BIOL*2400 Evolution

Fall 2018
Section(s): C01

Department of Integrative Biology
Credit Weight: 0.50
Version 2.00 - August 30, 2018

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1 Course Details

1.1 Calendar Description

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.

Pre-Requisite(s): BIOL*1070, BIOL*1090

1.2 Timetable

Lectures: Monday/Wednesday/Friday, 9:30-10:20am WMEM (First class is **Friday September 7th**)

Tutorial sessions: Fridays in the Summerlee Science Complex. Check webadvisor for your tutorial time and tutorial room. **Check Courselink to find your assigned group** before our first tutorial on **Friday September 14th.** Teaching assistants will run weekly tutorial help sessions to assist the student groups with each of the group assignments: 1) "Phylogeny assignment", 2) “Population genetics assignment, and 3) “Quantitative genetics assignment”. Attendance is highly encouraged. In addition, teaching assistants will run optional review sessions on topics such as: “Study skills and note taking” and “How to answer short answer questions on an exam”, "How to organize your draft essay", "When to cite "in text" references for your term essay.

1.3 Final Exam

Final exam time and location is subject to change. Please see WebAdvisor for the latest information from the registrar's office.

2 Instructional Support

2.1 Instructor(s)

Dr. Elizabeth Boulding
Email: boulding@uoguelph.ca
Telephone: +1-519-824-4120 x54961
Office: SC1 1464
Office Hours: Friday at 13:30 - 15:30 or by appointment

2.2 Instructional Support Team

Course Co-ordinator: Dr. Lisa Robertson
Email: lrober13@uoguelph.ca
Office: SSC 3470
Office Hours: Fridays at 13:30 pm or email to set up an appointment. DR.R does not answer content-related questions, please see DR. Boulding or your TA for content questions.

2.3 Teaching Assistant(s)

Teaching Assistant: Trysta Bastien
Email: trysta@uoguelph.ca

Teaching Assistant: Melissa Holborn
Email: mholborn@uoguelph.ca

Teaching Assistant: Camden Moir
Email: moirc@uoguelph.ca

Teaching Assistant: Christine Ouellet
Email: couell04@uoguelph.ca

Teaching Assistant: Jessica Roy
Email: jroy05@uoguelph.ca

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3 Learning Resources

3.1 Required Resource(s)

Readings (Textbook)
https://carlzimmer.com/books/evolution-making-sense-of-life/
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 University and Coop bookstores. Major concepts from the required readings from the textbook will be tested on the midterm and final exams.

Courselink (Website)
https://courselink.uoguelph.ca
Most Powerpoint slides from lecture and other course materials will be posted here. This site will be used: for instructions and hints on the Term Assignment, to ask the Professor about course material, to ask the Course Co-ordinator about logistics, to communicate with the class

on class Discussion forums about new discoveries in Evolutionary Biology and to communicate with the other students in your tutorial group in your private group Discussion topic.

iClicker Cloud (or other in class electronic assessment tool) (Software)
https://www.iclicker.com/students
To facilitate discussion and to enhance your learning in and out of class, we will be using educational software called iClicker Cloud allows for students to participate using mobile devices and laptops by default.

Top Hat allows you to answer questions and engage in discussion using your smartphone, tablet or laptop or an iClicker 2 remote. You will either need to purchase the iClicker Cloud app or register an iClicker remote that you already own following the instructions at the URL above for this class "Evolution Fall 2018'. *Please be certain to use your University of Guelph email and your University of Guelph students number so that your iClicker grades can be uploaded to Courselink. We will practice using iClicker Cloud in class on September 10, 12 and 14 before the graded questions/participation exercises begin on September 17th.

3.2 Recommended Resource(s)

Lectures (Other)
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.

Tutorials (Other)
The purpose of tutorials is to have students work in groups to complete group assignments related to course content. Another aim of tutorials is to assist students in developing study skills and written scientific communication skills.

3.3 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/

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4 Learning Outcomes

4.1 Learning Outcomes

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, life-history evolution, and co-evolution.
(f) Identify species concepts and explain common mechanisms of speciation.
(g) Understand the geological time scale and be able to identify periods of mass extinction and periods of synchonized adaptive radiations.

(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.

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5 Teaching and Learning Activities

5.1 Seminar

Fri, Sep 14 - Fri, Nov 23

Topic(s):	Completion of Group Assignments, writing assistance, and support with the Individual Article Critique
Reference(s):	See Web Advisor for your tutorial time and location and Courselink for your group members

5.2 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.

Topic Order	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: Your Lover or your Dentist?	Ch. 4: *The Tree of Life: How Biologists 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	Hopeful Monsters: Development and evolution: Ontogeny recapitulates phylogeny? Heterochrony, and Hox genes;	Ch. 10: *Adaptation from Genes to Traits* pages 302-7: *Cascades of Genes*;

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	The Day the Dinosaurs Died: Would humans have evolved without meteorites and Mass Extinctions?	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.

5.3 Note

You can be tested on material in assigned readings from the textbook even if the material is not covered in lecture. Usually such material will be straightforward descriptive examples illustrating major course concepts. You will not be tested directly on recommended readings but they will help you understand the lecture material. One copy of the textbook and other supplementary readings as assigned during lectures will be available under our course number at the reserve desk in the library or on Courselink.

5.4 Important Dates

Sept 7th	First Class
Sept. 21st	Tutorial group assignment 1 (Fossil record/phylogeny) due
Oct 3rd	Midterm #1 in regular classroom
Oct. 8th	Thanksgiving holiday, no class
Oct. 12th	No Tutorials
Oct. 19th	Tutorial group assignment 2 (Population genetics) due
Oct. 26th	Tutorial group assignment 3 (Quantitative genetics) due
Nov. 2nd	Draft of popular article critique due
Nov 2nd	40th Class Day
Nov. 9th	Peer review of another student's popular article critique due

Nov. 19th	Midterm #2 in regular classroom
Nov. 23rd	Final popular article critique due
Nov. 30th	Last Class
TBA	Final Exam - see online schedule

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6 Assessments

6.1 Methods of Assessment

Methods of Assessment

Form of Assessment	Weight of Assessment	Due Date of Assessment	Course Content /Activity	Learning Outcome Addressed
iClicker Cloud	4%	Every lecture beginning with lecture 5	Lecture, readings	Conceptual skills
Fossil record/Phylogeny assignment	2%	Sept. 21st Group's Dropbox	Tutorial group	Conceptual and quantitative skills
Midterm 1	25% or 15%	Oct. 3rd in class	Lecture, readings	Conceptual, inquiry and basic skills
Population genetics assignment	2%	Oct. 19th Group's Dropbox	Tutorial group	Conceptual and quantitative skills
Quantitative Genetics assignment	2%	Oct. 26th Group's Dropbox	Tutorial group	Conceptual and quantitative skills
Popular article critique draft	3%	Nov. 2th PEAR	Lecture, textbook	Critical and communication skills
Peer review of popular article	2%	Nov. 9th PEAR	Lecture, textbook	Critical and communication skills
Midterm 2	25% or 15%	Nov. 19th in class	Lecture, readings	Conceptual, inquiry and basic skills
Popular article	15%	Nov. 23rd	Lecture,	Conceptual, inquiry,

critique final version		PEAR/Dropbox	readings	critical, and communication skills
Final Exam	30%	TBA	Lecture, readings, group assignments	Conceptual, inquiry and basic skills

6.2 Note

iClicker Cloud (or other in class electronic assessment tool): 4% of your final grade will be based on your graded responses as well as on your participation based on questions presented using Power Point by the Instructor during our lecture period. Those students achieving 70% or greater on their term will be awarded 100% for this section of the course so that you will not be penalized for illness or occasional absences from class.

*Midterm Exam*s: 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.

Group Assignments: Students are strongly encouraged to work in groups of 4 or 5 during their registered Friday tutorial period to complete assignments designed to reinforce concepts presented in lecture. Each assignment will be distributed to students approximately 5 days prior to the due date and the tutorial occuring on the due date will serve as a work period for the assignment. Each group must submit ONE copy of the assignment to their designated group Dropbox within 2 hours of the end of their tutorial. Late submissions will be subject to a 10% deduction per 24 hours, or portion thereof, late.

Individidual Article Critique: For each associated component of this assignment (draft, peer review, and final critique) will be due by 5pm on the specified due date for each component. Please see the Instructions for this assignment for further details regarding late penalties.

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.

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7 Course Statements

7.1 Group Work

Within tutorials, students will be randomly assigned to groups consisting of 4 or 5 students in order to complete group assignments and work together in tutorial throughout the semester. Each group will be provided their own discussion board to encourage communication within Courselink as well as a dropbox designated to the group within which the group assignments will be submitted.

7.2 Grading Policies

Midterms

- Midterm exams will be held during normal lecture hours. These exams will consist of multiple choice and short answer questions that focus on concepts and skills related to lecture content. Sample questions will be discussed in tutorial.

Tutorial Group Assignments

- Students will complete 3 group assignments that reinforce content presented in lecture
- Tutorial assignments 1-3 (phylogeny, population genetics, quantitative genetics) will be submitted by groups (one copy) to the Dropbox specficially created for each group.
- These assignments are due to the group dropbox within 2 hours of tutorial. For example, for students in the 8:30-9:20am tutorial, the group assignmetns will be due by 11:20am.
- Late submissions will be subject to a 10% late penalty per 24 hour period or portion thereof.

Individual Article Critique

- This assignment will be completed and submitted individually by students.
- This assignment has 3 components: Draft, Peer Review, and Final Version. Each component has an associated deadline date and on each date the component is due by 5pm.
- Late penalties will apply for late submissions as follows:
    - The late penalty associated the draft is 10% per 24 hours late or portion thereof. After 24 hours, a grade of zero will be assigned. If a student does not submit a draft, they will be unable to complete the Peer Review component of this assignment and will receive a grade of zero for the Peer Review.
    - The late penalty associated with the Peer Review is 10% per 24 hours late or portion thereof. After 24 hours, a grade of zero will be assigned to this component.
    - The late penalty for the final version is 10% per 24 hours late or portion thereof up to a maximum of 10 days, at which point a grade of zero will be assigned.

Final Exam

- The final exam will be held outside of class during the normal final exam period. This 2 hours exam will consist of multiple choice and short answer questions that cover material presented throughout the course. Sample questions will be discussed in tutorial.

7.3 Discussion Board and Email

The discussion board and associated forums will be monitored by the instructor, course coordinator, and by the TAs. You can expect a response within 48 hours, however, the discussion board forums will not be monitored in the evening or on weekends.

This same policy applies to emails sent to the instructor, course coordinator, or TAs.

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8 Department of Integrative Biology Statements

8.1 Academic Advisors

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

- Make an appointment with a program counsellor in your degree program. B.Sc. Academic Advising or Program Counsellors

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, 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.
- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: Chemistry & Physics Help and Math & Stats Help

8.3 Wellness

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.
- Student Health Services is located on campus and is available to provide medical attention.
- 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.

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9 University Statements

9.1 Email Communication

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

9.2 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 instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The regulations and procedures for Academic Consideration are detailed in the Undergraduate Calendar.

9.3 Drop Date

Courses that are one semester long must be dropped by the end of the fortieth class day; two-semester courses must be dropped by the last day of the add period in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate

Calendar.

9.4 Copies of Out-of-class Assignments

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

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance, and not later than the 40th Class Day.

More information: www.uoguelph.ca/sas

9.6 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.

9.7 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.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.