

BIOLOGY 466: Population Genetics (Hybrid)

Summer 2015

LECTURE: TUES and THURS 1:00-3:50 pm in BIOL 004 and ENGR 333

COURSE LEARNING OBJECTIVES:

Primary Course Goal: Students will be able to understand and apply the major principles in population and evolutionary genetics.

This course provides a comprehensive overview of the field of population genetics, the branch of evolutionary biology concerned with the genetic structure of populations and how it changes through time. The principles of population genetics are needed to understand evolution, epidemiology, to develop strategies for worldwide conservation of genetic diversity in endangered species, and to understand the genetic basis of traits, such as the cause of genetic disease. Primary forces and processes involved in shaping genetic variation in natural populations (mutation, drift, selection, migration, recombination, mating patterns, inbreeding, isolation, population size and population subdivision), methods of measuring genetic variation and structure in nature, along with experimental simulations for modeling these processes will be emphasized.

Goal 1: Describe and predict how primary forces (natural selection, genetic drift, mutation, and gene flow) influence the genetic structure within and between populations.

Students will be able to (SWBAT):

- Objective 1- Calculate the effects of natural selection, genetic drift, mutation, and gene flow on allele frequencies in a population.
 - Performance indicator: Students will demonstrate proficiency by completing weekly problem sets and scoring 80% or better on exams.
- Objective 2- Analyze novel populations for signatures of selection, drift or gene flow.
 - Performance indicator: Students will score 90% or better on in-class analysis of real genetic data.

Goal 2: Explain how various factors and processes such as population size, inbreeding, and assortative mating affect genotype and allele frequencies in populations.

Students will be able to (SWBAT):

- Objective 1- Predict how allele and genotype frequencies will change due to various factors and model those predictions using the software PopG.
 - Performance indicator: Students will demonstrate proficiency by scoring 90% or better on PopG assignments.
- Objective 2 - Calculate the probability that two individuals will have alleles that are identical by descent.
 - Performance indicator: Students will comprehend primary literature on inbreeding and communicate results and conclusions in class discussion.
 - Performance indicator: Students will demonstrate proficiency by scoring 90% or better on inbreeding problem set.

Goal 3: Discuss and critique strategies for worldwide conservation of endangered species.

Students will be able to (SWBAT):

- Objective 1- Compare different conservation methods and provide examples of each.

- Performance indicator: Students will demonstrate proficiency by scoring 80% or better on exams.
- Objective 2 -Quantitatively and qualitatively predict outcomes for various conservation methods.
 - Performance indicator: Students will demonstrate proficiency by scoring 80% or better on exams.
- Objective 3-Defend alternative ideas for the protection of specific endangered species.
 - Performance indicator: Students will successfully defend approaches to conservation of specific assigned endangered species.
- Objective 4-Analyze and critically evaluate primary literature used in the determination of endangered status.
 - Performance indicator: Students will critique primary literature and federal decisions of protection in a class discussion.

Goal 4: Use several of the major software packages used in scientific research.
Students will be able to (SWBAT):

- Objective 1-Compute various population genetics parameters using current software.
- Objective 2 -Analyze real population genetic data using a variety of DNA markers.

Goal 5: Synthesize component ideas to suggest explanations and draw conclusions about the evolutionary history of a population.
Students will be able to (SWBAT):

- Objective 1-Use population genetic parameters such as Hardy-Weinberg equilibrium, heterozygosity, genetic distance and F_{st} to evaluate genetic structure within and between populations.
 - Performance indicator: Students will demonstrate proficiency by scoring 80% or better on active learning assignments.
- Objective 2 -Compare population genetic parameters between populations to reconstruct evolutionary histories and identify signatures of primary forces.
 - Performance indicator: Students will demonstrate proficiency by scoring 80% or better on active learning assignments.

PREREQUISITES and COREQUISITES: Students may not register for this course unless the prerequisites have been met: a 'C' or better (although a B or better is strongly advised) in BIOL 142 AND BIOL 302. These courses must be completed and cannot be taken concurrently. **No grade will be given in this course to anyone who does not meet these requirements.**

INSTRUCTOR:

Tracy Smith, Office BS 454

Email

tsmith6@umbc.edu

office hours

Email for appt

CLASS BLACKBOARD SITE: All relevant information, communication and material for the course will be posted to the class Blackboard site on myUMBC.

REQUIRED TEXT: An Introduction to Population Genetics by Rasmus Nielsen and Montgomery Slatkin.

TECHNICAL REQUIREMENTS and REQUIRED SOFTWARE: You must have a computer and a reliable connection to the internet in this course. You also must install Simutext software on your computer to access the lab portion of the course. See more information under "Lab" below.

GRADING: The final grade will be weighted in the following manner:

60% EXAMS (3 @ 20% each)
15% CLASSWORK/ACTIVE LEARNING
15% LAB (Computer simulations)
10% PRESENTATION

These items are the **only** factors that will be used to determine the final grade; no 'extra credit' will be given.

LECTURES: Lectures/Active Learning will be given in BIOL 004 and ENG 333 on Tuesdays and Thursdays. A schedule of topics and dates (Syllabus) is available on the class Blackboard site.

LAB: There will be a hybrid computer simulation lab component to the course. You must purchase web access to complete the lab component through simbio.com. The cost is \$25. Please have this purchased by Friday May 29. Follow the instructions below to purchase access.

1. To subscribe to your SimUText please visit:
<https://simutext.com/register.jsp?accesskey=ypee-Aqnr-RBUT-QWxr-EgQ8>
2. You will need to supply your email address as a user name, your name and student ID, and select a password.
3. Follow the remaining instructions to subscribe to your SimUText and download the software you will need.
4. Should you encounter a problem during registration, the access key for this course is **ypee-Aqnr-RBUT-QWxr-EgQ8**.

A word doc copy of the workbook is available on blackboard or through the simbio software program.

You may not share access to simbio. Anyone not purchasing their own access will be given a zero for the lab part of the course.

You will need to complete the "Graded Questions" online and submit your workbook via the drop box on blackboard by the due date for each lab. See syllabus for due dates.

Your lab grade will be calculated from both the online post-lab "Graded Questions" (40%) and from the workbook (60%) that you will submit by midnight on Sunday each week. Only specific questions in the workbook will be graded, but you must complete all assigned parts of the workbook each week to receive full credit.

HOMEWORK: Four problem sets based on material from Lectures and reading assignments will be posted on Blackboard. Problem sets ('homework') will be posted immediately after the last assignment is due and are due per the schedule below. The correct answers and feedback will be made available after submission: no credit will be given for work submitted after the deadline.

Homework 1: Due by Tuesday, 6/2 @ 1pm

Homework 2: Due by Tuesday, 6/9 @ 1pm

Homework 3: Due by Thursday, 6/18 @ 1pm

Homework 4: Due by Thursday, 7/2 @ 1pm

EXAMS: There will be three exams. Exams will be multiple choice and/or short answer. An answer key for the exam will be posted on Blackboard after the exam. Questions concerning the grading of an exam must be submitted by E-mail to the instructor within one week of the time the answer key is posted. After this time, exam scores will not be re-evaluated. Individual scores and the mean will be given out for each exam, however, letter grades will not be assigned for each exam - only a final letter grade for the class will be given.

If you experience a sudden illness, family emergency or other unforeseen event that prevents you from being in school the day of the exam, you or someone else must **1) notify the instructor at least one hour before the exam** and **2) provide documentation afterwards**. Make-up classwork, labs and exams will be permitted **only** in cases where sufficient documentation to support the reason for missing the exam can be provided: for example, if you are too sick to take an exam, you are required to obtain a signed statement from a non-parent physician stating that you were too ill to attend class. Makeup exams will be given in the next few days, and no later than two classes after the exam. Makeup exams may be oral or written (short essay), at the discretion of the instructor. Missing labs and classwork must be completed within one week of missing the assignment.

For disability related services, such as questions regarding accommodations or to make arrangements to take exams in the Student Support Services center, students should visit SSS located in MP 213 at phone extension 410-455-2459 or email sss@umbc.edu for more information. Information on how to document a disability can be obtained from Student Support Services. Students who experience test anxiety are advised to seek help from the Counseling Center, through Student Support Services.

INSTRUCTOR RESPONSE TIME AND ASSIGNMENT FEEDBACK: All emails will be answered within 24 hours except on a weekend in which they will be answered the following Monday. Graded assignments and other feedback will be available within one week.

DISCUSSION BOARDS: It is expected that you participate on the discussion board by answering and asking questions about material from class or your lab simulation for the

week. Before emailing the instructor, you should ask your question on Blackboard discussion boards first and only email the instructor about content if no one gives a satisfactory answer on the discussion board. There will be a 1% grade boost at the end of the semester for students with borderline grades who make three meaningful discussion board posts.

CELL PHONES: No phones out during class. If you have an emergency, leave the room to use your phone.

ACADEMIC INTEGRITY

Information on the UMBC policy on academic integrity, can be found at:
http://www.umbc.edu/undergrad_ed/ai/students.html.

Anyone charged with academic misconduct (as defined below) in any aspect of the course that is graded (exams, problem sets) will, at a minimum, receive a grade of zero for that exam or assignment.

All incidences of academic misconduct in the class will be reported to the Academic Conduct Committee for inclusion in the Academic Misconduct Reporting Database.

Excerpted from the Undergraduate Student Academic Conduct Policy
http://www.umbc.edu/undergrad_ed/ai/documents/ACC2011.pdf (Approved 12/14/2010)

The Undergraduate Student Academic Conduct Policy defines and strives to ensure academic integrity at UMBC. The Policy describes the process for addressing allegations of undergraduate student academic misconduct. The underlying philosophy of this Policy is that members of the university community view academic integrity as a serious institutional value.

Academic Misconduct means Cheating, Fabrication, Facilitating Academic Misconduct, Plagiarism, or Dishonesty by an undergraduate student.

Cheating means using or attempting to use unauthorized material, information, study aids, or another person's work in any academic exercise. For example:

- Working on an assignment with others when the instructor asked for individual work,
- Receiving unauthorized help on an assignment, or
- Getting questions or answers from someone who has already taken a test or exam, or
- Copying from another student during a test or exam with or without that student's knowledge, or
- Using unauthorized material (e.g., an instructor's manual) to fulfill an assignment,
- Using unauthorized crib notes or cheat sheets during a test or exam, or
- Using unauthorized aids (e.g., calculator), or
- Altering a graded test, exam, or paper and submitting it for regrading, or
- Asking someone else to take a test or exam in place of the enrolled student, or
- Cheating on a test or exam in any other way, or
- Any other action defined as cheating in the class syllabus by the Faculty Member.

Fabrication means falsification or invention of any information or citation in an academic exercise. For example:

- Inventing or falsifying lab or research data, or
- Inventing or falsifying a bibliography, or
- Any other action defined as fabrication in the class syllabus by the Faculty Member.

Facilitating academic misconduct means helping or attempting to help another student commit an act of academic misconduct. For example:

- Writing or providing all or part of a paper, essay, problem set, computer program, or other assignment for another student, or
- Helping someone else cheat on a test or exam (e.g., permitting someone to copy from a test or exam, taking a test or exam for someone else), or
- Any other action defined as facilitating academic dishonesty in the class syllabus by the Faculty Member.

Plagiarism means knowingly, or by carelessness or negligence, representing as one's own, in any academic exercise, the intellectual or creative work of someone else. For example:

- Turning in work done in whole or in part by someone else, or
- In a course requiring computer work, copying another person's program, or
- Paraphrasing or copying material from a written source, including the Internet, without footnoting or referencing it in a paper, or
- Copying material from a written source, including the Internet, without using quotation marks, or
- Turning in a paper obtained, at least in part, from a term paper "mill" or website, or
- Turning in a paper copied, at least in part, from another student's paper, whether or not that student is currently taking the same course, or
- Any other action defined as plagiarism in the class syllabus by the Faculty Member.

•
Dishonesty means lack of truthfulness or sincerity when interacting with the faculty member regarding an academic exercise. For example:

- Lying to the instructor in an attempt to explain an incident of academic misconduct, or
- Lying to the instructor or using a false or forged excuse in order to get an extension on a due date, or
- Submitting a written summary about a required out-of-class event that the student did not attend, or
- Any other action defined as dishonesty in the class syllabus by the Faculty Member.

In response to Academic Misconduct, the Faculty Member may take one or more of the following actions:

- Award a Course Penalty, including, but not limited to, an F in the course, a zero on the assignment, and/or a percentage off the final grade;
- Require the completion of additional assignments;
- Give the student a written warning;
- Provide information about forms of assistance from the Counseling Center, the Writing Center, the Learning Resources Center, or other resources; and/or
- Request consideration of an Institutional Penalty by the ACC.

In all cases, the Faculty Member shall submit a report to the Academic Misconduct Reporting Database.

Academic Misconduct may be reported to the Faculty Member by graders, laboratory assistants, teaching assistants, staff members or other students in the course. Those reporting and those receiving reports of Academic Misconduct shall treat the incidents and their resolutions as confidential matters. The Faculty Member shall notify the student of the alleged Academic Misconduct and invite the student for a meeting to discuss the issue. An email sent to the student at his/her UMBC email address shall be considered sufficient notification. During the meeting the Faculty Member will describe the basis for the allegation, explain the proposed course resolution, and offer the student the opportunity to provide an explanation.

Course Penalties issued by the Faculty Member due to Academic Misconduct are final and not reviewable or appealable, except as provided below.

After the Faculty Member submits the report to the Academic Misconduct Reporting Database, the Chair of the ACC will email the student providing a link to the Policy and explaining the circumstances under which a student is entitled to request a hearing before the ACC (which is made up of four faculty members and four student members). Students have fifteen university working days, after email notification of the Academic Misconduct report by the Chair of the ACC, to request a hearing. The request must be submitted in writing to the Chair of the ACC. The request must state the reasons for the hearing request, substantiate with particularity and specificity the factual basis on which the hearing request is made, and state the remedy sought. ***Dissatisfaction with a Course Penalty assigned for Academic Misconduct is not grounds for a hearing before the ACC.*** The ACC Chair will schedule a hearing typically within sixty days of receipt of the student's request for a hearing.