BIOC16H3 – EVOLUTIONARY GENETICS & GENOMICS
WINTER 2020
COURSE SYLLABUS

Lecture: Tuesday, 14:00-16:00, MW 264
Tutorial: Thursday, 09:00-11:00, BV 264

Instructor: **Dr. Mark Fitzpatrick**
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Office: SW558
Office Hours: Monday 11:00-12:00, Thursday 12:00-14:00

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Office Hours: TBA

DESCRIPTION: This course will cover the fundamentals of modern ecological and evolutionary genetics and genomics. The course begins with an overview of genetic variation, its measurement, and the forces responsible for the origin and maintenance of variation. The remainder of the course describes the ecological and evolutionary context of natural selection, and the forces that shape genetic variation and genomic within and between species. Emphasis will be placed on experimental studies of natural populations, and the relationship between theory and experiments. Overall, the goal of this class is to enable students to apply insights gained from classic and modern genetic and genomic techniques to understand how variation is produced, maintained, and distributed within and among populations.

LEARNING OBJECTIVES:

1. Understand the importance of the four agents of evolution and how they change allele frequencies in populations.
2. Calculate and apply Wright's F-statistics that are used to understand population differentiation.
3. Develop a basic understanding of quantitative genetics, QTL mapping, reaction norms, and the evolutionary significance of phenotypic plasticity.
4. Understand and apply the usage of positive Darwinian selection to assess i) genetic evolution in a population, ii) evolutionary divergence between related species.
5. Gain a basic understanding of how genes arise and evolve.
6. Develop a basic understanding of epigenetic regulation and its role in evolution.
7. Develop solid oral presentation skills and the confidence to talk in front of your peers.
8. Gain the skills necessary to critically analyze and discuss cutting edge scientific papers.

REQUIRED TEXTBOOK:
Cutter, A.D. (2019) A Primer of Molecular Population Genetics. Oxford University Press.

OTHER READINGS: Any additional lecture readings along with pdfs for the tutorial paper discussions will be available on Quercus.

LECTURES: Most lectures will be delivered as "chalkboard" discussions. This will require you to attend class and take effective notes. Handwritten notes are ideal since they will include graphs, drawings etc. I will not post any notes for the chalkboard lectures so if you miss a lecture you should seek notes from a classmate. I strongly encourage students to ask questions, seek clarification, and discuss concepts during the lecture. Interruptions are encouraged!

TUTORIALS: Weekly tutorials will be run as discussions of key scientific papers and associated methodologies. The beginning weeks will feature example presentations and presentation tips by the TA. The following weeks will consist of presentations and discussions led by students in the class. Each student is required to present one (1) paper during the term and lead the corresponding class discussion pertaining to that paper. The grading rubric will be discussed during the initial tutorials. A candidate list of papers will be provided by the instructor/TA.

Students are also required to submit nine (9) assignments during the term that consist of summaries and discussion questions. This will include one summary per week (students will not submit a summary on the week of their presentation). Students must select one paper from the papers to be discussed each week and submit a single page précis that summarizes the hypotheses, experimental approaches, major findings, and broad significance of the paper. In addition, students must also submit four discussion questions stemming from that paper.

GRADING & EVALUATION:

Assessment Type	Grade Value
Final Exam (3 hrs)	35%
Midterm Exam (2 hrs, in class)	25%
Presentation & Discussion	15%
Problem Set	7%
Summaries with Questions (9 x 1.44% each)	13%
Participation (lecture and tutorial)	5%
TOTAL	*100%*

Note: The final examination will be cumulative, however, a greater emphasis will be placed on the material covered after the midterm.

PROBLEM SET:
The problem set will be a series of questions related to topics discussed in lecture. Questions may include: multiple choice, short answer, matching, true/false, calculations, problem solving, multiple choice. The Problem Set will be posted to Quercus, 1-2 weeks prior to the deadline. A completed hardcopy will be due in class at 14:00 on March 17, 2020. It is worth 7% of your final grade in the course.

ACADEMIC INTEGRITY:
The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil. utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment. On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

ACCESS FOR STUDENTS WITH DISABILITIES: Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. AccessAbility Services staff (located in Rm AA142) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email ability@utsc.utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

MISSED EXAMS: There will be no make-ups for the midterm exam. Students unable to attend the midterm for religious reasons must notify the instructor as soon as possible. Students who are unable to attend the midterm due to illness must notify Prof. Fitzpatrick (by telephone or email) within 3 working days of the test. Acceptable reasons for missing a test include: illness (a doctor's note will be required, see below), death of a close family member, and *severe* storm days. Unacceptable excuses include: having another midterm on the same day, extended reading week travel plans, and minor traffic and weather disruptions.

Students who miss the midterm for a medical reason must present a completed UTSC medical certificate (available via the registrar's website) that confirms their illness, and medical attention, at the time of the exam. *Medical certificates will be verified*. Students who miss the midterm and have provided acceptable documentation must make arrangements with Prof. Fitzpatrick for alternative evaluation or increasing the weight of their final exam. Students that miss the midterm with no acceptable, documented excuse will receive a grade of zero. Students that miss the final exam must petition the Registrar to write a deferred exam.

INTELLECTUAL PROPERTY:
Recording or photographing any aspect of a university course - lecture, tutorial, seminar, lab, studio, practice session, field trip etc. – without prior approval of all involved and with written approval from the instructor is not permitted.

DISCLAIMER: The instructor reserves the right to modify this syllabus and lecture schedule as necessary throughout the term to better achieve course objectives and/or enhance the quality of instruction. As such, the lecture and tutorial outlines provided below are tentative. Notification of changes will be made in class and the most up-to-date version will always be the one available on Quercus. You are responsible for being aware of the contents of this syllabus.

***TENTATIVE* LECTURE SCHEDULE:**

Date	Topic	Reading
07 Jan	Introduction / Syllabus	
14 Jan	Measuring Genetic Variation	tba
21 Jan	Changes in Allele Frequency I	tba
28 Jan	Changes in Allele Frequency II	tba
04 Feb	F-Statistics & Population Differentiation	tba
11 Feb	Quantitative Genetics I: Introduction & Heritability	tba
18 Feb	*No lecture (Reading Week)*	
25 Feb	**Midterm Exam (in class)**	tba
03 Mar	Quantitative Genetics II: Phenotypic Plasticity, Reaction Norms, Linkage Disequilibrium	tba
10 Mar	Quantitative Genetics III: QTL Mapping	tba
17 Mar	Detecting Positive Selection	tba
24 Mar*	Genomics: The Evolution of New Genes & Lateral Transfer	tba
31 Apr*	Epigenetics & Evolution	tba

* = these lecture topics may be modified by the instructor