Course Number and Title: PCB4553 Population Genetics

Catalog Description: This course provides a comprehensive introduction to the mathematical theory of allele and genotype frequency dynamics within and between populations and will serve as a springboard to more advanced topics in evolutionary biology. Topics covered include deterministic and stochastic processes in evolution and an introduction to classical quantitative genetics theory.

Credit Hours

4 credit hours

Pre-requisites and Co-requisites

Consent of instructor; there are no formal prerequisites. The course assumes familiarity with basic transmission genetics ("Mendelian genetics") and mastery of basic algebra. Some knowledge of calculus and elementary probability theory is useful but not assumed.

Course Objectives

By the end of the course the student will have a basic working knowledge of the fundamental mechanisms of evolution, including:

- Mutation
- Recombination
- Random genetic drift
- Natural selection
- Components of phenotypic variance

Instructor Information

Name: Charles F. Baer
Office location: 621 Bartram Hall
Telephone: 352-392-3550
E-mail address: cbaer@ufl.edu
Web site: http://www.biology.ufl.edu/People/faculty/cbaer.aspx
Office hours: TBA

Teaching Assistant Information (if applicable):

N/A

Course Meeting Time(s) TBA

Course Meeting Location(s) TBA

Course Website

Course # on Sakai. You are responsible for all announcements made in class and/or posted on the course website for this course.

Fees: NONE

Required Materials

Textbook or Other Readings

Gillespie, J. H. Population Genetics: A Concise Guide, 2nd Ed. 2004, Johns Hopkins Press.

Software

NA

Other Materials (e.g., clickers, instruments, etc.)

NA

Recommended Materials

NA

Course Outline (topics covered by week or by class period)

Week	Day	Topic	Reading	Homework Assignment
1		Introduction, Intro to probability theory	Preface, JHG Appendix A, B	
		Genomes, Mutation, and Genetic Variation	JHG 1.1, 1.2; Wayne & Miyamoto 2006	
2		Labor Day, no class		
		One-locus dynamics, Intro to genetic drift	JHG 1.3-1.4; 2.1-2.2	1
3		Drift and Mutation II: Effective population size and the Neutral Theory	JHG 2.3-2.5, 2.7; Hartl and Clark, 2nd ed., pp. 66-70	
		Drift and Mutation III: The neutral coalescent	JHG 2.6; Hudson 1990	
4		Natural Selection I: General viability selection in an infinite population	JHG 3.1-3.2	2
		Nat Sel II: Maintenance of genetic variation; Intro to Diffusion Theory:	JHG 3.3-3.4, 3.7	

		Equilibrium Distribution of p		
5		NS3: Diffusion theory, con't: Fixation probability	JHG Appendix B, p.200-206; JHG 3.8-3.10; Rice Ch. 5; excerpt from Crow and Kimura	3
		Two-locus (dis)equlibrium	JHG 4.1-4.2	
6		Non-random mating: Inbreeding, population subdivision	JHG 5.1-5.3, 5.5	4
		Molecular population genetics: Estimators of Theta; Tajima's D	JHG 2.6; TBA	
7		Genetic Load	JHG 3.5, TBA	5
		Evolution of Genetic Systems (e.g., Sex)	JHG Ch. 7; TBA	
8		Quantitative Genetics I: Correlation between relatives	JHG 6.1	6
		QG II: Response to selection	JHG 6.2, 6.5	
9		QG III: Dominance and epistasis	JHG 6.4	7
		QGIV: Evolution of correlated traits	TBA	
10		Moran 1958		
		Hill and Robertson 1966 (?)		
11		Price 1970, Price 1972		
		Felsenstein 1974		
12		Maynard Smith and Haigh 1974; Charlesworth, Morgan and Charlesworth 1993		
		Hudson, Kreitman and Aguade 1986		

		McDonald and Kreitman 1991	
13		Tajima 1989	
		Birky and Walsh 1989 Kondrashov and Crow 1993	
14		Thanksgiving, no class	
		Houle 1992	
15		Gillespie 2000	
		Smith and Eyre-Walker 2002 Kousathanas and Keightley 2013	
16		In-class presentations	

Attendance Policy

Attendance and promptness are optional but strongly recommended.

Conduct in Class

- Please be courteous and do not talk during lecture. This can be distracting to other students and the instructor.
- Only approved electronic devices may be used in class. Approved electronic devices are laptop computers (when used to take notes or otherwise participate in classroom activities) and voice recording devices. Unapproved electronic devices include cell phones, video recorders, digital cameras and MP3 players.

Grading

Midterm Exam (100 points, 40% of final grade): The midterm is a 24-hour take-home exam. Open book/notes/Internet. You may NOT discuss any aspect of the midterm exam with any other individual human.

Final Exam (100 points, 40% of final grade) The final is a two hour in-class exam, closed book.

Class Participation (20 points, 20% of final grade): Each student will be responsible for leading an in-class discussion on one of the assigned readings.

Grading Scale

Point Range (%)	Letter Grade	GPA equivalent
≥ 90.00	A	4.0
86.7 – 89.9	A-	3.67
83.3 – 86.6	B+	3.33
80.0 – 83.2	B	3.0
76.7 – 79.9	B-	2.67
73.3 – 76.6	C+	2.33
70.0 – 73.2	C	2.0
66.7 – 69.9	C-	1.67
63.3 – 66.6	D+	1.33
60.0 –63.2	D	1.0
56.7 – 59.9	D-	0.67
< 56.7	E	0

Grade Curve Policy

The grades shown in the table are guarantees, e.g., if you make AT LEAST a 73.3% you are GUARANTEED a C+. I reserve the right to curve downward, i.e., to be more generous.

Make-up Exam Policy

Make-up exams will be administered on a case-by-case basis. Valid excuses include (but are not necessarily limited to) personal illness or injury or the illness, injury, or death of a family member. If you know you will need to miss class (e.g., for a job interview), please notify me in advance.

UF Counseling Services

- Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, psychological and psychiatric services.
  - Career Resource Center, Reitz Union, 392-1601, career and job search services.
- Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their web site: http://www.counsel.ufl.edu/.

Honesty Policy

- All students registered at the University of Florida have agreed to comply with the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."
- In addition, on all work submitted for credit the following pledge is either required or implied: "*On my honor I have neither given nor received unauthorized aid in doing this assignment*."
- If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional

information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at: http://www.dso.ufl.edu/judicial/procedures/academicguide.html.

Accommodation for Students with Disabilities

- Students who will require a classroom accommodation for a disability must contact the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). Please see the University of Florida Disability Resources website for more information at: http://www.dso.ufl.edu/drp/services/.
- It is the policy of the University of Florida that the student, not the instructor, is responsible for arranging accommodations when needed. Once notification is complete, the Dean of Students Office of Disability Resources will work with the instructor to accommodate the student.

Software Use

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.