

BIOL 4830 POPULATION GENETICS SPRING 2018

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Write BIOL 4830 in the subject line!
Check your Stan State email every day!

COURSE PREREQUISITES

Completion of Introductory Genetics BIOL 3350 (or equivalent) with a grade of D or better.

COURSE DESCRIPTION

This course focuses on examining how the forces of evolution contribute to population-level genetic variation, and the current molecular, statistical and bioinformatics approaches toward measuring that variation. The topics to be discussed include: the history of population genetic research, the forces of evolution (natural and sexual selection, genetic drift, inbreeding, gene flow, mutation), F-statistics, coalescence, quantitative traits, comparative genomics and human population genetics. The use of population genetics in conservation, biogeography and ecological studies will also be discussed. Throughout the course, a focus on modern techniques will unite theory with current research in the field.

Familiarity with the concepts of genetics presented in the pre-requisite course is absolutely necessary. There is some mathematical-based theory and statistical problem-solving in this course, therefore a student must possess basic algebra skills and a basic understanding of probability. For a student to be successful a minimum of 15 hours of intense review are needed outside of class (this does not include time you spend on homework assignments). **If you are not prepared to dedicate the time and effort needed for this course, you should reconsider your enrollment.**

REQUIRED TEXTS/RESOURCES

- *Population Genetics*. Hamilton, M.B. 2009. Wiley---Blackwell. ISBN: 9781405132770
- A reliable internet connection is necessary, as there are some homework assignments using online resources.
- I will not be making PowerPoint lectures available for student download. You are responsible for taking notes.

CENSUS DATE

This course cannot be taken for credit. It can only be taken for a letter grade. Students can only drop this course prior to the census date of February 21.

GRADING

Grades are determined by the points you earn during the course. I will not assign +/- grades, only whole letter grades. A total of 1000 points are available. It is expected that students will keep track of their scores (including copies of all graded materials) for the duration of the term.

In-class exams	
Exam 1	175 points
Exam 2	225 points
Exam 3	250 points
Study group activities:	
Article summaries (2, 50 points each)	100 points
Homework assignments (2, 50 points each)	100 points
Poster (participation 50 pts, presentation 100 pts)	150 points
<hr/> Total	<hr/> 1000 points

PERSONAL INTEGRITY AND CLASSROOM BEHAVIOR

It is assumed that you have read and understand the university's position on academic integrity and student discipline. Inappropriate behavior (including, but not limited to, cheating and/or **plagiarism**) will be dealt with as severely as university and state regulations allow.

You are allowed to take notes on your laptops, but any abuse of this privilege (such as checking email, etc) will result in a 50-point penalty from your semester point total (half a letter grade). Cell phone use is forbidden, unless you choose to record the lectures. **Do not text in class.**

LECTURE EXAMS

The exams will be given in a mixed format (multiple choice, true/false, short answer/essay, graph interpretation). Exams 2 and 3 will assume that you are familiar with material from earlier exams. I do not recycle exam questions. **Do not make the mistake of underestimating the difficulty of exams.** As you progress through the course, your study skills and work ethic will likely improve, which is why I have allotted an increasing number of points to be earned through each exam.

Students who arrive after the first exam of the day has been turned in will not be allowed to take the exam, and will receive a zero grade for the exam. If you must leave the room for personal reasons, you will not be allowed to finish the in-class exam. Your partially finished exam will be graded as it stands. If you plan to miss an exam for any reason, you must take an alternate exam before the in-class exam is scheduled to take place. If you miss an exam unexpectedly, you must provide documentation of a legitimate reason for doing so; otherwise, you will not be allowed to take the alternate exam, and you will receive a zero grade for the missed exam.

STUDY GROUPS

You will be assigned to a study group at the beginning of the semester. Study groups will consist of 3 or 4 students. You will work very closely with your study group members throughout the semester... you will sit as a group in lecture, and you will work as a team to write article summaries, perform data analysis homework assignments, and create a scientific poster. Part of your grade is dependent on your teamwork, thus every group member must do their share of the work! To ensure that each group member is contributing, I will be using online submission platforms and co-authorship grading (see the relevant sections below). **You will also evaluate your group members at the end of the semester.**

ARTICLE SUMMARIES (SUBMITTED VIA TURN-IT-IN ON BB)

I will post PDFs of the articles on the course BlackBoard site (Documents & Content page) days before the assignment is due.

1. Each group member will read the entire article, and think deeply about how the hypotheses are being tested, the analytical approaches, and the emerging conclusions. Each member will take responsibility for writing a summary of one of the sections within the article (Introduction, Materials and Methods, Results, Discussion) **in their own words**, for a total of 1 single-spaced page. **Include all article headers and sub-headers in your summary (these should be identical to the original article, and will not count as plagiarism).**
2. You will post this draft summary on to BlackBoard at least 48 hours before the assignment due date, using the Wiki specific to your assigned study group. Other group members will also post their section summaries to the assignment wiki, placing their text above or below yours to maintain the order found within the original article. Include your name in bold font above your section, so it is easy for me to give you credit for your work. **Once your rough draft is posted, do not modify it in any way.** Incomplete drafts will receive only partial credit.
3. All group members will then use the COMMENT button below to provide **very explicit instructions** on how their partners can improve their draft summary, **focusing on conceptual and analytical aspects (not just editorial aspects)**. You must offer at least 1 substantive conceptual/analytical comment to receive full credit. "Substantive" means you write an explanation which clearly demonstrates to me your deep understanding of an evolutionary concept, or an analytical approach used in the article. It helps if you also write a few sentences which your group member can cut and paste within their own summary, to improve their draft. You must offer a novel comment; do not reiterate suggestions made by another group member. These comments are due 24 hours before the assignment due date.
4. The group member who wrote the Introduction section will then submit the complete, final draft via TurnItIn on BB. This link will appear on the BlackBoard Assignments page 24 hours before the final due date.

You can earn a maximum of 40 points for your summarized section, and 10 points for your commentary. There are 2 article summary assignments, so the total points you can earn sums to 100. Your two summaries must include either an Introduction or a Discussion, and either a Materials/Methods or a Results. Late submissions will have 20% deducted for each day the assignment is overdue.

ONLINE SIMULATION EXERCISES (SUBMITTED VIA TURN-IT-IN ON BB)

The Hamilton textbook has a set of online data analysis exercises associated with it, which I will assign as homework (see textbook link on Blackboard).

1. Each group member will complete the homework assignment either together or on their own, so that everyone can understand the simulation results. Think deeply about how each simulation result should be explained. Each member will take responsibility for performing and explaining a sub-set of the simulations within the homework assignment **in their own words**, for a minimum of 1/2 single-spaced page. **Analyses must include screenshots of graphs and output.** Authors will focus on describing the concept or process that was being explored in each component of the simulation, and discuss what they learned. Within the summaries, refer directly to specific components of your graph images or results tables, using dots and stars or by circling an area or number. (I.e. “You can see in the graph of allele frequency changes that the frequency of the q allele begins to decline at the 10th generation [star], but the frequency of heterozygotes remains above 40% until the 100th generation [circled].”)
2. You will post this draft analysis on to BlackBoard at least 48 hours before the assignment due date, using the Wiki specific to your assigned study group. Other group members will also post their section summaries to the assignment wiki, placing their text above or below yours to maintain the original order within the assignment. Include your name in bold font above your section, so it is easy for me to give you credit for your work. **Once your rough draft is posted, do not modify it in any way.** Incomplete drafts will receive only partial credit.
3. All group members will then use the COMMENT button below to provide **very explicit instructions** on how their partners can improve their draft answer, **focusing on conceptual and analytical aspects (not just editorial aspects).** You must offer at least 1 substantive conceptual/analytical comment to receive full credit. “Substantive” means you write an explanation which clearly demonstrates to me your deep understanding of an evolutionary or population genetic concept or process. It helps if you also write a few sentences which your group member can cut and paste within their own answer, to improve their draft. You must offer a novel comment; do not reiterate suggestions made by another group member. These comments are due 24 hours before the assignment due date.
4. The group member who analyzes the **first** simulation exercise within each homework assignment will then submit the complete, final draft via TurnItIn on BB. This link will appear on the BlackBoard Assignments page 24 hours before the final due date.

You can earn a maximum of 40 points for your analyzed simulation components, and 10 points for your commentary. There are 2 homework assignments, so the total points you can earn sums to 100.

PLAGIARISM

Be very careful to avoid plagiarism on article summaries and homework assignments, because the TurnItIn software is very good at detecting even a single plagiarized sentence. You may be tempted to lift phrases directly out of the article, or use wording lifted directly from my slides...resist this temptation, because such phrases are highlighted by the software, and **if there are more than a few phrases (6-8 words in a row) used verbatim within a single summary, I will award every group member 0 points for the assignment (group members will not be penalized if they warned the section author about specific examples of plagiarism in the draft summary).** The TurnItIn archives copies of the work submitted in previous semesters, and will be making comparisons, **so resist the temptation to plagiarize from friends familiar with the course.**

POSTER PRESENTATION

Poster presentations will be created using the Wiki specific to your assigned study group. Each study group will select a topic relevant to population genetics, and perform a small literature review which includes **exactly** 4 recent (no older than 2009) primary literature articles. Each student will focus on reading one of the 4 articles, become intimately familiar with the work, and incorporate the most important aspects of the article within the larger, conceptual poster. The poster will be presented in the Poster Session (during the Final Exam period).

Participation points (50) can only be earned by documenting your contributions on Blackboard.

Each group member's contribution to the poster will be documented using the following structure:

1. Each group member chooses an article to summarize.
2. Each group member creates a new wiki page for their poster contribution, titled like "Poster, Betsy Ross,".
3. Group members will post their article summary on their wiki (see schedule for due date), and other group members will use the "Comments" tab to make suggestions and revisions.
4. More lengthy discussions can be documented on the group's Discussion Board (use the Board only for the poster project, please...don't use it for homework assignments, etc.).
5. To earn full points, a group member must:
 - a. post their own work on their own wiki
 - b. make constructive comments regarding **every other** group member's work on member wikis
 - c. discuss the formatting, organization, and printing of the poster on the Discussion Board

Any contributions which are documented in other ways (texting, Google Docs, etc.) won't be considered for credit.

To find primary literature articles relevant for your topic:

- Go to the CSU Stanislaus library website (link on University homepage).
- Choose "Find Books and Articles", then choose "Databases A-Z", then choose "Biological Abstracts." You will be taken to the Web of Science hub.
- Search on a combination of terms to find articles about the topic your group finds most interesting. Read the abstracts, and choose the article that the entire group feels is interesting and understandable.
- Click the "FIND IT!" link to access the full-text PDF. **Email me the 4 article PDFs for my approval; a single email with your group name in the subject line is desirable.**

Use Microsoft PowerPoint to prepare the poster presentation, by adding components (text boxes, images) to a single slide. You must format the slide as a custom size, with the minimum dimensions of (36" wide X 32" tall). I have posted a couple of **example posters** on Blackboard for you to use as a guideline for formatting and level of scientific rigor.

Currently, the best place to get your poster printed is Staples or Office Max, but you call around and comparison shop. A color print job should cost ~\$40. Talk to the print shop ahead of time to find out how long it will take, and build this into your preparation schedule. **If the print shop makes a mistake, it is their responsibility to print a second perfect copy for free.**

- The main goal of a poster is to relate the main points of your topic with as little effort as possible on the part of the audience to read, interpret, and understand.
- Use a suitable font size (can be read from about four feet away).
- Include a Title, a list of student presenters, and a Literature Cited section.
- Graphics are required (figures, special equations, photos). Graphics should be high resolution, and should convey the most important ideas in the poster. Don't add images just for "pizzazz".
- Clearly explain the ideas with short, concise sentences. **Use bullet points with informative but brief sentence fragments, instead of paragraphs!**
- For each figure, use an explanatory caption. You can outline each figures with a colored box, and outline the relevant paragraph/list in the Results or Discussion with the same color...this will help readers associate figures with text.
- Specific facts, data or images taken from the 4 articles must be cited within the poster text, using APA format.

COURSE OBJECTIVES

- Understand the molecular basis for population-level diversity
- Understand the processes that result in changes in allele frequencies
- Demonstrate knowledge of the molecular patterns of change that underlie population-level evolution
- Demonstrate knowledge of factors leading to the evolution of and influencing the expression of complex traits

TUTORING ON CAMPUS

Free tutoring services are available to assist you in most disciplines, including in biology!

Library 112; Phone (209) 667-3642; Web <http://www.csustan.edu/Tutoring>

Tutor for Spring 2018: Melanie Poetzsch

CAMPUS COUNSELING SERVICES

Overwhelmed by the stress of juggling classes and your home life? Our campus offers excellent counseling services to help support you!

Library 185; Phone (209) 667-3381; Web <http://www.csustan.edu/Counseling>

STUDENT HEALTH CENTER

You have already paid for access to health care on campus. Services include: birth control, flu shots, immunizations, pharmacy, check-ups, HIV testing, TB tests, and doctor's notes for when you are sick!

Phone (209) 667-3396; Web <http://healthcenter.csustan.edu>

COURSE SCHEDULE

All assignments are due by class time on the date specified.

Simulation 1	Fixation Indices
Simulation 2	Drift Selection Mutation

Week	Lecture	Text	Assignment
January 30	Syllabus Mendelian Genetics revisited		
February 6	Hardy-Weinberg theorem	Ch 2.1 Ch 2.3	Begin using the Study Recipe
February 13	Fixation and heterozygosity	Ch 2.5	
February 20	Exam 1 (first hour of class) Inbreeding	Ch 2.6	CENSUS DATE 2/21 Join a group by 2/22
February 27	Gametic disequilibrium	Ch 2.7	
March 6	Genetic drift and effective population size	Ch 3	Article 1 summary due 3/6
March 13	Genetic drift and effective population size		
March 20	Genetic drift and effective population size		Article 2 summary due 3/20
March 27	Exam 2 (first hour of class) Population structure and gene flow	Ch 4	Poster topic sign up by 3/27 Poster article PDF due 4/1
April 3	SPRING BREAK ENJOY YOUR HOLIDAY!		
April 10	Population structure and gene flow		Poster article summary due 4/10
April 17	Population structure and gene flow		Poster comments due 4/17
April 24	Mutation	Ch 5	Simulation 1 due 4/24
May 1	Natural selection	Ch 6	
May 8	Natural selection	Ch 7	Simulation 2 due 5/8
May 15	Exam 3 (first hour of class) In-class poster rough draft review		