

## Population Genetics Animal Sciences 446 / IB 416 Spring 2018

**Instructor:** Dr. Alfred L. Roca, E-mail: roca@illinois.edu  
432 Animal Sciences Laboratory; Office phone: 217-244-8853

**Course Description:** Conceptual and mathematical approach to the genetics of populations: estimation of allele and genotype frequencies; Hardy-Weinberg principle; measures of genetic diversity and distance; selection; non-random mating; genetic drift; mutation; neutral theory; migration and population subdivision; linkage and recombination; coalescence and phylogenetic inference. Applications to animals, plants, human health and conservation. Course materials will be placed on <https://compass2g.illinois.edu/> All course materials including lectures, exams and problem sets are copyrighted and *may not be distributed to others or to websites.*

**Prerequisites:** An introductory genetics course (ANSC 221 or IB 204); one of MATH 220, MATH 221, or MATH 234; or consent of instructor.

**Class Schedule:** 107 Animal Science Lab except as otherwise indicated, MWF 1:00 – 1:50 PM; some Fridays 1:00 - 2:50 PM (see schedule; may be at a different classroom). **Please arrive on time; please no texting or multi-tasking in class.** Office hours MWF after lecture; additional hours TBA.

**Required Text:** Hedrick, P.W. 2011. Genetics of Populations. Fourth Edition. Sudbury, MA: Jones and Bartlett Publishers. Alternative population genetics textbooks are available at the UIUC libraries.

**Problem Sets:** Problem sets, past exams and assigned book chapter questions **must** be worked on by students to assist in studying and to prepare for exams.

**Grading:** There will be three exams during the semester plus a final exam. The final exam will be **cumulative**. For students registered for 3 credit hours the three exams will count 20% each and the final exam 40% of the final grade. For students registered for 4 hours the three exams will count 15% each and the final exam 30% of the final grade. Plus and minus grades are expected to be used in grading. Grades may be curved to the benefit of students (those not using electronic items during class). Instructor reserves the option to institute quizzes for part of grade. Requests for re-grading of exams must be in writing; re-grading will cover the full exam.

**Projects for 4-credit option:** Students registering for 4 hours must write a report that comprises 25% of the final 4-credit grade. A one paragraph summary or abstract of the proposed project is due as indicated in the schedule. The final written report in the form of a *scientific article with primary references* will be due as indicated in the schedule. If revisions are required to the report, these will be due on the date indicated. Two options are available: (1) a computer simulation or modeling project in some area of population genetics with a project report (4-8 pages, 1.5 space); or (2) a written review of the literature regarding the population genetics of a taxon, or a particular topic of interest to you in the field (6-12 pages, 1.5 space). Further details will be provided on the 4-credit option.

**Academic Integrity:** "It is the responsibility of the student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions" Code of Policies and Regulations, Section 33. All students are responsible for knowing the policies regarding academic integrity. Suspected infractions of academic integrity will be addressed as mandated by the Code.

<b>Population Genetics</b>		<b>Animal Sciences 446 / IB 416</b>	<b>Spring 2017</b>
<b>Day</b>	<b>Date*</b>	<b>Topic**</b>	<b>Hedrick Chapter</b>
Wed	1/17	Introduction; review	1
Fri	1/19	Introduction; review	
Mon	1/22	Review and Probability	
Wed	1/24	Review and Probability	
Fri	1/26	Hardy-Weinberg principle and allele frequencies	2
Mon	1/29	Hardy-Weinberg principle and allele frequencies	
Wed	1/31	Bayesian probability	
Fri	2/2	Hardy-Weinberg principle and allele frequencies	
Mon	2/5	Genetic variation, diversity and distance	
Wed	2/7	Genetic variation, diversity and distance	
Fri	2/9	Selection	3
Mon	2/12	Selection	
Wed	2/14	Review; selection	
Fri	2/16	<b>FIRST EXAM, 1:00-2:50 PM, Room 292 ASL</b>	
Mon	2/19	Selection	
Wed	2/21	Selection	
Fri	2/23	Selection ( <b>topic for 4-credit project due</b> )	
Mon	2/26	Inbreeding	<b>8</b>
Wed	2/28	Inbreeding	
Fri	3/2	Inbreeding	
Mon	3/5	Genetic drift and effective population size	4
Wed	3/7	Genetic drift and effective population size	
Fri	3/9	Genetic drift, <b>1:00-1:50 PM, Room 292 ASL</b>	(ExplorACES)
Mon	3/12	Genetic drift and effective population size	
Wed	3/14	Review; mutation	5
Fri	3/16	<b>SECOND EXAM 1:00-2:50 PM Room 292 ASL</b>	
		Spring break week 3/17-3/25	
Mon	3/26	Mutation	
Wed	3/28	Mutation	
Fri	3/30	Neutral theory, coalescence and selection	6-I,II,IV
Mon	4/2	Neutral theory, coalescence and selection	
Wed	4/4	Neutral theory, coalescence and selection	
Fri	4/6	Gene flow & population structure	7
Mon	4/9	Gene flow, <b>4-cr project due</b>	
Wed	4/11	Gene flow & population structure	
Fri	4/13	Linkage and recombination	9
Mon	4/16	Linkage and recombination	
Wed	4/18	Recombination; Review	
Fri	4/20	<b>THIRD EXAM, 1:00-2:50 PM, Room 292 ASL</b>	
Mon	4/23	Molecular genetics/phylogenetics	<b>6-III</b>
Wed	4/25	Molecular genetics/phylogenetics	
Fri	4/27	Molecular genetics/phylogenetics	
Mon	4/30	Molecular genetics/phylogenetics (Revisions if any to 4-cr project due)	
Wed	5/2	Phylogenetics; Review	
Mon	<b>5/7</b>	<b>FINAL EXAM 8:00-11:00 AM, 107 ASL</b>	
*Dates are approximate; Guest lecturers may be invited regardless of topic			
**Classes are in <b>107 ASL</b> unless otherwise listed or announced by instructor			