size
3. Carry out and interpret analyses to determine if loci are adaptively evolving
4. Carry out and interpret analyses to link mutations with quantitative traits.

### Course Content

1. Introduction to Population Genetics and Genetic Variation, HWE
2. Mating-system Inbreeding and Linkage disequilibrium
3. Evolution and Genetic Drift
4. Population subdivision and gene flow
5. Mutation and Neutral Theory
6. Neutral Theory and Selection
7. Detecting Selection (module 1)
8. Detecting Selection (module 2)
9. Introduction to quantitative genetics
10. QTL analysis
11. Genomics and the Genotype-Phenotype problem
12. Population genomics

### Experiential Education and E-Learning

Description of course components that would be classified as EE or e-learning.  
Analysis of individualized simulated datasets.

### Other Information

n/a

### Course Policies

Policies you set for your course – for example:

- Policy for missed quizzes:  
If missed for valid reasons (see University Policies below), the missed marks will be reallocated to other quizzes.
- Penalties for late assignments:  
Assignments must be completed on the assigned due date. Late assignments will not be accepted
- Email and discussion forum etiquette/policies:  
If you have any questions regarding the course material please post a message on the course's Discussion forum on Moodle. I have allocated time to check and answer questions on the discussion forum. I do not answer questions regarding the subject matter and/or assignments via email. If you wish to meet with me in person – please send me an email with the title: **“BIOL4390 Request for Appointment”**, and include your full name and student number in the body of the email.
- Policies for recording lectures:  
Recording lectures is not permitted.

## 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-andor-harassing-behaviour-in-academic-situations-senate-policy/>