BIOL 2013 3 ch (3C) **Winter 2019**
Evolutionary Genetics

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Sessions **Bailey Hall 146**

Mondays	10:30 PM - 11:20 AM
Wednesday	10:30 PM - 11:20 AM
Friday	10:30 PM - 11:20 AM

Co-requisite **BIOL 2018 Laboratory in Evolutionary Genetics**

Pre-requisites

BIOL 1001	Biological Principles, Part I
BIOL 1006	Applications in Biology, Part I
BIOL 1012	Biological Principles, Part II
BIOL 1017	Applications in Biology, Part II

1. Overview

This course is a companion to BIOL 2018 Laboratory in Evolutionary Genetics. The overarching goal of this course is to provide you with an understanding of the genetic basis for evolutionary change, by integrating across the molecular and population scales. By the end of this course students will be able to answer the following questions:

- Where does new genetic variation come from?
- How do mutations occur at the DNA level?
- What are the principles of Mendelian genetics?
- What are the mechanisms of evolutionary change?
- What is linkage disequilibrium?
- What happens when multiple loci are under selection?
- How do we predict the evolutionary response to selection?
- How do species evolve?
- Are there "speciation genes"?
- How do non-selective mechanisms result in evolution?

2. Learning outcomes

Our goal is that at the end of the course all students will be able to:

- Explain the historical context that influenced Darwin's work and contributions
- Compile historical biological information to describe the basic process of evolutionary change by natural selection
- Understand and apply the principles of Mendelian inheritance for both autosomal and sex-linked loci
- Apply the laws of inheritance to construct and interpret human pedigrees
- Explain the molecular mechanisms of mutation
- Explain the evolutionary significance of different types of mutations
- Interpret variability in DNA and proteins using knowledge of the genetic code and the processes of transcription and translation
- Explain and illustrate the concept of mutation during DNA replication
- Explain linkage disequilibrium and use two- and three-point test crosses to calculate the distance between genes
- Recognize differences between the concepts of adaptive and non-adaptive evolution
- Use diverse methods to quantify genetic variation in populations
- Integrate strategies to estimate genetic variation solving problems related with molecular evolution
- Illustrate how selection on parts of the genome can influence neutral loci
- Use the Hardy-Weinberg equation to estimate the allele frequencies in a given population
- Use the Hardy-Weinberg equation and other evolutionary forces to predict changes in allele frequencies over time
- Quantify the evolutionary response to selection and determine the heritability of a trait
- Use existing models to predict the response of trait as a result of selection on a linked locus
- Use statistical methods to determine the influence of environment and genotype on phenotype
- Use phylogenetic data define a species under different species concepts
- Differentiate between the different models of speciation
- Recognize diverse models to explain the origin of modern human populations
- Critique non-scientific arguments on the origin of biological diversity using genetic and genomic information
- Analyze misconceptions and/or biased interpretations of scientific evolutionary thinking

3. Suggested textbook

The reference textbook is ***Evolutionary Analysis*** **(5th Edition)** by **S. Freeman and J.C. Herron.** The textbook is edited by **Pearson-Benjamin Cummins (ISBN-13: 978-0321616678)** and will be available at the UNB bookstore. The 4th edition of the book **(ISBN 978-0132275842)** is adequate as well. Copies of the textbook will be available on reserve in the Science Library.

4. Grading

To evaluate the student knowledge and understanding of concepts there are planned:

3 Quizzes
2 Midterm exams
1 Final exam (cumulative)

Quizzes

3 short multiple-choice quizzes will be given in class (check dates and value percentages below). These will provide students and professors with an assessment of progress on recent course material. The material that will be covered in the quizzes will be announced in class.

Midterm exams

Students will write **two midterm** exams (check dates and value percentages below). The midterm exams will cover material from **lecture sessions**.

Final exam (cumulative)

The **Final Exam** (date to be defined) **is cumulative**.

4.1. Grade break-down

4.1.1. Quizzes (4% each) **12% of final grade**

Dates

1. January 21, 2019
2. February 15, 2019
3. March 27, 2019

4.1.2. Exams **38% of final grade**

Dates		
Midterm exam #1	February 1, 2019	**19% of final grade**
Midterm exam #2	March 1, 2019	**19% of final grade**
Final exam	Date to be defined	**50% of final grade**

4.2. Grade distribution

Score (%)	Grade	Score (%)	Grade	Score (%)	Grade
100-93	A+	75-79	B+	60-64	C+
85-92	A	70-74	B	55-59	C
80-84	A-	65-69	B-	50-54	D
				<50	F

Quizzes, midterm and final exams are **absolutely obligatory**. In particular cases (e.g., illness), exam repositions are possible within the **next two days** following the scheduled exam date. Requests to write any exam prior to the scheduled date will never be granted. The student will need to present proper documents to justify the absence. See *Statement of Absence* (section 7 below).

5. General policies

Use of electronic devices

Computers and tablets
Feel free to bring your laptops or tablets to the lectures, but only use these in a manner that will not disturb those around you. Please refrain from using your laptops for anything other than taking notes.

Calculators
Use of calculators on quizzes, midterms, and exams is permitted and encouraged.

Mobile phones and similar devices
Phones must be turned off and remain off for the duration of lectures/labs.

Academic Integrity

Cheating during exams and plagiarism, **particularly copying written assignments**, won't be tolerated.
Conducts considered as **plagiarism** are:

1. Quoting verbatim or almost verbatim from a source (such as copyrighted material, notes, letters, business entries, computer materials, etc.) without acknowledgment.
2. Adopting someone else's line of thought, argument, arrangement, or supporting evidence (such as, for example, statistics, bibliographies, etc.) without indicating such dependence.
3. Submitting someone else's work, in whatever form without acknowledgment.

4. Knowingly representing as one's own work any idea of another.

For more detail please refer to http://lib.unb.ca/research/Plagiarism.html and read carefully UNB regulations and definitions regarding plagiarism.

6. Helpful on-campus resources

Writing and Study Skills Support

UNB's Student Services provides many coaching and mentoring services to assist with writing papers, effective study methods, and other skills development related to student success: http://www.unb.ca/fredericton/studentservices/academics/writing-centre/index.html

Science Library Support

UNB's Science Library offers assistance to students with respect to research and information literacy: http://lib.unb.ca/about/science.php

Math Skills Support

UNB's Math Learning Centre offers math help drop-in times and opportunity to book appointments: http://www.math.unb.ca/~mathhelp/

Technical Support

Information Technology Services (ITS) Help Desk can be reached by phone 453-5199, email - helpdesk@unb.ca, or visited in person at the Harriet Irving Library Learning Commons. http://www.unb.ca/its/get-it-help.html

7. Statement of Absence

Department of Biology
University of New Brunswick
10 Bailey Drive, Room 29
Fredericton, NB
E3B 5A3
Phone: (506) 453-4583

STATEMENT OF ABSENCE

TO BE COMPLETED BY THE STUDENT
If you miss a quiz or midterm exam for any reason, please complete this form and *sign it upon handing it to the course instructor*. It must be handed in within 2 days of your return to classes.

Contact Information (please print)

Last Name	First Name	Middle Name	Student Number
Address		City	Postal Code
Telephone/Cell	Faculty		UNB email

Reason for missed evaluation or midterm exam (please print)
Please briefly identify the reason for missing the evaluation session (details are not necessary). You must include supporting documentation.

Student's Statement:
I certify that I was incapacitated on the date(s) given above and did not complete the evaluation listed above. I recognize that falsification of documentation or misrepresentation constitutes academic dishonesty and can result in disciplinary charges.
I understand that it is my responsibility within seven calendar days of my return to campus, to sign this form with the instructor of the lab course listed above.

Student's Signature	Date (dd/mm/yyyy)

8. Course Outline

Lectures are distributed over 12 weeks including **2 reserved days** for the midterm exams.

There are six modules of the course:
M1: History of Evolutionary Thinking
M2: Molecular Basis for Evolutionary Change
M3: Evolutionary Driving Forces
M4: Mechanisms of Speciation
M5: Evolution of Multigene traits
M6: Evolution and Culture

Planned class schedule

DATE	TEXTBOOK		WEEK	SESSION
Monday, January 7, 2019		**All**	**1**	1
Wednesday, January 9, 2019	**Ch. 2**	Adrian		2
Friday, January 11, 2019	**Ch. 2**	Adrian		3
Monday, January 14, 2019	**Ch. 4**	Adrian	**2**	4
Wednesday, January 16, 2019	**Ch. 4**	Adrian		5
Friday, January 18, 2019	**Ch. 4,5**	Adrian		6
Monday, January 21, 2019	**Ch. 5**	Adrian	**3**	7
Wednesday, January 23, 2019	**Ch. 5**	Adrian		8
Friday, January 25, 2019	**Ch. 5**	Adrian		9
Monday, January 28, 2019	**Ch. 5**	Adrian	**4**	10
Wednesday, January 30, 2019	**Ch. 5**	Adrian		11
Friday, February 1, 2019		Adrian		12
Monday, February 4, 2019	**Ch. 6,7,16**	Jason	**5**	13
Wednesday, February 6, 2019	**Ch. 6,7,16**	Jason		14
Friday, February 8, 2019	**Ch. 6,7,16**	Jason		15
Monday, February 11, 2019	**Ch. 6,7,16**	Jason	**6**	16
Wednesday, February 13, 2019	**Ch. 6,7,16**	Jason		17
Friday, February 15, 2019	**Ch. 6,7,16**	Jason		18
Monday, February 18, 2019			**7**	
Wednesday, February 20, 2019	**Ch. 6,7,16**	Jason		19
Friday, February 22, 2019	**Ch. 6,7,16**	Jason		20
Monday, February 25, 2019	**Ch. 6,7,16**	Jason	**8**	21
Wednesday, February 27, 2019	**Ch. 6,7,16**	Jason		22
Friday, March 1, 2019		**Jason**		23
Monday, March 4, 2019				
Wednesday, March 6, 2019				
Friday, March 8, 2019				
Monday, March 11, 2019	**Ch. 8**	René	**9**	24
Wednesday, March 13, 2019	**Ch. 8**	René		25
Friday, March 15, 2019	**Ch. 8**	René		26
Monday, March 18, 2019	**Ch. 8**	René	**10**	27
Wednesday, March 20, 2019	**Ch. 9**	René		28
Friday, March 22, 2019	**Ch. 9**	René		29
Monday, March 25, 2019	**Ch. 11**	René	**11**	30
Wednesday, March 27, 2019	**Ch. 12**	René		31
Friday, March 29, 2019	**Ch. 12**	René		32
Monday, April 1, 2019	**Ch. 15**	René	**12**	33
Wednesday, April 3, 2019	**Ch. 20**	René		34
Friday, April 5, 2019	**Ch. 20**	René		35