University of Guelph
College of Biological Science

Department of Integrative Biology

COURSE OUTLINE version 1.0

BIOL*2400 Evolution

Fall 2017

THE DETAILS OF THIS COURSE OUTLINE MAY CHANGE UNTIL THE FINAL VERSION IS PRESENTED IN THE FIRST WEEK OF CLASSES.

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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Professor: Dr. Andrew McAdam
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Coordinator: Dr. Leslie Rye
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Teaching Assistants:

Maggie Bain	mbain@uoguelph.ca
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Course schedule

Lectures: Monday/Wednesday/Friday, 9:30-10:20am WMEM (First class is Friday September 8th)

Tutorial review sessions: teaching assistants will run multiple tutorial help sessions to assist students with course material and the video assignment at times that will be announced each week and on Fridays in SSC 2306. Attendance is optional but encouraged. In addition, teaching assistants will run optional review workshops on topics such as: "Study skills and note taking" and "How to answer short answer questions on an exam".

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 evolutionary theory after 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.
(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) Estimate a phylogenetic tree using the cladistic approach and apply the comparative method to explain character evolution.
(b) Elementary practice with model building and hypothesis testing.

(3) Basic skills:

(a) Comprehend scientific and criticize popular 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 will be advised in advance if they are expected to complete any readings prior 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 will 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 Video Assignment, to ask the Professor about course material, to ask the Course Co-ordinator about logistics, and to communicate with other students in the course.

Electronic Student Engagement System: To facilitate discussion and to enhance your learning, we will be using educational software called *REEF/iClicker*. This system allows you to answer questions and engage in discussion using your smartphone, tablet or laptop. You will need to purchase the software and instructions will be provided by e-mail/Courselink for purchasing, downloading and setting up the software which is available on the mobile app via the App Store or Google Play or from https://app.reef-education.com/#/login. Note that our course is called "Evolution BIOL*2400". The software is free for the first two weeks so we suggest not signing up until September 10th. There is a helpful video on how to register at

https://community.macmillan.com/docs/DOC-7414-add-your-instructors-course-in-reef

We will practice using the *REEF/iClicker* system in class on September 11, 13 and 15 before graded questions begin.

Course Content

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

	Topics	**Assigned [and Suggested] Readings (due before lecture*) from Zimmer & Emlen 2016 textbook 2nd ed.**
1	Review of key Evolutionary concepts. Brief history of the Darwin's original Theory of Evolution. The Modern Synthesis of the Theory of Evolution.	Ch. 1: *The Virus and the Whale: How Scientists Study Evolution* pages 2-15, 22-24. [Suggested readings: pp. 16-22.] Ch. 2: *Biology: From Natural Philosophy to Darwin* pages 39-48 including Box 2.2. [Suggested readings: pages 28-38]. Ch. 5 Box 5.2 only pages 149-150 (Mendel) *Genetics in the Garden*
2	Evolution of biodiversity: The Cambrian explosion, the extinction of the dinosaurs and the rise of the mammals.	Ch. 3: *What the Rocks Say: How Geology and Paleontology Reveal the History of Life* pages 50-68, 76-91
3	Estimation of Phylogenies: Who gave you AIDs:	Ch. 4: *The Tree of Life: How Biologists*

	Your Lover or your Dentist?	*Use Phylogeny to Reconstruct the Deep Past* pages 92-125 EXCEPT for Box 4.1 which contain material that will be covered in upper level Evolution courses. [Suggested readings: Chapter 9, *Molecular Phylogeny Methodology* pages 274-284]
4	Population Genetics: Drift, Migration and Selection.	Ch. 5: *Raw Material: Heritable Variation among Individuals (Mutation)* pages 145-152 Ch. 6: *The Ways of Change: Drift and Selection* pages 158-177, 184-186, 187-192 including Boxes 6.2-6.4 but NOT Boxes 6.1, 6.5-6.7.
5	Quantitative Genetics	Ch. 7: *Beyond Alleles: Quantitative Genetics and the Evolution of Phenotypes* pages 202-216 (but NOT Boxes 7.1-7.2) Ch. 8: *Natural Selection: Empirical Studies in the Wild* pages 230-240
6	Evolution of Sex, Sexual Selection	Ch. 11: *Sexual selection* pages 352-365, Pages 353-381
7	Co-operation, Kin, and Multi-level Selection	Chapter 16: *Evolution of Social Behaviour*
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	Hopeful Monsters: Development and evolution: Ontogeny recapitulates phylogeny? Heterochrony, and Hox genes; The Day the Dinosaurs Died: Would humans have evolved without meteorites and Mass Extinctions?	Ch. 10: *Adaptation from Genes to Traits* pages 302-7: *Cascades of Genes*; Ch. 14: *Macroevolution: The Long Run* pages 465-469; *Adaptive radiations* pages 478-480; *K-T boundary* in *Big Five Mass Extinctions*
10	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 even if the material is not covered in lecture. 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
REEF/iClicker	5%	Every lecture beginning Sept. 18th	Lecture, readings	Conceptual skills
Midterm 1	25% or 15%	October 2nd	Lecture, readings	Conceptual, inquiry and basic skills
Midterm 2	25% or 15%	November 13th	Lecture, readings	Conceptual, inquiry and basic skills
Video Assignment	15%	various		Conceptual, inquiry and basic skills
Final Exam	40%	Dec 7, 7-9pm	Lecture, readings	Conceptual, inquiry and basic skills

Electronic Student Engagement System: 5% of your final grade will be based on your graded responses as well as on your participation in *REEF/iClicker* questions in class. Those students achieving 70% or greater on their *REEF/iClicker* mark will be awarded 100% for this section of the course so that you will not be penalized for illness or other occasional absences from class.

Midterm Exams: The midterm exams will take place in class during the regular lecture period for that day. The midterms exams will include material covered in lecture and in the assigned readings. Since the material presented in the class will be integrated, all exams will be comprehensive. Each students higher grade in the midterms will be worth 25%, while their lower midterm grade will be worth 15% of their final grade.

Video Assignment: Students will be expected to work in groups of 4 or 5 to create a short video on a specific topic or concept in evolutionary biology. Students will form their own groups and identify a topic of interest early in the semester. A first draft of the video will be graded and each group will provide feedback on the content and presentation of the material in the video. A final version of the video will be graded near the end of the semester. These videos will be collected within a class YouTube channel and will provide additional learning resources for the class.

Final Exam: The final exam will cover all material from the course and will take place during the regular examination period. The final exam will cover all lectures and assigned readings, including the ones before the midterm.

Important Dates

Sept 8th	First Class
Sept 25th	Video Proposal Due
Oct 2nd	Midterm #1
Oct. 9th	Thanksgiving holiday, no class

Nov 2nd	Video Draft Due
Nov 3rd	40th Day
Nov 13th	Midterm #2
Nov 20th	Final Video Due
Dec 1st	Last Class
Dec 7th	Final Exam 7:00 – 9:00 PM

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 the course co-ordinator by email, 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 the course co-ordinator. 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 Winter 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 <@mail.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/