

Biology 355: Genetics

San Francisco State University

Spring 2019

INSTRUCTORS:

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GRADUATE ASSISTANTS:

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COURSE CREDIT: 3.0 Units

PREREQUISITES: The prerequisites for Biology 355 are 1) Biol 230, General Biology I, 2) Biol 240, General Biology II, and 3) one semester of organic chemistry, either Chem 130, General Organic Chemistry, or Chem 233, Organic Chemistry I. Each course must be completed with a grade of C- or better. You cannot be concurrently enrolled in these courses and Biol 355. If you do not meet these prerequisites, you will not be enrolled in Biology 355.

This semester, we may be able to slightly relax the prerequisites, as follows: Students who have taken Organic Chemistry will be given first priority. If space allows, students without Organic Chemistry may be admitted.

Finally, biochem majors may also enroll if they have 1) Biol 230, General Biology I, 2) CHEM 233 or CHEM 333, (ochem1), and 3) CHEM 340 (biochem 1), all with C or better.

SCHEDULE: T,Th 2:00-3:15 pm OR T,Th 3:30-4:45 pm

LOCATION Hensil Hall 245

WEBSITE: SFSU iLearn site for Biol 355, Spring 2019

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. We will, among other things, discuss pre-natal testing, GMOs, sequencing, ancestry testing, disease genes, cancer and drug resistance.

STUDENT LEARNING OUTCOMES

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 affects of changes at the genetic molecular level in well-described systems.
- 4) Reason about the affects 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) Explain the generation of genetic diversity in a population by mutation and recombination.
- 8) Interpret what genetic data tells us about ancestry and disease risk
- 9) Analyze genome wide association study data and interpret results.
- 10) Connect intergenerational molecular mutational processes to evolutionary divergence between species and adaptation.
- 11) Reconstruct the evolutionary history of species using molecular data.
- 12) Identify public genomic resources and use them to research genes associated with diseases.
- 13) Explain how the genomes of individuals can be used to reconstruct ancestry and predict disease susceptibility.
- 14) Identify and explain the major types of epigenetic modifications of DNA, and predict how epigenetic modification affects gene expression and phenotype.
- 15) Explain how inherited, somatic and environmentally-driven mutations contribute to cancer risk with regards to gene regulation and dysregulation.
- 16) Explain the principles and uses of next-generation sequencing

CLASS RHYTHM

Scott will teach the first half (before Spring Break), and Rori will teach the second half. (With occasional exceptions)

There will be a homework due every week on Tuesday morning before class, except if there was an exam the Thursday before.

Specifically, homeworks will be due:

2/5, 2/12, 2/19, 3/5, 3/12, 3/19, 4/2, 4/16, 4/23, 5/7 and 5/14

Slides will be shared on iLearn after the class.

The class is divided into four sections. Scott will teach 1+2 and Rori will teach 3+4.

1. Molecular Genetics, 1/29-2/21
2. Transmission Genetics, 2/26-3/21
3. Population Genetics, 4/2-4/25
4. Advanced Topics, 4/28-5/16

EXAMS:

There will be 4 exams on the following dates:

- Thursday Feb 21
- Tuesday March 19 OR Thursday March 21 (to be decided as a class)
- Thursday April 25
- Thurs May 16 (last day of class)

There is no final exam in the exam week.

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 exam grades is dropped, we do not plan any make up exams.

STUDENT EXPECTATIONS:

- We expect you to attend and actively participate as a member of the Biology 355 community. Therefore, please refrain from off-topic phone and computer use.
- In all situations display respect, tolerance, and patience towards other students and the teaching team.
- 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. Try to come to our office hours at least once before the spring break. Feel free to drop in even if you don't have a specific question. You can come alone or with a colleague.
- Seek out additional information through resources like Wikipedia, YouTube, etc.
- Use assignments to clarify information and extend your 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)

GRADING:

70% exams

20% homework

10% participation

Participation will be evaluated based on answering at least one clicker question during each class period, beginning on the second day of class (1/31). Clicker questions are intended for students' learning and are scored based on participation and not on specific/correct answers. Each day's participation is worth 5 points, up to a maximum of 100 points. Thus, if you attend 20 of the 25 classes (not counting the first day or exam days), you will receive all 100 points.

Homework will be evaluated based on a combination of content and participation. For each homework assignment, 10 points will be assigned based on participation (completion of the entire assignment with substantial answers), and 15 points will be assigned based on grading of a subset of the questions (based on time available for grading by the teaching assistants). There will be 10 or 11 homeworks. We will count your top 8 scores, for a maximum of $8 \times 25 = 200$ points.

Exams will be evaluated based on answers to questions. When questions are ambiguous or there are multiple reasonable ways to interpret a question, we will attempt to give credit based on student thought process rather than solely on one single correct answer. Your lowest exam grade will be dropped, and the remaining three exams will be averaged to give a total score of 700 points.

Extra credit opportunities will be made available on occasion through the course of the semester. Students can earn a maximum of 50 points on extra credit.

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

POINTS	GRADE	GRADE POINTS
930-1000	A	4.0
900-929	A-	3.7
870-899	B+	3.3
830-869	B	3.0
800-829	B-	2.7

770-799	C+	2.3
730-769	C	2.0
700-729	C-	1.7
670-699	D+	1.3
630-669	D	1.0
600-629	D-	0.7
0-599	F	0

GETTING HELP: We are really excited to help you learn genetics! Please don't hesitate to visit instructor and GA office hours. Even if you don't have a very clear question, it is a good idea to come to our office hours a few times during the semester. We also encourage you to use the iLearn forums to ask questions of the teaching staff and your colleagues. Students are also encouraged to take advantage of resources at the Learning Assistance Center (LAC: <http://lac.sfsu.edu/>), and the Campus Academic Resource Program (CARP: <http://carp.sfsu.edu/>) for additional support.

Most importantly, you yourselves are an excellent resource. We strongly encourage you to exchange contact information with each other and set up weekly study group meetings. Let us know if we can help you with that.

Finally, the web is a great resource. Wikipedia, Khan Academy, YouTube etc. are all great places to search for information. If you are not sure whether to trust a source, feel free to ask us.

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.

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>
If limited computer / internet access is making it hard for you to do well in the course, come to one of the office hours as soon as possible.

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). (<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/
- 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 15, 2019 – Last day to drop classes. During the first three weeks of instruction, dropping a course(s) is permitted without academic penalty. No symbol is recorded on the student's permanent record.

From February 16 – April 29, 2019 – Withdrawal from a class. After the first three 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 230 – May 14, 2019 – 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**