HGEN661 – Population Genetics

General Information

Instructors: Simon Gravel

Coordinator: **Simon Gravel, PhD**
Assistant Professor
Department of Human Genetics
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Workload: 3 credits

Prerequisites: Statistics or probability at the undergraduate level; concepts of conditional probability and Bayes Theorem. Basic programming skills: assignments will have a substantial programming component. This should not require advanced programming, but students should at least be familiar with basics such as loops, functions, variable and variable definitions. Students with limited programming experience may find this course challenging. In case of doubt, inquire with course instructor.
Python will be the default language for explanations, but other languages can be used for projects, by permission of course coordinator. Registration is by permission of course coordinator.

Maximum enrollment: 20

Learning Objectives:
Primary objectives:
-Understand the basic concepts in population and statistical genetics relevant to the study of genomic diversity.
-Learn to apply these concepts to the analysis of genetic data
-The ability to perform basic simulations, to organize code, and to hack into existing software.
Secondary objectives
-The means to critically evaluate population genetic claims in research papers,
-Awareness of the tools that may be used to model these evolutionary effects,

Content: The topics cover diverse strategies to understand, describe, and quantify patterns of genomic diversity. Most applications will be drawn from the field of human genetics, but the material will be useful for laboratory and natural populations of other species.

Course Topics :

- Populations, alleles, and genetic variation
- Single locus evolution
- Multi-locus evolution
- Finite populations: drift and sampling issues
- Natural selection
- Coalescent theory
- Population genetics of disease
- Inbreeding
- Linkage (and genetic maps)
- Population structure

Required Readings: Research papers from scientific journals selected by the course instructors, as well as selected chapters from various textbooks. Links to readings will be provided in the homework assignments.

Method of course delivery: The majority of the course will be self-paced through fill-in-the gaps programming exercises, to be performed in-class.

Method of Evaluation: This is a pass/fail course. The distribution of grades as follows:

- Class participation and assignments: 100%. There will be at least 10 assignments, each worth 10% of the final grade. Students are expected to complete 8 assignments for a "pass" grade. Evaluation of the assignment will be performed in class, and the instructor/TA will evaluate student understanding of the assignment.

Right to submit in English or French written work that is to be graded:
In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Academic Integrity statement:
McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).