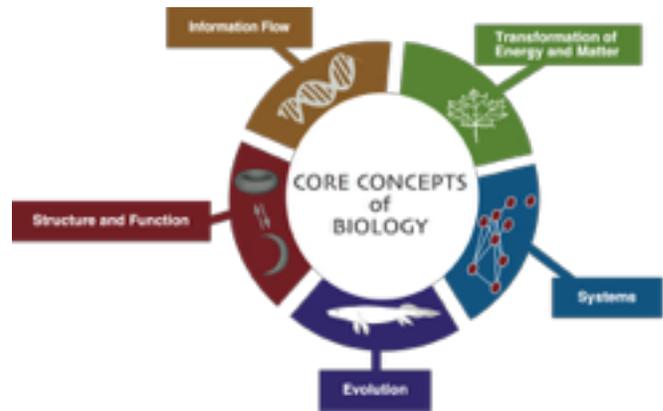


# Biology 355: Genetics

San Francisco State  
University  
Spring 2016



## INSTRUCTORS:

### Rori Rohlfs, PhD

Assistant Professor, Biology  
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HH 762  
Office hours: M 11:30-1:30 and by appt.

### Scott Roy, PhD

Assistant Professor, Biology  
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HH 415  
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### GA: Cameron Everson

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**COURSE CREDIT:** 3.0 Units

**PREREQUISITES:** BIOL 230, BIOL 240; CHEM 130

**SCHEDULE:** MWF 9:10-10:00 am 10:10-11:00 am

**LOCATION:** Thornton Hall 429 432

**WEBSITE:** SFSU iLearn site for Biol 355, Spring 2016

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## COURSE DESCRIPTION:

Biology 355 is a community of biologists working together on building understanding and mastery of genetics concepts and applications. The classroom culture is designed to engage you to think like the biologists you are. Problem solving and communication are key components to the goals and culture of this class. Case studies will be used to build practical analytical skills, as well as to learn general genetic concepts by exposure to them in a variety of contexts.

Biology 355 is intended for (and required of) all biology majors, and is open to other individuals requiring an upper-division general course in genetics. The course content includes molecular genetics, transmission genetics, population genetics, and advanced topics, with sensitivity to the ethical, legal, and social implications. After taking the course, students will be able to:

- 1) Describe the molecular structure of genes and explain the molecular processes of replication and expression of genes.
- 2) Define standard genetic terms/vocabulary.

- 3) Predict the phenotypic effects of changes at the genetic molecular level in well-described systems.
- 4) Reason about the effects of perturbations in the information pathway through DNA, RNA, and proteins, to phenotypic traits.
  
- 5) Compare and contrast the mechanisms and effects of meiosis and mitosis.
- 6) Draw out the transmission of genes and traits from parent to offspring, bearing in mind recombination.
- 7) Analyze pedigrees to predict the mode of transmission of genetic traits and evaluate proposed modes of inheritance.
- 8) Explain the generation of genetic diversity in a population by mutation and recombination.
- 9) Interpret what genetic data tells us about ancestry and disease risk
- 10) Analyze genome wide association study data and interpret results.
- 11) Connect intergenerational molecular mutational processes to evolutionary divergence between species and adaptation.
- 12) Reconstruct the evolutionary history of species using molecular data.
- 13) Identify public genomic resources and use them to research genes associated with diseases.
- 14) Explain how the genomes of individuals can be used to reconstruct ancestry and predict disease susceptibility.
- 15) Identify and explain the major types of epigenetic modifications of DNA, and predict how epigenetic modification affects gene expression and phenotype.
- 16) Explain how inherited, somatic and environmentally-driven mutations contribute to cancer risk with regards to gene regulation and dysregulation.
- 17) Compare traditional and next-generation sequencing in methods and applications.

### **STUDENT EXPECTATIONS:**

- Attend and actively participate as a member of the Biology 355 community (so no off-topic phone or computer use).
- In all situations display respect, tolerance, and patience.
- Be open to learning in different ways and trying new learning and study strategies.
- Approach us for help early and often, and provide us with feedback.
- Seek out additional information through resources like Wikipedia, YouTube, etc.
- Use readings and assignments to clarify information and extend knowledge.
- Take responsibility for your own learning by staying attentive and organized.

### **REQUIRED MATERIALS:**

- One pack of 3x5 index cards – bring a few to every lecture
- Your own iClicker (available at the SFSU Bookstore)
- Web/E-mail/iLearn access
- Scanner/camera access (free scanners available in library)
- Selected lectures from Coursera course 'Useful Genetics,' as indicated in class assignments: <https://class.coursera.org/usefulgenetics-003/lecture/preview>.

### **GRADING:**

10%                      Participation (clicker questions) 10 days dropped

20%	Homework assignments	3 dropped
70%	Exams (4, each is cumulative)	1 dropped from first 3

Grade assignments will be based on the percentage of total points earned. We as instructors do not decide your grade, but rather you as a student do the work to earn your grade.

<u>%</u>	<u>GRADE</u>	<u>GRADE POINTS</u>
93-100	A	4.0
90-92	A-	3.7
87-89	B+	3.3
83-86	B	3.0
80-82	B-	2.7
77-79	C+	2.3
73-76	C	2.0
70-72	C-	1.7
67-69	D+	1.3
63-66	D	1.0
60-62	D-	0.7
0-59	F	0

**GETTING HELP:** We are really excited to help you learn genetics! Please don't hesitate to visit instructor and GA office hours. In addition you yourselves are an excellent resource. We strongly encourage you to exchange contact information with each other and set up weekly study group meetings.

**EXTRA CREDIT:** Extra credit opportunities will be made available on occasion through the course of the semester.

**LATE ASSIGNMENTS:** Due to the large size of this class, we cannot award points for assignments submitted after the deadline. Even if you miss the deadline for an assignment, we still highly recommend doing the work as preparation for the exams.

**ATTENDANCE:** Attendance of lecture sessions is ***essential*** for success in this course. Lectures often include in-class activities and discussions of the material in ways not emphasized in suggested and required readings. In addition, questions and problems practiced in lecture sessions will appear on exams. Positive attendance means being present at the start of class and remaining present throughout class. Attendance will be monitored through responses to iClicker questions. You are responsible for responding to iClicker questions yourself, and you may NOT respond for any of your colleagues.

**LECTURE ACTIVITIES AND HOMEWORK ASSIGNMENTS:** Participation in lecture sessions means not just being physically present, but being mentally and intellectually present as well. Your voice matters in large and small group discussions, and we will provide you with numerous opportunities to share your ideas. We will curate a number of different activities to facilitate your learning through various approaches. We hope that these in-class activities a) allow you a chance to think through your ideas and b) provide us with an idea of your understanding of the concepts we cover in class. *These activities may not be made up.*

**iCLICKERS:** iClickers will be used to allow both you and us as instructors to understand how our community is thinking about a biological topic. You will receive points for participating in iClicker questions given during class, but we will not grade you on the correctness of your answer because we want you to be honest about how you are thinking. ***Under no circumstances can you operate anyone else's iClicker.*** Any

instance of one student responding for another student will be considered and handled as a cheating incident. Either the iClicker 1 or 2 is fine.

**EXAMS:** There are 4 exams throughout the semester. See the course calendar for the exact dates of these exams. The exams will include a variety of question styles that require you to recall, evaluate, apply, and reflect on what you learned. These exams cover concepts discussed in lecture, in-class activities, and homework assignments. Questions, problems, and discussion/reflection prompts from class may appear as exam questions. We will supply a study guide in advance of these exams. As one of the first three exam grades is dropped, **there will be no make up exams for the first three exams**. If you miss the fourth exam due to a verifiable, unplanned emergency, you **MUST** a) notify the instructors (by phone or E-mail) of the problem **PRIOR** to the exam and b) provide adequate documentation (doctor's note, copy of death certificate etc.). Contact one of the instructors immediately to schedule a make up. The exam must be made up within 1 week of the original exam date.

**COMPUTERS:** This is an electronically supported course. You must have easy access to a computer and the internet in order to be successful in this course. A list of computer labs on campus can be found at: <http://tech.sfsu.edu/it/content/lab>

**STUDENTS WITH DISABILITIES:** Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email ([dprc@sfsu.edu](mailto:dprc@sfsu.edu)). (<http://www.sfsu.edu/~dprc/>)

**POLICY ON OBSERVANCE OF RELIGIOUS HOLIDAYS:** The faculty of San Francisco State University shall make reasonable accommodations for students to observe religious holidays when such observances require students to be absent from class activities. It is the responsibility of the student to inform the instructor, *in writing*, about such holidays during the first two weeks of the class each semester. If such holidays occur during the first two weeks of the semester, the student must notify the instructor, in writing, at least three days before the date that he/ she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed. (*SFSU Policy F00-212*)

**STATEMENT ON PLAGIARISM AND CHEATING:** Students are expected to maintain academic integrity in all work pursued at San Francisco State University. Cheating on tests may, at the discretion of the instructor, result in the automatic disqualification of the test and the student receiving zero points for that test. Cell phone use (text messaging included) during a test for *any* reason (personal or otherwise) is considered cheating. Plagiarism, defined as either **1) direct copying or loose paraphrasing of text from a published work or from an online source without appropriate referencing, or 2) use of another student's work or ideas without appropriate attribution**, will result in zero points earned for that assignment.

**STUDENT DISCLOSURES OF SEXUAL VIOLENCE:** SF State fosters a campus free of sexual violence including sexual harassment, domestic violence, dating violence, stalking, and/or any form of sex or gender discrimination. If you disclose a personal experience as an SF State student, the course instructor is required to notify the Dean of Students. To disclose any such violence confidentially, contact:

- The SAFE Place - (415) 338-2208; [http://www.sfsu.edu/~safe\\_plc/](http://www.sfsu.edu/~safe_plc/)
- Counseling and Psychological Services Center - (415) 338-2208; <http://psyservs.sfsu.edu/>
- For more information on your rights and available resources: <http://titleix.sfsu.edu>

**Departmental and University Deadlines and Procedures:**

**February 8, 2016 – Last day to drop classes.** During the first two weeks of instruction, dropping a course(s) is permitted without academic penalty. No symbol is recorded on the student's permanent record. Students are responsible for making changes to their official academic schedule. If you decide not to attend a class you enrolled in, you must drop that class through GATOR REG during access hours. If you added a class during the first two weeks and then decide to drop, you also must drop through GATOR REG. As a courtesy, please notify the instructor that you are dropping.

**From February 10 – April 26, 2014 – Withdrawal from a class.** After the first two weeks of instruction, withdrawal from a course is ***not permitted except for serious and compelling reasons***. The "W" grade carries no connotation of quality of student performance and is not used as units attempted in calculating grade point average or progress points. The expectation of being dropped for nonattendance is ***not*** a sufficient reason for withdrawal. If the withdrawal is approved, the student will receive a "W" grade. Requests for withdrawal are reviewed by the Instructor and Department Chair. Students must submit their unofficial transcripts along with their petitions.

**From April 27 – May 17, 2014 –** Withdrawals are normally not permitted during this period except in cases of **verified accident or serious illness** where the cause of withdrawal is due to circumstances clearly beyond the student's control and where the assignment of an incomplete is not practical. Ordinarily, withdrawals in this category involve a **total withdrawal from the University**. All requests during this period must be reviewed by the Instructor, Department Chair, and Associate Dean. Students must submit their unofficial transcripts and appropriate documentation with their petitions.

**Note:** The University withdrawal policy is: **A student may withdraw from an individual course only 2 times no matter what their circumstances are. The third time that the student enrolls in the same course (if the course repeat policy has been waived), they CANNOT withdraw for any reason.**

## General course outline

Class Date	Assignments	Topics
W, Jan 27		Molecular genetics <ul style="list-style-type: none"> <li>• How are genes structured?</li> <li>• How do cells divide</li> <li>• How are genes regulated?</li> <li>• What molecular techniques do we use to study genes?</li> <li>• How is the genome structured?</li> </ul>
F, Jan 29		
M, Feb 1		
W, Feb 3	HW1	
F, Feb 5		
M, Feb 8		
W, Feb 10	HW2	
F, Feb 12		
M, Feb 15		
W, Feb 17	HW3	
F, Feb 19		Exam 1
M, Feb 22		Transmission genetics <ul style="list-style-type: none"> <li>• Why is their dominance and recessivity?</li> <li>• Why does a gene's effect depend on other genes?</li> <li>• How are genes and traits inherited?</li> <li>• What's the chance that offspring have particular genotypes and traits?</li> <li>• What's the genetic basis for trait inheritance?</li> </ul>
W, Feb 24	HW4	
F, Feb 26		
M, Feb 29		
W, Mar 2	HW5	
F, Mar 4		
M, Mar 7		
W, Mar 9	HW6	
F, Mar 11		
M, Mar 14		
W, Mar 16	HW7	Review
F, Mar 18		Exam 2
Mar 21-25		<b>HAPPY SPRING BREAK</b>
M, Mar 28		
W, Mar 30	HW8	
F, Apr 1		

M, Apr 4		Population genetics and evolution <ul style="list-style-type: none"> <li>• Where does genetic diversity come from?</li> <li>• What can (and can't) genetic variation tell us about our ancestry?</li> <li>• What's the role of genetics in adaptation?</li> <li>• How can we use genetics to understand variation between species?</li> </ul>
W, Apr 6	HW9	
F, Apr 8		
M, Apr 11		
W, Apr 13	HW10	
F, Apr 15		
M, Apr 18		
W, Apr 20	HW11	Review
F, Apr 22		Exam 3
M, Apr 25		Advanced Topics: Chosen based on student interest, recent breakthroughs, research in the community.
W, Apr 27	HW12	
F, Apr 29		
M, May 2		
W, May 4	HW12	
F, May 6		
M, May 9		
W, May 11	HW13	
F, May 13		Review
M, May 16		Exam 4