

**University of Guelph
College of Biological Science
Department of Integrative Biology**

COURSE OUTLINE

BIOL*2400 Evolution

Winter 2018

Course description

BIOL*2400 Evolution F, W (3-0) [0.50]

This course provides a broad overview of evolutionary biology. It examines the concepts and mechanisms that explain evolutionary change and the evolution of biological diversity at different levels of biological organization (gene to ecosystem) and across space and time. It also introduces historical forms of scientific inquiry, unique to biology. The course is designed to be of interest to students with general interests in science and in research in all areas of biology.

Prerequisites: BIOL*1040 or (BIOL*1070, BIOL*1090)

Restriction: BIOL*3400

Department: Department of Integrative Biology

Teaching team

Professor: Dr. Elizabeth G. Boulding

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Office hours: W 1:00-3:00 or by appointment

Professor: Dr. Moira Ferguson

Office: SCIE 1457

Phone extension: 52726

email: mmfergus@uoguelph.ca

Office hours: M, W 2-3 pm or by appointment

Please direct all administrative/academic queries to Dr. Ferguson

Teaching Assistants:

Katherine Drotos	kdrotos@uoguelph.ca
Melissa Holborn	mholborn@uoguelph.ca

Course schedule

Lectures: Monday/Wednesday/Friday, 12:30-1:20pm RICH 2520 (First class is Monday January 8th)

Tutorial review sessions: teaching assistants will run multiple optional tutorial help sessions on specific Fridays as indicated on CourseLink in SSC 3306 (TBA) to assist students with the course material, assignment and research summary. Attendance is optional but encouraged. Professors may also conduct pre- and post-midterm review sessions in class and tutorial slots.

Learning Outcomes (goals and rationale)

By the end of the course students will understand the major theories and hypotheses that have been proposed to explain the generation of biodiversity at all levels of biological organization and methods that can be used to test them. This will include:

Learning goals and rationale

(1) Conceptual skills:

- (a) Differentiate Darwin's original theory from the "Modern Synthesis".
- (b) Accurately define and describe terms and concepts such as evolution, adaptation and fitness.
- (c) Explain simple methods of phylogenetic tree estimation and interpretation.
- (d) Explain basic mechanisms of evolutionary change at the genetic, molecular and phenotypic levels such as natural selection, genetic drift, mutation and gene flow.
- (e) Identify, differentiate, analyze and give examples of processes such as sexual selection, multi-level selection, life-history evolution, and co-evolution.
- (f) Identify species concepts and explain common mechanisms of speciation.

(2) Inquiry skills:

- (a) Construct a phylogenetic tree using the cladistic approach.
- (b) Elementary practice with model building and hypothesis testing.

(3) Basic skills:

- (a) Comprehend and summarize scientific material on Evolution.
- (b) Acquisition, filtering, and synthesis of scientific concepts, facts and methods.
- (c) Applied numeracy
- (d) Communicate scientific ideas about evolution.

Course Resources

Lectures: The purposes of lectures are to motivate interest and curiosity in the topic of evolution while supporting students in their learning of fundamental topics, concepts and methods in evolutionary biology. Students will be expected to also supplement their learning through readings from the course textbook and the primary literature as indicated by the instructor. Students are strongly encouraged to complete assigned readings prior to coming to lecture.

Readings: Textbook and primary literature readings are assigned. The textbook for the course is *Evolution: Making Sense of Life* (2nd edition) by C. Zimmer and D. Emlen (ISBN: 9781936221554) and is on reserve in the main library or available for purchase at the bookstore. Assigned readings from the primary literature may be indicated in assignments or lecture.

Courselink: Lecture notes and other course materials will be posted here. This site will be used for instructions and hints on the assignments, to ask the Professors about course material and logistics, and to communicate with other students in the course.

Course Content

General topics and their approximate coverage in the course are listed below. The order of presentation during the semester is subject to change. Readings refer to relevant sections of the course textbook, *Evolution: Making Sense of Life* (2nd edition) by C. Zimmer and D. Emlen.

	Topics	Readings (due before lecture*) from Zimmer & Emlen 2016 textbook 2 nd ed.
1	History of Evolutionary Thought	Ch. 1: The Virus and the Whale: How Scientists Study Evolution. Ch. 2: Biology: From Natural Philosophy to Darwin. Know contributions of scientists referred to in class (not the others in the text).
2	Inferring Evolutionary History	Ch. 4: The Tree of Life: How Biologists Use Phylogeny to Reconstruct the Deep Past (not Box 4.2) Ch. 9: Molecular Phylogeny Methodology (Only figures and associated concepts referred to in class).
3	Population Genetics: Drift, Migration and Selection	Ch. 5: Raw Material: Heritable Variation among Individuals (Mutation); Sections 5.2-5.5 (including Box 5.2). Ch. 6: The Ways of Change: Drift and Selection; Sections 6.1-6.8. Note: not responsible for calculations not covered in class.
4	Quantitative Genetics	Ch. 7: Beyond Alleles: Quantitative Genetics and the Evolution of Phenotypes; Sections 7.1 & 7.3.
5	Natural Selection in the Wild	Ch. 7: Beyond Alleles: Quantitative Genetics and the Evolution of Phenotypes; Section 7.2. Ch. 8: Natural Selection: Empirical Studies in the Wild; Sections 8.1, 8.2, 8.5, 8.7.
6	Evolutionary Developmental Biology	Ch. 10: Adaptation from Genes to Traits; Sections 10.1-10.2.
7	Evolution of Sex, Sexual Selection	Ch. 11: Sex: Causes and Consequences; Sections 11.1-11.5.
8	Geographical Speciation and Sympatric Speciation: Going your Own Way versus Quantum Leaps	Ch. 13: The Origin of Species pages 412-449 EXCEPT Box 13.1
9	Evolution of Biodiversity: The early Paleozoic explosion, the late Mesozoic extinction of the dinosaurs and the early Cenozoic diversification of the modern mammals.	Ch. 3: What the Rocks Say: How Geology and Paleontology Reveal the History of Life pages 50-68, 76-91
10	The Day the Dinosaurs Died: Would humans have	Macroevolution: The Long Run pages

	evolved without meteorites and Mass Extinctions?	465-469; Adaptive radiations pages 478-480; K-T boundary in Big Five Mass Extinctions
11	Human evolutionary divergence from other primates.	Ch. 17: Human Evolution: A New Kind of Ape including pages 572-575; The emergence of Homo, Parallel Humans and New Discoveries from Ancient Genes pages 588-600.

Note: You can be tested on material in assigned readings from the text if the concepts have been covered in class. Usually such material will be straightforward descriptive examples. You will not be tested directly on recommended readings but they will help you understand the lecture material. Other supplementary readings as **assigned** during lectures will be available under our course number at the reserve desk in the library or on Courselink.

Methods of Assessment

Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcome Addressed
Midterm 1	15% or 25%	February 5th	Lecture, readings	Conceptual, inquiry and basic skills
Midterm 2	15% or 25%	March 12 th	Lecture, readings	Conceptual, inquiry and basic skills
Group Assignment	10%	January 31st	Phylogenetic Reconstruction and Population Genetics	Conceptual, inquiry and basic skills
Individual Writing Project – Summary and Comment about a Scientific Research Article	15%	January 19 th (approval); March 2nd (draft 5%); March 28 th (final 10%)	Lecture, readings	Conceptual, inquiry and basic skills
Final Exam	35%	April 20 th ; 2:30-4:30 pm.	Lecture, readings	Conceptual, inquiry and basic skills

Midterm Exams: The midterm exams will take place in class during the regular lecture period for that day. The midterm exams will include material covered in lecture and in the assigned readings and will include multiple choice and short answer questions. Since the material presented in the class will be integrated, all exams will be comprehensive (all material taught in class before the date of the exam) including the final exam. Each student's higher grade in the midterms will be worth 25%, while their lower midterm grade will be worth 15% of their final grade.

Final Exam: The final exam will take place during the regular examination period and will be worth 35% of the final grade. The final exam will cover all lectures and assigned readings. It will emphasize material since the second midterm but will be cumulative and require a deep synthetic understanding of all the concepts covered in the course.

Individual Writing Project: There are two parts to this project. First, each student will write and submit a Summary of a peer reviewed primary scientific article published in a research journal during 2017 on a topic in the field of evolutionary biology. Your target audience are the mostly second year biology students in our Evolution class and not the general public. Reviews, comments and perspectives are not to be used. The Summary will be a maximum of 400 words. Second, students will choose ONE concept from the Modern Synthesis of the Theory of Evolution taught in class and directly relevant to the research in the article. They will explain in a maximum of 100 words how the concept is supported (or not) by the research in the article. Details of requirements including formatting of references and websites will be given in class and posted on the class Courselink site. Students must upload their choice of scientific article for approval by the posted due date (11:59 pm) onto Courselink. The first draft of the writing project must be uploaded for grading by the due date and will be worth 5% of the final grade. Students will then revise their draft project based on feedback and upload an edited and final version for grading (10% of the final grade) by 11:59 pm on the due date. The use of summaries of the chosen scientific article published in the popular press (e.g., www.livescience.com; sciencedaily.com; bbc.com/news/science_and_environment) or elsewhere is strictly prohibited and is grounds for an allegation of academic misconduct.

Assignment: There will be a group Assignment worth 10% of the final grade. Students will be assigned to groups through the class Courselink site. The Assignment will involve reflection, discussion, and calculation on the topics of Phylogenetic Reconstruction and Population Genetics. The Assignment will be based on the relevant assigned readings, and lecture material. The Assignment will be posted on Courselink at least one week prior to the due date. The Assignment (one submitted document per group) must be uploaded to Dropbox on Courselink by 11:59 pm on the due date. Late assignments will be given a grade of zero. Assignments must be submitted in .txt or .pdf format. We recommend that all communication among group members be done in your group's private Discussion topic on Courselink in case you run into problems. (If you subscribe to your group's private Discussion topic then messages posted by group members will go directly to your email).

We will be using Turnitin, integrated with the CourseLink Dropbox tool, to detect possible plagiarism, unauthorized collaboration or copying as part of the ongoing efforts to maintain academic integrity at the University of Guelph. All submitted assignments and summaries will be included as source documents in the Turnitin.com reference database solely for the purpose of detecting plagiarism of such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. A major benefit of using Turnitin is that students will be able to educate and empower themselves in preventing academic misconduct. In this course, you may screen your own assignments through Turnitin as many times as you wish before the due date. You will be able to see and print reports that show you exactly where you have properly and improperly referenced the outside sources and materials in your assignment.

Important Dates*

January 15th	Students Assigned to Groups For Assignment
January 19th	Article for Writing Project Due for Approval
January 26th	Tutorial
January 31st	Group Assignment Due
February 2nd	Tutorial
February 5th	Midterm #1
February 9th	Tutorial
Feb 19-23rd	Mid-semester Break, no classes
March 2nd	Draft Writing Project Due
March 9th	Tutorial; 40th Class Day
March 12th	Midterm #2
March 23rd	Tutorial
March 28th	Final Writing Project Due
April 6th	Last Class
TBD	Tutorial
April 20th	Final Exam 2:30-4:30 pm

***Tutorial dates are subject to change**

Course and University Policies

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise **Dr. Ferguson** with your name, student id#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for Academic

Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

There will be two midterm examinations given on the dates shown in the table above in class. NO make-up midterm exam will be given. Any student who claims illness or compassionate grounds for missing the mid-term exam must obtain a certificate of illness or verification of compassionate reasons as outlined in the Undergraduate Calendar and give it to Dr. Ferguson within 1 week after the exam. If there is an adequate reason (a medical or compassionate exemption) for missing the mid-term exam, then the final will account for the sum of both exams. If you have no adequate reason for missing the exam then a mark of zero will be assigned for the mid-term exam. Students missing the final exam will need to formally apply for permission to write a deferred final examination during the next semester.

The date and time for the examination will be set by Office of the Registrar. An INCOMPLETE will be submitted as a mark for those students unable to complete the final exam.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibility Services as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email accessibility@uoguelph.ca or see the website: <https://www.uoguelph.ca/sas/>

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

E-mail Communication

As per university regulations, all students are required to check their official @uoguelph.ca e-mail account regularly: e-mail is the official route of communication between the University and its students.

Drop Date

The last date to drop one-semester courses, without academic penalty, is the 40th class day. To confirm the actual date please see the schedule of dates in the Undergraduate Calendar. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Copies of out-of-class assignments

Keep paper and/or other reliable backed-up electronic copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Campus Resources

The Academic Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs:

<https://www.uoguelph.ca/registrar/calendars/undergraduate>

If you are concerned about any aspect of your academic program:

- make an appointment with a program counsellor in your degree program.
<http://www.bsc.uoguelph.ca/index.shtml> or <https://www.uoguelph.ca/uaic/programcounsellors>

If you are struggling to succeed academically:

- There are numerous academic resources offered by the Learning Commons including, the Writing Centre, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a learning specialist.
<http://www.learningcommons.uoguelph.ca/>

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance.
<https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention.
<https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.uoguelph.ca/~ksomers/>

If you have a documented disability or think you may have a disability:

- The Student Accessibility Services (SAS) can provide services and support for students with a documented learning or physical disability. They can also provide information about how to be tested for a learning disability. For more information, including how to register with the centre please see: <https://www.uoguelph.ca/sas/>