

BIOLOGY 6090
POPULATIONS: EVOLUTIONARY GENETICS
Winter, 2021

Instructor: Thomas Dowling

Email: thomas.dowling@wayne.edu

Lecture: M 4:30-5:20 PM, W 4:30-6:10 PM

Place: synchronous, online

Office: BIO 3113 (not available here this semester)

Office hours: By appointment

COURSE DESCRIPTION:

This is a graduate level course in population genetics, specifically designed to give our graduate students background knowledge and analytical skills that will be useful as they complete their research projects and degrees. Material will be presented in the form of traditional lectures, group discussion of readings from the primary scientific literature, and use of various computer programs.

The course is both theoretical and applied, providing students a solid foundation in population genetics and use of this information for understanding evolution. Given this, students are expected to come into the course with certain knowledge and abilities:

1. Genetics – understanding basic genetic principles, specifically focused on understanding how genetic variation is generated and transmitted
2. Evolution – understanding basic evolutionary principles and how these effect the distribution of genetic variation within and among populations
3. Math – population genetics is firmly based in mathematics (e.g., algebra, calculus); therefore, it is important to have that skill
4. Use of computer programs – we will be using computer programs to analyze data; therefore, students will need to be familiar with how to use a computer beyond basic word processing and Powerpoint. Ability to use Excel is very important.
5. Scientific communication – we will work on scientific communication, specifically writing and presentation.

COURSE OBJECTIVES:

- To develop an understanding of population genetic principles and how they apply to the fields of biodiversity, genetics, and ecology
- Learn to characterize population genetic processes with a variety of computer programs

- Synthesize concepts (objective 1) and practice (objective 2), allowing for analysis and interpretation of data in an evolutionary context
- Learn to organize and communicate your thoughts and ideas

CLASS MEETING TIME/LOCATION:

My lectures will be synchronous, being presented on Zoom during the scheduled class time. All lectures will be recorded and available on Canvas. The class meeting schedule is seen in the right hand panel on your Canvas page or you can get it to by clicking on the “Zoom” category in the left hand navigation bar. This will show you all scheduled meetings. There is a “join” button you click to enter the Zoom meeting.

All lecture PowerPoint slides, recordings of the lectures, and the lecture syllabus can be found on Canvas Homepage. If there are any issues with Canvas, please contact Computing & Information Technology (C& IT) at (313) 577-4778 or helpdesk@wayne.edu.

OFFICE HOURS AND COMMUNICATION:

Because of the small number of students, I not have scheduled office hours this semester. I will also be happy to meet, and appointments should be made by email. Meetings will be conducted over Zoom. I will communicate by email and announcements through Canvas.

GRADING:

Grades will be based on the following:

- 1) Midterm take home exam (**25%**) – provided to the students on Monday 8 March, complete exam turned in Friday 12 March.
- 2) Homework assignments (**25% total**)
 - a) Sequence alignment (5%)
 - b) F-statistic analysis (10%)
 - c) Phylogeography (10%)
- 3) Review paper (**40% total**)
 - a) Choice of topic (5%)
 - b) Outline (5%)
 - c) Draft (10%)
 - d) Final paper (10%) - due last day of classes
 - e) Presentations (10%) - Wednesday 21 April
- 4) Participation in discussion (**10%**)

ADD/DROP POLICY:

Add forms will not be signed after the second week of class. **Drop** forms must be signed before the end of “study day”, which is the day after the last day of classes (Note: It is not a good idea to wait until the last day to drop; instructors are often hard to find on “study day”). Please note that “**incomplete**” grades will not be issued to students in poor standing who are seeking an alternative to a late drop.

ADD/DROP INFORMATION

(<https://wayne.edu/registrar/registration/dropping-and-withdrawing>)

Students can enroll in the class until **Jan 19**. If a student signs up for the class and decides to drop it before or on **Jan 19**, the tuition for the class will be cancelled, the student will be reimbursed, and the class will not show on his/her transcript. If the student drops the class between **Jan 20** and **Mar 28**, the tuition will not be reimbursed and a final grade of “WP” (withdrawal with a passing grade, if average of all your exam scores earned to date is greater than or equal to 60%), “WF” (withdrawal with a failing grade, if average of all your exam scores earned to date is less than 60%), or “WN” (withdrawal never attended) will be shown on his/her transcript. **All withdrawals must be requested through Academica and they will not be granted after Mar 28** (<https://wayne.edu/registrar/withdrawals/>). If the student signs up for the class, stops attending lectures, and fails to withdraw, he/she will receive a failing grade “F” for the course. **Please note that “incomplete” grades will not be issued to students in poor standing who are seeking an alternative to a late drop.**

CHEATING POLICY:

A student found cheating during an exam (using a “cheat sheet” or electronic device, looking at another’s paper, or allowing another to look at yours), or by turning in an assignment containing any plagiarism, will receive a zero for that test or assignment with no opportunity to drop or replace that score. A second episode of cheating will result in a grade of E for the course and possible university disciplinary action.

Students with disabilities: If you have a physical or mental impairment that may interfere with your ability to successfully complete the requirements for this course, you are invited to contact Educational Accessibility Services (583 Student Center Building; 577-1851) to discuss appropriate accommodations on a confidential basis.

Academic disputes, including issues not specifically resolved or covered by this syllabus, will be resolved by following the guidelines for University Student Due Process.

STUDENT CODE OF CONDUCT

All participants in the course are bound by the Student Code of Conduct that can be found at (<https://doso.wayne.edu/conduct/academic-misconduct>). Students who engage in dishonest conduct, acts of cheating, or plagiarism will receive a zero for that assignment or exam with no opportunity to drop or replace that score. Dishonest conduct includes helping another student engage in dishonest conduct and will result in a zero for both the helper's and the helped student's assignment/exam. A second episode of cheating will result in a grade of F for the course and may also result in initiation of university disciplinary action. (The University is aware that students often use **WhatsApp** and/or other group messaging apps for the purposes of cheating on their classwork. Be aware that that using group messaging apps in this manner is indeed a violation of the academic integrity honor code and can come with consequences.)

In short, do not cheat. It rarely helps you with your final course grade, and the consequences are simply not worth the risk. Be aware that cheating is a very personal and disrespectful insult to instructors, your TA, and your classmates, and the instructors will show no leniency in how it is handled.

COVID-19 COMPLIANCE

All students are expected to familiarize themselves with mandatory campus health and safety guidelines – including practicing social distancing and wearing a face covering – by completing the [Warrior Safe Training](#) modules in Canvas. University policy requires students to complete a [campus daily health screener](#) beginning 48 hours before first coming to campus.

OTHER

Any specific issue not covered by this syllabus will be resolved using University policies. Disputes that cannot be resolved following the guidelines present in this syllabus will be resolved by following the guidelines of the University "Student Due Process."

SCHEDULE OF LECTURES

A tentative lecture schedule is provided as the last page of this document. Your instructors reserve the right to re-arrange lecture topics if needed to cover all necessary material during the course of the semester.

Topic*	Text	Date	Assignment due dates
Introduction		Mon 11 Jan	
Origins of population genetics	Provine	Wed 13 Jan	
Tools for assessing variation/Measures of variation	Chapters 1 & 2	Wed 20 Jan	
Genomic approaches to characterizing variation	Abby Wicks	Mon 25 Jan	
Activity - how to read and edit DNA sequences		Wed 27 Jan	paper topic due Wed 27 Jan
Readings (2 papers - student's choice)		Mon 1 Feb	
Hardy-Weinberg equilibrium	Chapter 2 & 9	Wed 3 Feb	Sequence homework due Wed 3 Feb
Selection	Chapter 3	Mon 8 Feb	
Readings (2 papers - student's choice)		Wed 10 Feb	
Readings (1 paper - student's choice)		Mon 15 Feb	
Selection	Chapter 3	Wed 17 Feb	outline due Fri 19 Feb
Selection	Chapter 3	Mon 22 Feb	
Mutation	Chapter 5	Wed 24 Feb	
Genetic drift	Chapter 4	Mon 1 Mar	
Genetic drift	Chapter 4	Wed 3 Mar	
Inbreeding and other forms of nonrandom mating	Chapter 8	Mon 8 Mar	midterm exam - give Monday, return Friday
Population subdivision and migration	Chapter 7	Wed 10 Mar	
Spring break		Mon 15 Mar	
Spring break		Wed 17 Mar	
Population subdivision and migration	Chapter 7	Mon 22 Mar	paper draft due Wed 24 Mar
Activity - population structure and F-statistics		Wed 24 Mar	
Open discussion - papers, presentation, etc.		Mon 29 Mar	
Readings		Wed 31 Mar	Fstat homework due Wed 31 Mar
Speciation	TBA	Mon 5 Apr	
Activity - Phylogeography and MEGA		Wed 7 Apr	
Speciation		Mon 12 Apr	
Readings		Wed 14 Apr	MEGA homework due Wed 14 April
Applied population genetics	TBA	Mon 19 Apr	
Presentations (15 min + 5 min)		Wed 21 Apr	
Neutral theory and coalescence	Chapter 6	Mon 26 Apr	final paper due Fri 30 April

*** The instructor reserves the right to make changes to the above schedule and topics**

Text: Hedrick, P. W. 2011. *Genetics of Populations, 4th edition*. Jones and Bartlett. **(required)**

Additional reading/resources:

Provine, William B. 1971. *The Origins of Theoretical Population Genetics*. Univ. Chicago Press.
(not required)

Assorted papers (journal articles, book chapters, etc.) for use in the discussion section **(to be made available by the instructor on Canvas)**

Access to a computer (preferably a PC) with Microsoft Office