

*This syllabus is a general representation of the course as previously offered and is subject to change.*

## **BIOL 434 Population Genetics / BIOL 509 Population and Quantitative Genetics**

General Course Syllabus (as of June 2019)

### **About the Course:**

**Course Description:** Theoretical and experimental aspects of population and quantitative genetics.

**Course Format:** Lecture

**Credits:** 3

**Pre-requisites:**

For BIOL 434: BIOL 336 and either (a) BIOL 200 and one of BIOL 233, BIOL 234; or (b) FRST 302.

For BIOL 509: The course is restricted to graduate students.

### **Course Objectives / Learning Outcomes:**

The course aims to introduce the study of the process of evolution through population and quantitative genetic models.

By the end of this course, students should be able to:

- Apply Hardy-Weinberg principles, probability, and mathematical models to predict outcomes of allele frequencies, genotype frequencies, and phenotype frequencies.
- Explain and predict the factors that can cause genotype frequency changes, including random drift, selection, mutation, migration, recombination, non-random mating (inbreeding), sex ratio evolution, and population structure.
- Understand the assumptions made in population models.
- Describe introductory concepts of quantitative genetics.

### **Textbooks and Additional Resources:**

Course web-page: <http://www.zoology.ubc.ca/~whitlock/bio434/>

The (optional) textbook is Charlesworth and Charlesworth, *The Elements of Population Genetics*. You may prefer an equally good (in different ways) text by Joe Felsenstein, which is freely available as a PDF at <http://evolution.genetics.washington.edu/pgbook/pgbook.html>.

There are also many references on reserve in Woodward Library, including copies of *Principles of Population Genetics* by Hartl and Clark.

## Grading Scheme / Evaluation:

The final grade for BIOL 434 will be composed of:

Final exam	50%
Midterm	30%
Assignment marks and class participation	20%

The midterm date will be determined by majority vote of the class.  
Assignments are due in class.

## Schedule of Topics:

Warning: this is an approximate schedule and we will add topics and vary the order fairly often.

Week	Topics
1	<b>Review</b> of allele frequencies, Hardy-Weinberg equilibrium, and linkage equilibrium; Hardy-Weinberg equilibrium for multiple alleles and loci
2	<b>Drift</b> : Identity by descent, diffusion, the coalescent
3	Effective population size
4	<b>Mutation</b> : Types of mutations, mutation and drift, neutral theory
5	<b>Selection</b> : Defining and measuring fitness, single locus models
6	Mutation selection balance, frequency dependent selection, gametic selection
7	Selection and drift, selection on two or more loci, estimating selection
8	<b>Inbreeding</b> : Calculation of inbreeding coefficients, mating system evolution
9	<b>Population Subdivision and Migration</b> : Wahlund effect, F statistics, genetic distance
10	Models of population structure, migration and drift, interdemic selection
11	<b>Quantitative Genetics</b> : Heritability, estimating heritability, response to selection
12	Genetic basis of quantitative traits, sources of variance, norms of reaction
13	Maintenance of quantitative variation, response to multivariate selection

## Course Policies

Make-up policy: Make-ups for the final exam will follow the university policy. No make-ups for the mid-term are given. If a student misses the mid-term for a valid reason, the final exam grade will be counted for the mid-term as well.

## **University Policies:**

*UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.*

*UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.*

*UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.*

*UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.*

*Details of the policies and how to access support are available on [the UBC Senate website](#).*