

Population Genetics (BISC 514)

Instructor: Dr. Ryan Garrick, office: Room 508 Shoemaker Hall

Class e-mail address (use this for *everything* related to Bisc514): bisc514olemiss@gmail.com

Class time & location: **Tues & Thurs: 11:00am–12:15pm, Shoemaker Room 225.** Regular attendance is **essential**. Use of cell phones is not permitted at all - its distracting for everyone around you, and totally ruins the class dynamic. Use of computers for note-taking etc. is totally fine (but please use them only for things related to the class).

Not required, but useful resource: *Conservation and the Genetics of Populations*. Authors: Fred W. Allendorf, & Gordon H. Luikart. Year: 2007. Publisher: Wiley-Blackwell. Access: copy and paste *exactly* this into your web browser, and a free PDF of the whole book should show up: <http://baloun.entu.cas.cz/popevol/prik lady/Conservation%20and%20the%20Genetics%20of%20Populations.pdf>

Office hours: **Tues 12:30-2:00pm (no appointment necessary).** If you cannot see me during the scheduled office hours, an appointment will need to be made by email. Please include the following: (1) BISC 514 in the subject line, (2) what you would like some help with in the main text of the email (that way I can be better prepared), and (3) your first and last name at the end of the message. You should receive a response from me within 24 hours.

Description: Basic principles of the factors that influence the genetic composition of natural populations, and evolutionary processes that drive change over time. Topics covered will include selection, gene flow, mutation, genetic drift, population size, and how these forces interact.

Prerequisites: Grade of C or better BISC 301 or BISC 336 (or instructor approval).

Attendance policy: In at least one of our class meetings during first two weeks of the semester, attendance will be taken. Non-verified students (i.e., those who are absent during the attendance recording period(s), will be administratively dropped from the class. I will let you know how and when attendance will be taken on the day of attendance verification.

Blackboard: Log on at www.olemiss.edu. This is the first place to look for any information regarding the course during the semester, including syllabus, announcements, grades, etc. You will be notified of modifications to the syllabus, classroom locations etc. through your registered email address on Blackboard, and in class.

Grading: **Exams** (3, including the final): 17% each for undergrads vs. 22% each for grad students. **In-class participation** (on-going, but particularly including 5 paper discussion sessions): 10% for everyone. **Computer labs** (6): 4% each for undergrads vs. 1.5% each for grad students. **Bess beetle experiment** (on-going, but particularly including Final report): 15% for undergrads vs 7.5% for grad students. **Grad student research project** (required for grad students only): 7.5%. For the overall course, the following standard grading scheme applies: 90-100 = A, 80-89 = B, 70-79 = C, 60-69 = D, < 60 = F (+/- will not be used).

Exams: Bring your **student ID, #2 pencil, a calculator, and one Scantron form # F-289** to every exam. The Scantron form # F-289 (1/2 page, red print) can be purchased at the Bookstore in the Student Union. **Other than calculators, no electronic devices are allowed to be turned on during exams.** This includes cell phones, computers, i-pads, etc. Exam grades will be posted as soon as possible. If you suspect that a question was graded improperly, you have one week (from the date of test return) to contact me about it. Exam dates are non-negotiable; make-up exams are given *only* (1) in the event of *serious illness*, in which case a medical doctor's letter is required, or (2) if you have a documented school function (marching band, game), in which case you will need to provide documentation *before* the day of the exam. Make-up exams must be taken at a date and time chosen by me, generally within 2–3 days of the original exam date.

Cheating: A rather bad idea. Cheaters will be assigned a zero for the exam in question.

Computer sessions: These will be take place in the Shoemaker Room 225, same as lectures.

Students with disabilities: University policy provides for reasonable accommodations to be made for students with verified disabilities on an individualized and flexible basis. It is the responsibility of any student with a disability to contact the Office of Student Disability Services (662-915-7128). SDS will then contact the instructor through the student by means of an Instructor Notification of Classroom Accommodations form.

<i>Date</i>	<i>Topic(s)</i>	<i>Chapter or section(s)*</i>
Week 1. Jan 22	<i>Intro. to course, what is a pop. (?), terminology.</i> <i>Mating systems (inbreeding vs. outbreeding); mutation & recombination.</i>	Definitions of terms (on Blackboard) Ch12 up to 12.1.2 (p.285-290); Ch12.2 (p.291); Ch12.3 - 12.4 (p.296-297) Box14 (on Blackboard)
Jan 24	<i>Computer lab 1: MUTATION, and SELECTION (on alleles or genotypes) vs. DRIFT simulations</i>	Worksheet provided
Week 2. Jan 29	<i>Types of selection (esp. balancing); neutral vs. adaptive loci.</i> <i>Neutral markers & pop. genetics; differences between phenotype vs. genotype vs. allele frequencies.</i>	Ch8 (p.171-190) Ch4 up to 4.5 (p.63-78)
Jan 31	<i>Bess beetle expt. 1: Background, formulation of hypotheses & planning</i>	Bibbs et al. (2010) EENY87; Garrick et al. (In Review)
Week 3. Feb 05	<i>Qualitative vs. quantitative traits; phenotypes.</i>	Ch2 up to 2.3 (p.15-26); Ch11.3.2 - 11.3.3 (p.272-

	<i>Loss of genetic variation; inbreeding & inbreeding depression.</i>	274) Ch11.4 - 11.6 (p.274-278); Ch14.4 -14.5 (p.350-355)
Feb 07	Paper Discussion 1: Wombat murder mystery	Banks et al. (2003) Mol Ecol
Week 4. Feb 12	<i>Neutral marker heterozygosity-fitness correlations</i>	Ex10.2 (p.244-245)
	<i>Individual-based clustering</i>	Ch16.4.2 (p.398-401)
Feb 14	Computer lab 2: STRUCTURE (how many pops, what might cause isolation?)	Worksheet provided
Week 5. Feb 19	Paper Discussion 2: topic TBD, and review for Ex.1	Paper TBD
Feb 21	EXAM 1. Bring Scantron form F-289	
Week 6. Feb 26	Bess beetle expt. 2: Measurement & analysis of phenotypic traits	
Feb 28	<i>Intro to Hardy-Weinberg Eq. (HWE), Linkage Diseq. (LD) & pop. assignment</i> <i>Measuring diversity within pops; Fis & Fst separately, then jointly ("F-statsland")</i>	Ch20.5 - 20.6 (p.515-520) CH5.1-4 (p.94-108); Ch5.6 (p.110-111); Ch9.1 (p.199-204); Ch9.7 (p.218-219); Ch10 up to 10.3 (p.231-245); Box5 (on Blackboard)
Week 7. Mar 05	Bess beetle expt. 3: mtDNA sequence analysis	Worksheet (on Blackboard)
Mar 07	Bess beetle expt. 4: Sampling at Whirlpool trails	
Week 8. Mar11-15	SPRING BREAK (no class)	
Week 9. Mar 19	Bess beetle expt. 5: Measurement & analysis of phenotypic traits, & (hypothetical) genetic data	
Mar 21	Computer lab 3: GENEPOP	
Week 10. Mar 26	<i>Dispersal vs. gene flow; direct vs. indirect methods for measuring gene flow</i>	
Mar 28	Computer lab 4: STRUCTURE II	
Week 11. Apr 02	EXAM 2. Bring Scantron form F-289	
Apr 04	<i>Landscape genetics</i>	
Week 12.		

Apr 09	▣ <i>Paper Discussion 3: LANDSCAPE GENETICS</i>	
Apr 11	<i>Computer lab 5: GENEPOP II</i>	
Week 13. Apr 16	<i>Paper Discussion 4: MITO-NUCLEAR COEVOLUTION; Intro to range expansion</i>	
Apr 18	<i>Paper Discussion 5: ALLELE SURFING DURING RANGE EXPANSION; Intro to phylogeography</i>	
Week 14. Apr 23	<i>Phylogeography</i>	
Apr 25	<i>Hybridization & conservation genetics</i>	
Week 15. Apr 30	<i>Computer lab 6: HYBRIDLAB & STRUCTURE</i>	
May 02	<i><u>Bess beetle expt.: Final reports due today</u> Grad student presentations (& final reports due); review for final exam</i>	
Week 16. May 07	FINAL. 12:00–3:00pm, Bring Scantron form F-289	

* From Allendorf & Luikart (2007) – check Blackboard for additional reading material (i.e., peer-reviewed papers) that I will upload as PDF files, and flag via ‘announcements’.