

## COURSE SYLLABUS

<b>COURSE TITLE:</b>	BIOL 302 Evolutionary Processes		
<b>COURSE CODE:</b>	CRN 87956	<b>TERM:</b>	T1 Fall 2015
<b>COURSE CREDITS:</b>	3.0	<b>DELIVERY:</b>	Lecture & Practicum (Lab)
<b>CLASS SECTION:</b>	01	<b>START DATE:</b>	September 3 <sup>rd</sup> 2014
<b>CLASS LOCATION:</b>	Rm 102 Arts Bldg	<b>LAB LOCATION:</b>	Rm 212 Biology Bldg
<b>CLASS TIME:</b>	11:30 am to 12:20 pm (M,W,F)	<b>LAB TIME:</b>	1:30 to 4:20 pm R OR 1:30 to 4:20 pm F
<b>WEBSITE:</b>	via Blackboard		

### Course Description

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

Theodosius Dobzhansky

In this course we will explore the above statement to its greatest depths. 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 such concepts 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 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 caring 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 at: <http://students.usask.ca/current/academics/grades/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 at: [http://www.usask.ca/university\\_secretary/council/academiccourses.php](http://www.usask.ca/university_secretary/council/academiccourses.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://www.usask.ca/university\\_secretary/LearningCharter.pdf](http://www.usask.ca/university_secretary/LearningCharter.pdf)

## **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
1	Sept 04-F	1 – Introduction	No lab
2	Sept 07-M	Labour day – No Classes	No lab
	Sept 09-W	2 – What is evolution and why should we care?	
	Sept 11-F	3 – History of evolutionary thought I.	
3	Sept 14-M	4 – History of evolutionary thought II.	Population genetics I
	Sept 16-W	13 – Intraspecific variation.	
	Sept 18-F	14 – Genetic variation.	
4	Sept 21-M	15 – Population genetics.	Population genetics II: Hardy-Weinberg Equilibrium
	Sept 23-W	17 – Selection.	
	Sept 25-F	18 – Selection II.	
5	Sept 28-M	19 – Genetic theory of natural selection.	Selection I
	Sept 30-W	20 – Genetic theory of natural selection II.	
	Oct 02-F	21 – Genetic theory of natural selection III.	
6	Oct 05-M	16 – Inbreeding.	Selection II Darwinian Snails
	Oct 07-W	25 – Genetic drift I.	
	Oct 09-F	26 – Genetic drift II.	
7	Oct 12-M	Thanksgiving – No Classes	Selection II Continued
	Oct 14-W	22 – Quantitative traits.	
	Oct 16-F	23 – Quantitative genetics.	
8	Oct 19-M	<b>Mid-term exam</b>	

	Oct 21-W	24 – Case studies of microevolutionary change.	Selection III Polygenic traits
	Oct 23-F	27 – Eco-evolutionary dynamics.	
9	Oct 26-M	9 – Evolutionary biogeography.	Genetic drift
	Oct 28-W	10 – Species concepts.	
	Oct 30-F	11 – Speciation I.	
10	Nov 02-M	12 – Speciation II.	Phylogenies
	Nov 04-W	5 – Phylogenetics I.	
	Nov 06-F	6 – Phylogenetics II.	
11	Nov 9-M	Mid-term break – No Class	No lab
	Nov 11-W	Remembrance Day – No Class	
	Nov 13-F	Mid-term break – No Class	
12	Nov 16-M	7 – Phylogenetics III.	Review lab
	Nov 18-W	8 – The fossil record.	
	Nov 20-F	28 – Life history evolution I.	
13	Nov 23-M	29 – Life history evolution II.	<b>Lab exam</b>
	Nov 25-W	30 – Sexual reproduction I.	
	Nov 27-F	31 – Sexual reproduction II.	
14	Nov 30-M	32 – Conflict and cooperation.	
	Dec 02-W	33 – Coevolution.	
	Dec 04-F	34 – HIV/AIDS case study & class debate.	
15	Dec 07-M	Review lecture	
<b>FINAL EXAM</b>		TBA	

\*Please note, 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 (Wednesday December 9<sup>th</sup> to Wednesday December 23<sup>rd</sup>); 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:

<http://www.usask.ca/calendar/exams&grades/examregs/>

## **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** 3<sup>rd</sup> Edition, Douglas J. Futuyma. 2013.

Most lectures will be based on chapters of this textbook. Suggested chapters/readings will be announced in lecture.

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

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

[www.usask.ca/consumer\\_services/bookstore/textbooks](http://www.usask.ca/consumer_services/bookstore/textbooks)

## **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 instructor's 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%
<b>Total</b>	<b>100%</b>

## Evaluation Components

### Midterm Exam

**Value:** 20% of final grade

**Date:** Oct 19, 2015

**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 26 or 27, 2015 (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-term exam), a deferred assignment exam may be granted given appropriate documentation (e.g., a doctor's note).

## **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 will be 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 ([http://www.usask.ca/university\\_secretary/honesty/StudentAcademicMisconduct.pdf](http://www.usask.ca/university_secretary/honesty/StudentAcademicMisconduct.pdf)) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals ([http://www.usask.ca/university\\_secretary/honesty/StudentNon-AcademicMisconduct2012.pdf](http://www.usask.ca/university_secretary/honesty/StudentNon-AcademicMisconduct2012.pdf))

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at:  
[http://www.usask.ca/university\\_secretary/pdf/dishonesty\\_info\\_sheet.pdf](http://www.usask.ca/university_secretary/pdf/dishonesty_info_sheet.pdf)



## **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](mailto: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 (Sept 02, 2015) by Dr. Jeffrey Lane, BIOL 302 Instructor