Biology 3046 | Molecular Evolution

Term Offered in the Fall term

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Office hours: by appointment

Time Typically Tuesdays and Thursdays | 2:35 – 3:55

Location LSC

Lectures The format of the course is a series of 1 hour 20 min lectures. The lecture schedule indicates the topics covered in each session.

Students with disabilities are encouraged to register as quickly as possible at the Student Accessibility Services if they want to receive academic accommodations. To do so please phone 494-2836, e-mail access@dal.ca , drop in at the Killam, G28 or visit the website at www.studentaccessibility.dal.ca.

References There is no required textbook for this course. Lecture notes will be posted on the course website. In addition, key scientific papers and/or review articles relevant to the lecture material will be posted on the web. Students are advised to download these materials and read them thoroughly in preparation for each lecture.

The following books have been placed on reserve in the Killam Library: (1) Page, R. D. M. & E.C. Holmes. *Molecular Evolution: A Phylogenetic Approach*. 1998; (2) Li, Wen-Hsiung. *Molecular Evolution*.1997; (3) Avise, John C. *Molecular Markers, Natural History & Evolution* . 1994; (4) Nei, Masatoshi. *Molecular Evolution and Phylogenetics*. 2000; (5) Felsenstein, Joseph. *Inferring Phylogenies*. 2003; (6) Daniel L. Hartl and Andrew G. Clark. *Principles of population genetics* (1997). These textbooks provide thorough coverage of many of the topics covered in this course

The following scientific journals provide an excellent source for additional information, and are available either in print or electronically through the Dalhousie Libraries: *Genome Research, Journal of Molecular Evolution, Molecular Biology and Evolution, Molecular Phylogenetics and Evolution, Trends in Ecology and Evolution, Bioinformatics, Development Genes and Evolution, Evolution, Genetics, Nature, PNAS(USA), Science* and *Systematic Biology*. Students can search the journal literature via databases such as Biological Abstracts, PubMed and Web of Science. The library also makes available a document delivery service that permits students to order journal articles for a nominal fee of $2.00 per article.

Course website www.biol3046.info

Assessment:

Evaluation:
Exam 1: 25%
Exam 2: 25%
Exam 3: 25%
Project: 25%

Examinations:
The exam structure will include multiple choice and short answer questions. A description of the material covered in the exam, as well as any changes to the exam structure, will be provided at least one week before the examination date. Make-up exams will not be administered in cases where an exam is missed due to travel.

Project:
The web has become an extremely important source for dissemination of molecular data, scientific knowledge and analytical resources related to the discipline of molecular evolution. By completing this project a student will demonstrate a proficiency to use web-based resources to address topics in molecular evolution.

You will select a topic that interests you. You will conduct a survey of the literature using web-based resources, and write a scholarly summary of a particular point. You will then construct a web-site dedicated to your topic. Minimally, the site should include (i) the summary; (ii) the results of the literature survey; and (iii) links to material on the web that is relevant to the topic. This list is a bare minimum (you get 1/2 the credit for this); you can add as much additional content relevant to your topic as you like. You should have fun with this project, it is not all that hard! Potential topics are wide open, and can relate to an evolutionary theory, a biologically motivated problem, a new method of data analysis, a particularly useful database, etc. After deciding on a topic, you must receive approval from the instructor. Do NOT simply mimic, or paraphrase, the information from a pre-existing portal; this is plagiarism and will not be tolerated.

The final web-portal should be saved as a fully functional website and "burned" onto a CD an turned in by the due data. You will be graded on functionality of the site (i.e., do all the links work) as well as content.

Student Accessibility
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Letter Grades:

Percentage	Letter Grade
90 – 100	A+
85 - 89.9	A
80 - 84.9	A-
75 - 79.9	B+
70 - 74.9	B
65 - 69.9	B-
60 - 64.9	C+
57 - 59.9	C
55 - 56.9	C-
50 - 54.9	D
Below 50	F

Example of a class schedule

Week		Section	Topics
1	Th	Introduction	class business
2	Ts	1. Foundations	1.1 Introduction; 1.2 History
	Th	1. Foundations	1.3 Mutation and recombination
3	Ts	1. Foundations	1.4 Review of probability and Likelihood
	Th	2. Population genetics	2.1 Introduction; 2.2 Hardy-Weinberg equilibrium
4	Ts	2. Population genetics	2.3 Linkage disequilibrium
	Th		**Exam 1**
5	Ts	2. Population genetics	2.4 Inbreeding; 2.5 Mutation
	Th	2. Population genetics	2.6 Assortative mating; 2.7 Natural selection
6	Ts	2. Population genetics	2.8 Genetic Drift; 2.9 Equilibrium polymorphism
	Th	3. Phylogenetics	3.1 Introduction; 3.2 Homology evolving
7	Ts	3. Phylogenetics	3.3 Phylogenetic Methods
	Th		**Exam 2**
8	Ts	4. Neutral evolution	Web project; 4.1 Genetic load
	Th	4. Neutral evolution	4.2 Neutral theory
9	Ts	4. Neutral evolution	4.3 Macroevolution
	Th	4. Neutral evolution	4.4 Molecular clock
10	Ts	5. Functional divergence	5.1 FFTNS and Shifting Balance
	Th	5. Functional divergence	5.2 Structure and function of genes and proteins
11	Ts	5. Functional divergence	5.3 Evolution of new genes
	Th	5. Functional divergence	5.4 Evolution of the molecular tool box
12	Ts	5. Functional divergence	5.5 Statistical tests; 5.6 Case studies
	Th	6. Fun Stuff	Ancient DNA studies / Paleomolecualr Archeology
13	Ts	6. Fun Stuff	Human origins
	Th		**Exam 3**