Department of Biology Course Outline

SC/BIOL 3200 3.0, Processes of Evolution
Fall, 2018

Course Description

This course provides a comprehensive overview of how and why evolution works. Whereas students would have gained an appreciation of the essence of evolution in the past, this course will delve into some details, specifically to explore the mechanisms and processes that drive evolution. Students will learn about and explore the importance of variation and mechanisms of genetic change across populations and species, and how evolutionary novelty is created. The course also provides an opportunity to examine empirical findings of micro- and macro-evolution.

Prerequisites (strictly enforced)

SC/BIOL 2040 3.0

Course Instructor(s) and Contact Information

Course Director – Dr. Santosh Jagadeeshan

Email – sanjagster@gmail.com (York email TBA)

Office hours: Email to make an appointment

T.A Kyle Hendrickson

Email: kthendrickson@gmail.com

Schedule

Lectures – Tuesdays, 14:30 to 17:30
Location - Vari Hall B

Evaluation

In-term Test 1	25%
In-term Test 2	25%
Assignments	10%
Final Exam	40%
Total marks	**100**

There will be regular in-class quizzes. These are not graded, but will serve to review material, as well as to monitor student learning progress.
Final course grades may be adjusted to conform to Program or Faculty grades distribution profiles.

Important Dates

First Class – Sept, 11th 2018
In-term test 1 – Oct 2nd, 2018
In-term Test 2 – Nov 13th, 2018
Last Class - Dec 4th, 2018
Final Exam – Dates, times, and rooms are scheduled by the Registrar's Office

Drop Deadline: Fri. Nov. 9, 2018 (last day to drop without course on transcript)
Course Withdrawal: Sat. Nov. 10 to Dec. 4, 2018 (course still appears on transcript with 'W")

Resources

Text Book . ***Evolution: making sense of life***, by Carl Zimmer and Douglas J. Emlen. Roberts and Company Publishers. ISBN: 9781936221554
Students should use this link for advance access to the chapters required for the first class session - https://app.box.com/s/uwp5e45nkmluofqs1xvvx501j27fkq42

Course Moodle: Information will be provided in class.

Learning Outcomes

Upon successful completion of this course, students should be able to:

- Appreciate and apply evolutionary thinking to biological issues
- Define and describe why evolution occurs.
- Use correct terminologies regarding evolutionary concepts and processes
- Explain the relevance of Hardy-Weinberg equilibrium and the consequence of deviations from this equilibrium
- Explain how genetic drift and selection can lead to population changes
- Define and describe neutral evolution and the molecular clock
- Define, differentiate, and describe random and selective processes.
- Describe methodologies that are used to construct phylogenetic trees
- Interpret and critically evaluate phylogenetic relationships of organisms
- Define and describe important terms and concepts, such as allele frequency and equilibria, population fitness, fitness landscapes, bottleneck, founder events, positive selection, adaptation, speciation, etc.
- Define, differentiate and explain Natural selection and Sexual selection
- Define, differentiate, and critically evaluate theories of sexual selection
- Explain and critically evaluate the evolution of sex and gender
- Confront misconceptions in biology and society
- Chronologically place milestones in the evolution of life on this planet
- Integrate evolutionary concepts to human and global health
- Explain fundamental mechanisms that drive evolutionary change at the genetic, phenotypic, and organismal levels.
- Link concepts learned in class to current research

Course Content

Evolution is a central principle of modern biology, so much so, that the great evolutionary geneticist Theodosius Dobzhansky expressed that 'Nothing in biology makes sense, except in the light of evolution'. By providing a comprehensive overview of key concepts and mechanisms that drive evolutionary change, this course will help students appreciate the importance and relevance of evolution to all branches of biological sciences.

The course is intended to help students acquire a good understanding of the fundamentals principles of evolutionary topics including variation, phylogenetics, population genetics, molecular evolution, gene-environment interactions, natural selection, sexual selection, and adaptation. Students will explore key processes that drive both short-term and long-term evolutionary phenomena.

NOTE: This outline, including evaluations and schedule is tentative until it is finalized in the first class.

Lecture schedule

Date	Lecture Topic	Reading*
Sept 11	Welcome! A brief history of life A brief history of evolutionary thought A glimpse of evolutionary feats	 Chapter 3: What the Rocks Say: *How geology and paleontology reveal the history of life* Chapter 2: From Natural Philosophy to Darwin. Chapter 1: The whale and the Virus: *How scientists study evolution*.
Sept 18	Tree thinking – understanding evolutionary relationships of life. The key Ingredient for evolution	Chapter 4: The Tree of life: How biologists use phylogeny to reconstruct the deep past. Chapter 5: Raw material – Heritable variation among individuals. **Student groups finalized**
Sept 25	The genetics of populations Genes, organisms, and the environment Review session for In-term test 1.	Chapter 6: The way of Change. Chapter 7: Beyond Alleles: Quantitative genetics and the evolution of phenotypes
Oct 2	**IN-TERM TEST 1**	
Oct 9	*No Classes – Reading week*	
Oct 16	Signatures of evolution in molecules - Fundamentals of Molecular Evolution	Chapter 9: The history in our genes. Chapter 4: The tree of life. Pp97-113
Oct 23	Selection: Microevolution in action 'Evo-Devo' and evolutionary novelty	Chapter 8: Natural selection: Empirical studies in the wild. Chapter 10: Adaptation: From genes to traits.
Oct30	Shall we dance or shall we fight? - Sexual selection	Chapter 11: Sex: causes and consequences Chapter 16: Brains and Behavior: pp531-535, 539, 553-555.
Nov 6	Life history evolution Review for In-term test 2	Chapter 12: The evolution of life history and parental care
Nov 13	**IN-TERM TEST 2**	
Nov 20	Generating biological diversity - speciation Evolution in the long run	Chapter 13: The Origin of species Chapter 14: Macroevolution
Nov 27	iApe Evolution and Medicine	Chapter 17: Human evolution: A new kind of ape Chapter 18: Evolutionary Medicine
Dec 4	Review for exams	
*Additional suggested reading will be provided during lectures		

Experiential Education and E-Learning

Students will explore concepts by critically evaluating case studies. Students will also use online resources to find answers to specific questions, solve problems, and handle tasks.

Description of course components that would be classified as experiential education (EE) or e-learning.

Other Information

Students are strongly encouraged to attend lectures ***and participate*** in activities inside and outside of the classroom. Participating in these activities is essential to explore and acquire a deeper understanding of concepts. It will undoubtedly help your performance in tests and exams.
Do not be shy to ask questions – to be wrong in class, or wrong in the exam – that is a good question!.
Remember, information and images presented on slides are subject to Canadian copyright law. Any form of recording **cannot** not be posted online without the expressed permission of the instructor.
Group activities. Your assignments will be done in groups. Groups will also interactively solve problems in class and outside class. Group members are expected to be committed, diligent, and respectful of each other. Any form of academic misconduct will result in expulsion of a group member, who will need explicit permission from the instructor to re-gain lost marks, continue doing assignments on their own, or be included in another group.

Course Policies

Missing a test
Fill out and submit the online submission form (https://science.apps01.yorku.ca/machform/view.php?id=84113). Notify instructor by email immediately, and provide appropriate documentation. If you fail to do so within 48 hours of missing the test, you will not be able to take a make-up test. A make-up test will be different from the original version. It will contain more short answer questions than multiple choice questions. Only ONE make-up test will be given.
If you missed the test due to health reasons, you must provide support in the form of an Attending Physicians Statement (http://www.registrar.yorku.ca/pdf/petitions/attending_physician_statement.pdf), or a statement by a psychologist or counsellor. You are not required to provide the nature of the illness, but you must provide a) date of consultation, b) Physicians contact information for verification, and c) a statement that the student would not have been able to attend without compromising his/her ability, health or well-being. This documentation must be dated before or on the day of the test or exam. These supporting documentations should be received within one-week of the missed test.

Re-Grading policies
Students can see their tests on appointment only, and within 5 days of receiving marks. If you believe an answer has been marked incorrectly, you must provide a written rationale. Note that re-assessing a test can result in either confirming the mark, increasing the mark, or reducing the mark.

Late assignment hand-ins
There will be penalty for handing in your assignments late. Details will be provided to for each assignment. In general, expect to lose 0.5 – 1.0 marks every day that passes the original deadline.

Email and discussion forums
Part of group activities is to discuss topics online on a discussion forum. Some of these topics may be controversial and are meant to stimulate discussion regarding misconceptions in science. Students are expected to be courteous to their peers and take these discussions seriously.

Electronics in class
Students are expected to take responsibility for their own learning. Computers and tablets maybe used to take notes or explore topics when instructed. Chatting, surfing the web, Facebook, or any other activity that is unrelated to the course, is frankly, rude to your classmates and the lecturer, and your own commitment to education. Please refrain from doing so. You are advised to turn off your cell phones, but it is mandatory to put them on silent while in class!.

University Policies

Academic Honesty and Integrity
York students are required to maintain the highest standards of academic honesty and they are subject to the Senate Policy on Academic Honesty (http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/). The Policy affirms the responsibility of faculty members to foster acceptable standards of academic conduct and of the student to abide by such standards.
There is also an academic integrity website with comprehensive information about academic honesty and how to find resources at York to help improve students' research and writing skills, and cope with University life. Students are expected to review the materials on the Academic Integrity website at -

http://www.yorku.ca/academicintegrity/

Access/Disability

York University is committed to principles of respect, inclusion and equality of all persons with disabilities across campus. The University provides services for students with disabilities (including physical, medical, learning and psychiatric disabilities) needing accommodation related to teaching and evaluation methods/materials. These services are made available to students in all Faculties and programs at York University.

Student's in need of these services are asked to register with disability services as early as possible to ensure that appropriate academic accommodation can be provided with advance notice. You are encouraged to schedule a time early in the term to meet with each professor to discuss your accommodation needs. Please note that registering with disabilities services and discussing your needs with your professors is necessary to avoid any impediment to receiving the necessary academic accommodations to meet your needs.

Additional information is available at the following websites:

Counselling & Disability Services - http://cds.info.yorku.ca/

Counselling & Disability Services at Glendon - https://www.glendon.yorku.ca/counselling/

York Accessibility Hub - http://accessibilityhub.info.yorku.ca/

Religious Observance Accommodation

York University is committed to respecting the religious beliefs and practices of all members of the community, and making accommodations for observances of special significance to adherents. Should any of the dates specified in this syllabus for an in-class test or examination pose such a conflict for you, contact the Course Director within the first three weeks of class. Similarly, should an assignment to be completed in a lab, practicum placement, workshop, etc., scheduled later in the term pose such a conflict, contact the Course director immediately. Please note that to arrange an alternative date or time for an examination scheduled in the formal examination periods (December and April/May), students must complete and submit an Examination Accommodation Form at least 3 weeks before the exam period begins. The form can be obtained from Student Client Services, Student Services Centre or online at http://www.registrar.yorku.ca/pdf/exam_accommodation.pdf

Student Conduct in Academic Situations

Students and instructors are expected to maintain a professional relationship characterized by courtesy and mutual respect. Moreover, it is the responsibility of the instructor to maintain an appropriate academic atmosphere in the classroom and other academic settings, and the responsibility of the student to cooperate in that endeavour. Further, the instructor is the best person to decide, in the first instance, whether such an atmosphere is present in the class. The policy and procedures governing disruptive and/or harassing behaviour by students in academic situations is available at - http://secretariat-policies.info.yorku.ca/policies/disruptive-andor-harassing-behaviour-in-academic-situations-senate-policy/