

# Biology 380-1: Evolutionary Genetics (Spring 2019)

**Lecture:** Monday, Wednesday, Friday 9:20-10:30 in Schaefer 132

**Lab:** Tuesday 1:00-3:50 in Schaefer 108

**Instructor:** Rose Keith  
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Office hours: MF 11:30-1:00, W 10:30-11:45. If you're not available during these times, please email me to set up a meeting.

**Textbook:** A Primer of Ecological Genetics, Jeffrey K. Conner and Daniel L. Hartl, 2004

**Course description:** This course focuses on how the genetic composition of populations changes in response to evolutionary forces, with an emphasis on quantitative traits. We will discuss current methods and applications in ecology, evolution, and human research.

## Course objectives

By the end of this course, you will be able to:

1. Predict how genotypes and phenotypes of a population will change under selection and other evolutionary forces.
2. Understand how genetics and environment together affect the phenotype of an organism.
3. Quantify and explain the distribution of genetic variation within and among populations and use it to make inferences about evolutionary history.
4. Apply methods in quantitative genetics to current, real-world questions.

## Course policies

Course materials: All course materials will be available on Blackboard. Unless otherwise discussed before the assignment is due, all materials should be turned in in hard-copy in class the day they are due.

Attendance: The participation grade will be partially based on attendance. Attendance will not be tracked for lectures, but frequent absences will inevitably result in less participation. The benefit of the lab activities is dependent on you being there to participate in them; if you expect to miss a lab, please contact me in advance if possible. For excused absences for illness or sports, there will be opportunities to make up the participation points. If other extraordinary circumstances cause you to miss a lab, please contact me.

Late work: Work that is turned in late without permission will have a penalty of 5% on that assignment for each day that it is late. If there are extraordinary circumstances that prevent you from turning in work on time, please talk to me—as far in advance as possible.

Accommodations: If you have documented accommodations, I'll be happy to work with you to support those. Please talk to me about it as soon as possible so that I can make sure we have a plan in place.

Laptops and devices in class: Using laptops in class is allowed; however, there is a significant body of research that shows that most students don't learn as well when they take notes on laptops, and so I discourage you from doing so. There may be some in-class activities where you can work from your laptop instead of printing them out; however, if you get distracted it will result in a lower participation grade. I do not want to see phones out in class or lab unless there is a specific reason you need to be using it for class activities at that point (ie, using it as a calculator).

When you read this, find a cat picture (one from the internet is fine if you don't have a cat, although if you do I'd rather see yours) and email it to me at rakeith@smcm.edu before class on Wednesday. This will count as credit for a pre-class question set.

## Assignments

Grades for the course will be based on the following:

Exams (4)	30
Final	10
Problem Sets (8)	10
Pre-class questions	5
Participation	6
Paper discussions	7
Lab assignments	15
Presentations	5
Teaching the class:	
Abstract	1
Presentation	8
Paper	3
<b>Total:</b>	<b>100</b>

Exams: There will be four midterm exams. These will be take-home and open-note, and will focus on your ability to apply and synthesize the topics from class. After the first exam, each will cover the most recent section of class and the one before; that is, Exam 2 will cover the entire class up until that point, Exam 3 will cover everything after Exam 1, etc. Exams will be handed out on a Friday and will be due the following Monday. If you have some circumstances that mean that you need more time than that weekend, ask in advance and I can give it to you on Wednesday instead. While the exam is out, do **not** discuss it or any of the topics in it with other members of the class. While you have the exam, I will not answer questions on the material, so be sure to ask in advance.

Final: The final will meet during our assigned time, and will be cumulative. It will not be completely open-note; however, you may bring up to five pages of paper on which you can include any information you wish, which you may reference during the exam.

Problem sets: In order to practice the material, there will be eight problem sets. I will post these on Blackboard: type up the answers and hand it in on the date indicated on the syllabus. 50% of the credit for the problem sets will be based on completion, with the remaining 50% based on accuracy. I encourage you to ask each other questions and work together, but turn in your own work in your own words.

Pre-class questions: These will be posted on Blackboard as tests. A set will be due by 8:00 AM every day that we have class. These will be 2-3 questions about the course material; full credit will be given for completion.

Participation: Participation grades will be based on engagement in lab and class. If you are focused on the work and complete in-class and in-lab assignments, you'll do well.

Paper discussions: Evolutionary genetics is an active field of research, with implications for basic science as well as research in humans. In order to better understand how our course content relates to this research, we will have four discussions throughout the semester on articles related to topics we're discussing in class. You will read the paper carefully, answer a few questions, and come to class prepared to participate in a discussion.

Written lab assignments: In order to practice describing and analyzing experiments and data, many lab activities will include a written report. Details on formats will be given each week. Each assignment will be due at the beginning of the lab section the following week.

Presentations: There will be one or two relatively short in-class presentations during the term. Details will be given closer to the assignment.

Teaching the class: During the final week of class, you will work in groups of two or three to teach the class on a topic of your choice. More details will be given out later in the semester. Briefly, you'll work together to figure out a topic that interests you, with one or two focal papers to use as examples. You'll plan a lesson of about an hour that will cover the necessary background and those papers. The grade will be based on an abstract that you'll turn in for feedback, a short paper on your topic, and the lesson that you teach.

## Course Schedule

DATE	TOPIC	READING	ASSIGNMENTS DUE
<b>JAN 14</b>	Intro; Biometricians vs Mendelians		
<b>JAN 16</b>	Biometricians vs Mendelians		
<b>JAN 18</b>	Biometricians vs Mendelians, con't, review of Mendelian Genetics	p. 1-8	
<b>JAN 21</b>	NO CLASS		
<b>JAN 23</b>	Review Mendelian genetics, Genetic variation and markers	p. 9-24	
<b>JAN 25</b>	Hardy-Weinberg Equilibrium	p. 24-36	
<b>JAN 28</b>	Random mating and inbreeding	p. 36-43	
<b>JAN 30</b>	Evolutionary forces	p. 47-52	PS1
<b>FEB 1</b>	Evolutionary forces	p. 52-66	
<b>FEB 4</b>	Evolutionary forces	p. 66-77	
<b>FEB 6</b>	Evolutionary forces	p. 77-85	PS2
<b>FEB 8</b>	Evolutionary forces	p. 85-89	Exam 1 given out
<b>FEB 11</b>	Evolutionary forces	p. 97-100, re-visit 57-61	Exam 1 due
<b>FEB 13</b>	Variation among populations	p. 112-125	
<b>FEB 15</b>	Heritability		PS3
<b>FEB 18</b>	Heritability		
<b>FEB 20</b>	No CLASS		
<b>FEB 22</b>	Paper discussion	Haworth et al.	Discussion questions
<b>FEB 25</b>	Phenotypic selection and the response to selection	p. 165-169, 189-196	
<b>FEB 27</b>	G x E	p. 138-145	PS4
<b>MARCH 1</b>	Correlated traits (maybe)	p. 150-163	
<b>MARCH 4</b>	Paper discussion with Dr Emerson		
<b>MARCH 6</b>	Mapping	p. 170-180	PS5
<b>MARCH 8</b>	Paper discussion	Wise and Rausher	Exam 2 given out
<b>MARCH 11</b>	NO CLASS		
<b>MARCH 13</b>	NO CLASS		
<b>MARCH 15</b>	NO CLASS		
<b>MARCH 18</b>	Mapping		Exam 2 due
<b>MARCH 20</b>	Mapping		
<b>MARCH 22</b>	Paper discussion		
<b>MARCH 25</b>	Selection on genes		PS6
<b>MARCH 27</b>	Selection on genes		
<b>MARCH 29</b>	Selection on genes		Students lead examples; Exam 3 given out

<b>APRIL 1</b>	Selection on genes and genetic variation in humans	Exam 3 due
<b>APRIL 3</b>	Genetic variation in humans	Teaching abstracts due
<b>APRIL 5</b>	Paper discussion	Prasad, Barrett
<b>APRIL 8</b>	Genetic variation in humans	
<b>APRIL 10</b>	Applications	PS7
<b>APRIL 12</b>	Applications	
<b>APRIL 15</b>	Ashley and Alex	
<b>APRIL 17</b>	Meghan and Josh	PS8
<b>APRIL 19</b>	Emily	Exam 4 given out
<b>APRIL 22</b>	Student's choice	Exam 4 due
<b>APRIL 24</b>	Student's choice	
<b>APRIL 26</b>	Student's choice and review	