UNIVERSITY OF SASKATCHEWAN

COURSE SYLLABUS

COURSE TITLE:	BIOL 302 Evolutionary Processes		
COURSE CODE:	CRN 83033	**TERM:**	T1 Fall 2017
COURSE CREDITS:	3.0	**DELIVERY:**	Lecture & Practicum (Lab)
CLASS SECTION:	01	**START DATE:**	September 6th 2017
CLASS LOCATION:	Rm 102 Arts Bldg	**LAB LOCATION:**	Rm 212 Biology Bldg
CLASS TIME:	11:30 am to 12:20 pm (M,W,F)	**LAB TIME:**	1:30 to 4:20 pm R OR
WEBSITE:	via Blackboard		1:30 to 4:20 pm F

Course Description

"*Nothing in biology makes sense except in the light of evolution*"
Theodosius Dobzhansky

In this course we will explore the above statement in great detail. Biological evolution is responsible for the entirety of biological diversity and serves as a unifying principle in biology. For example, all behaviours, physiological and morphological traits, and trophic interactions are a consequence of evolution. To truly understand these phenomena, as well as concepts such as evolved antibiotic resistance, artificial selection for improved dairy production and why we have sex (to name but a few) requires a proper understanding of evolutionary processes. In the first part of the course, we will examine evolutionary processes occurring within species (i.e., microevolution). You will learn the necessary 'ingredients' for evolutionary change and how an understanding of these requirements informs such topics as: trophy hunting, adaptation to climate change, agriculture and medicine. In the second part of the course, we will focus on evolutionary patterns and processes occurring above the species level (i.e., macroevolution). In particular, we will learn how to use phylogenetics to infer evolutionary relationships of both extinct and extant species. Throughout, we will bring together concepts from macro- and micro-evolution to address some of the 'big questions' in biology. For example: Why do individuals cooperate? How do new species arise? Why do we age? Concepts and themes will be presented verbally, mathematically and graphically. Students should be familiar and comfortable with all these media, but also understand that they merely serve as tools for conveying the concepts.

Prerequisites: BIOL 120 and BIOL 121, BIOL 226 and 3 senior credit units in BIOL.
Note: Students with credit for BIOL 263 or BIOL 401 may not take this course for credit.

Learning Outcomes

The goal of this course is to develop a conceptual understanding of evolutionary processes and be able to incorporate this understanding not only into your studies in Biology but also into your everyday life. Phylogenetic relationships and population genetics equations (for example) are easily accessible online, in the primary literature and in textbooks. Rather than memorizing these facts and equations, I am much more concerned with you learning the concepts of evolution and being able to apply them. Whether your chosen profession upon graduation is to be a professor in Evolutionary Biology (and thus, teaching these concepts to the next generation of BIOL 302 students!), a public health professional (for example, coping with the rapid evolution of HIV), agriculturalist (interested in improving your crop yields) or care-giver for your family (e.g., deciding whether to purchase a standard or antibiotic household cleaner) you should be able to incorporate evolutionary concepts to better inform your decisions. Specifically, by the completion of this course, students will be expected to:

1. Understand the relevance of Darwin's insights and findings to evolutionary biology: be aware of who and what influenced Darwin and how his advances continue to inform evolutionary biology.

2. Articulate the prerequisites for evolutionary change and understand how these prerequisites can be estimated within populations.

3. Be able to apply quantitative and population genetic theory to topics within evolutionary biology.

4. Describe how interspecific evolutionary relationships (i.e., within the field of phylogenetics) can be used to make evolutionary inference.

5. Know the major evolutionary events in the history of life on earth.

5. Understand the relevance of evolution to: biology, medicine (human and animal), agriculture/animal breeding and sociology.

Information on literal descriptors for grading at the University of Saskatchewan can be found here: https://students.usask.ca/academics/grading/grading-system.php

Please note: There are different literal descriptors for undergraduate and graduate students.

More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found here: http://policies.usask.ca/policies/academic-affairs/academic-courses.php

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at: http://teaching.usask.ca/about/policies/learning-charter.php

University of Saskatchewan Grading System (for undergraduate courses)

Exceptional (90-100) A superior performance with consistent evidence of

- a comprehensive, incisive grasp of the subject matter;
- an ability to make insightful critical evaluation of the material given;
- an exceptional capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Excellent (80-90) An excellent performance with strong evidence of

- a comprehensive grasp of the subject matter;
- an ability to make sound critical evaluation of the material given;
- a very good capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Good (70-79) A good performance with evidence of

- a substantial knowledge of the subject matter;
- a good understanding of the relevant issues and a good familiarity with the relevant literature and techniques;
- some capacity for original, creative and/or logical thinking;
- a good ability to organize, to analyze and to examine the subject material in a critical and constructive manner.

Satisfactory (60-69) A generally satisfactory and intellectually adequate performance with evidence of

- an acceptable basic grasp of the subject material;
- a fair understanding of the relevant issues;
- a general familiarity with the relevant literature and techniques;
- an ability to develop solutions to moderately difficult problems related to the subject material;
- a moderate ability to examine the material in a critical and analytical manner.

Minimal Pass (50-59) A barely acceptable performance with evidence of

- a familiarity with the subject material;
- some evidence that analytical skills have been developed;
- some understanding of relevant issues;
- some familiarity with the relevant literature and techniques;
- attempts to solve moderately difficult problems related to the subject material and to examine the material in a critical and analytical manner which are only partially successful.

Failure <50 An unacceptable performance

Course Overview

This course provides a quantitative and conceptual overview of evolutionary mechanisms at different biological scales, including molecular/genetic, population and species levels.

Class Schedule

Week	Date	Lecture*	Lab
	Sept 06-W	1 – Introduction	
	Sept 08-F	2 – What is evolution and why should we care?	
	Sept 11-M	3 – History of evolutionary thought I	
	Sept 13-W	4 – History of evolutionary thought II	
	Sept 15-F	5 – Intraspecific variation	
	Sept 18-M	6 – Genetic variation	
	Sept 20-W	7 – Population genetics	
	Sept 22-F	8 – Selection I	
	Sept 25-M	9 – Selection II	
	Sept 27-W	10 – Genetic theory of natural selection	
	Sept 29-F	11 – Genetic theory of natural selection II	
	Oct 02-M	12 – Genetic theory of natural selection III	
	Oct 04-W	13 – Inbreeding	
	Oct 06-F	14 – Genetic drift I	
	Oct 09-M	**Thanksgiving – No Classes**	
	Oct 11-W	15 – Genetic drift II	
	Oct 13-F	16 – Quantitative traits	

	Oct 16-M	17 – Quantitative genetics	
	Oct 18-W	18 – Case studies of microevolutionary change	
	Oct 20-F	**Mid-term exam**	
8	Oct 23-M	19 – Eco-evolutionary dynamics	
	Oct 25-W	20 – Evolutionary biogeography	
	Oct 27-F	21 – Species concepts.	
	Oct 30-M	22 – Speciation I.	
	Nov 01-W	23 – Speciation II.	
	Nov 03-F	24 – Phylogenetics I.	
	Nov 06-M	25 – Phylogenetics II.	
	Nov 08-W	26 – Phylogenetics III.	
	Nov 10-F	27 – The fossil record.	
	Nov 13-M	Mid-term break – No Class	
	Nov 15-W	Mid-term break – No Class	
	Nov 17-F	Mid-term break – No Class	
	Nov 20-M	28 – Life history evolution I.	
	Nov 22-W	29 – Life history evolution II.	
	Nov 24-F	30 – Sexual reproduction I.	
	Nov 27-M	31 – Sexual reproduction II.	**Lab exam**
	Nov 29-W	32 – Conflict and cooperation.	
	Dec 01-F	33 – Coevolution.	

	Dec 04-M	34 – HIV/AIDS case study	No lab
	Dec 06-W	34 –Review lecture	
FINAL EXAM	TBA		

***Denotes labs with in-lab assignments**

NB: the lecture topics indicated on each date are tentative and this schedule should serve as a general guide only. Guest speakers, extended class discussions etc., may lead to adjustments to the schedule, but you can expect that we'll follow this general order.

Midterm and Final Examination Scheduling

Midterm and final examinations must be written on the date scheduled.

Final examinations may be scheduled at any time during the examination period (Friday December 8th to Friday December 22nd); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of his or her own for medical or other valid reasons, documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures:

https://students.usask.ca/academics/exams.php

Instructor Information

Contact Information

Dr. Jeffrey Lane Instructor	Rm 318 Biology Bldg jeffrey.lane@usask.ca	966-4475
Mr. Scott Halpin Lab Coordinator	Rm 150 Biology Bldg scott.halpin@usask.ca	966-4493

Office Hours

By appointment

Recommended Resource

Textbook

Evolution 4th Edition, Douglas J. Futuyma and Mark Kirkpatrick 2017.

Most lectures will be based on chapters of this textbook. Suggested chapters/readings will be announced in lecture. **Prior to 2017, we used the 3rd Edition of this textbook and if you can find a used version of this edition, I would recommend using it. I will provide page numbers for corresponding sections from both editions.

Copies of the textbook can be found in the Natural Sciences Library.

Textbooks are also available for purchase from the University of Saskatchewan Bookstore:

https://www.usask.ca/bookstore/

Downloads

These will be available as appropriate through the course Blackboard page (PAWS). The only document that you are required to download and read is the course syllabus. **Please note that the Powerpoint slides or lecture notes (as pdfs) may be provided to you as a courtesy**. You are not required to download or print these slides/notes. I will endeavour to have the lecture slides/notes posted sometime in advance of the lectures; however, I will not guarantee this. Slides/notes will be provided as pdf files and it is therefore recommended that students be able to annotate pdfs on a tablet/computer etc. or print notes prior to class when they are available.

Grading Scheme

Mid-term exam	20%
Final exam	40%
Individual laboratory writing assignments	25%
Lab exam	15%
Total	**100%**

Evaluation Components

Midterm Exam

Value: 20% of final grade
Date: Oct 20, 2017
Length: 50 min
Type: Invigilated. In class.
Description: Multiple choice problems and questions. Calculators allowed. No phones, laptops, tablets or other material allowed to be used.

Final Exam

Value: 40% of final grade
Date: See University of Saskatchewan online schedule
Length: 3 hours
Type: Comprehensive. Invigilated. Scheduled.
Description: The exam is comprehensive. It will cover all lecture material, with an emphasis placed on material delivered since the midterm exam. Calculators allowed. No phones, laptops, tablets or other material allowed.

Assignments: Individual laboratory writing assignments

Value: 25% of final grade
Due Date: See Course Schedule (above)
Description: Multiple choice, short and long answer questions about the experiments and background of the laboratory experiments. Late assignments will be penalized (-5% per day).

Lab exam

Value: 15% of final grade
Due Date: Nov 30 or Dec 01, 2017 (in your scheduled lab section)
Type: Invigilated. In class.
Description: Multiple choice, problems and short answer questions about the experiments and background of the laboratory experiments.

Submitting Assignments

Students are expected to submit exams on or before their required due dates. All exams are required to be submitted prior to the student leaving the exam room. Late assignments and deferred exams will be dealt with as described below.

Late Assignments

All exams and lecture assignments are expected to be completed on time, If a student has a valid excuse for a missed assignment or a within-class missed exam (i.e., the mid-tem exam), a deferred assignment or exam may be granted given appropriate documentation (e.g., a doctor's note). Documentation must be received within **3 business days** of the scheduled exam/assignment date. If documentation is not received within this period of time, the instructors reserve the right to not offer a deferred assignment or exam or to assign a penalty of 10%/day (starting on the initial due date/exam time).

Criteria That Must Be Met to Pass

Please refer to the University of Saskatchewan Grading System (for undergraduate courses) above for criteria that must be met to pass. There are no other additional criteria that must be met to pass.

Attendance Expectations

Students are expected to attend all scheduled lab periods. Lecture attendance is not mandatory but likely to correlate directly with your final mark.

Student Feedback

Marks from machine-graded exams are usually available within one week. Short- and long-answer questions are likely to take longer to grade. The multiple-choice questions will not be posted after the exam. Students are encouraged to meet with the instructor

to review their performance.

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (https://www.usask.ca/secretariat/student-conduct-appeals/academic-misconduct.php) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (https://www.usask.ca/secretariat/student-conduct-appeals/non-academic-misconduct.php)

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at:
https://www.usask.ca/secretariat/student-conduct-appeals/

Examinations with Disability Services for Students (DSS)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Disability Services for Students (DSS) if they have not already done so. Students who suspect they may have disabilities should contact DSS for advice and referrals. In order to access DSS programs and supports, students must follow DSS policy and procedures. For more information, check http://www.students.usask.ca/disability/, or contact DSS at 966-7273 or dss@usask.ca.

Students registered with DSS may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through DSS by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by DSS.

Acknowledgements

Prepared (Aug 28, 2017) by Dr. Jeffrey Lane, BIOL 302 Instructor