# Population Genetics    Animal Sciences 446 / IB 416    Fall 2009

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

**Course Description:**  Mathematical theory of the genetics of populations: estimation of allele frequency for autosomal and X-chromosomal loci, Hardy-Weinberg principle, systems of mating, relationship between relatives, forces that change allele frequency, and quantitative inheritance.  Applications to animals, plants, and humans.  Students desiring 4 hours credit do additional work in some area of population genetics.

**Prerequisite:**  ANSC 340 (Plant and Animal Genetics), IB 150 (Organismal & Evolutionary Biol) or IB 201 (Genetics and Evolution); and Mathematics 220 (Calculus I) or Mathematics 234 (Calculus for Business I); or consent of instructor.

**Class Schedule:**  107 Animal Science Lab, M&W 9:00 – 9:50 AM; F 9:00 - 10:50 AM

**Required Text:**  Hedrick, P.W. 2005. Genetics of Populations. Third Edition. Sudbury, MA: Jones and Bartlett Publishers.

**Problem Sets:**  Problem sets and past exams will be available to assist you in studying and to provide a guideline of what is expected on exams.  Joint work and discussion of problem sets are encouraged.

**Grading:** There will be three exams during the semester and a final exam.  For students registered for 3 hours the hour exams will count 20% each and the final exam 40% of the final grade.  For students registered for 4 hours the hour exams will count 15% each and the final exam 30% of the final grade.  Course grades will be based on cumulative performance.  Plus and minus grades are expected to be used in grading.

**Projects for 4-credit option:**  Students registering for 4 hours are expected to write a report that comprises 25% of the final 4-credit grade.  A one paragraph summary or abstract of the proposed project is due Friday October 9. The "final" written report in the form of a scientific article with primary references will be **due November 13**. If revisions are required to the report, the revised final report will be due December 9 (last day of class). Two options are available: (1) a computer simulation or modeling project in some area of population genetics with a project report (5-10 pages, 1.5 space); or (2) a written review of the literature regarding the population genetics of a taxon, or particular topic of interest to you in the field (10-15 pages, 1.5 space).

**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.

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| **Day** | | **Topic** | **Hedrick Chapter** |
| | | | |
| Mon | 8/24 | Introduction | 1 |
| Wed | 8/26 | Probability | |
| Fri | 8/28 | Hardy-Weinberg principle and allele frequencies | 2 |
| Mon | 8/31 | Hardy-Weinberg principle and allele frequencies | |
| Wed | 9/2 | Hardy-Weinberg principle and allele frequencies | |
| Fri | 9/4 | Genetic variation, diversity and distance | |
| Mon | 9/7 | **Labor Day—no class** | |
| Wed | 9/9 | Genetic variation, diversity and distance | |
| Fri | 9/11 | Genetic variation, diversity and distance | |
| Mon | 9/14 | Selection | 3 |
| Wed | 9/16 | TBA | |
| Fri | 9/18 | Selection | |
| Mon | 9/21 | Selection | |
| Wed | 9/23 | Review | |
| Fri | 9/25 | **FIRST EXAM** | |
| Mon | 9/28 | Selection | |
| Wed | 9/30 | Selection | 4 |
| Fri | 10/2 | Selection | |
| Mon | 10/5 | Inbreeding | 5 |
| Wed | 10/7 | Inbreeding | |
| Fri | 10/9 | Inbreeding (*topic for 4-credit project due*) | |
| Mon | 10/12 | Genetic drift and effective population size | 6 |
| Wed | 10/14 | Genetic drift and effective population size | |
| Fri | 10/16 | Genetic drift and effective population size | |
| Mon | 10/19 | Genetic drift and effective population size | |
| Wed | 10/21 | Review | |
| Fri | 10/23 | **SECOND EXAM** | |
| Mon | 10/26 | Mutation | 7 |
| Wed | 10/28 | Mutation | |
| Fri | 10/30 | Mutation | |
| Mon | 11/2 | Neutral theory, coalescence and selection | 8 |
| Wed | 11/4 | Neutral theory, coalescence and selection | |
| Fri | 11/6 | Gene flow & population structure | 9 |
| Mon | 11/9 | Gene flow & population structure | |
| Wed | 11/11 | Gene flow & population structure, **4-cr project due** | |
| Fri | 11/13 | Linkage and recombination | 10 |
| Mon | 11/16 | Linkage and recombination | |
| Wed | 11/18 | Review | |
| Fri | 11/20 | **THIRD EXAM** | |
| | 11/21 | **Fall break week** | |
| Mon | 11/30 | Molecular genetics/phylogenetics | 11 |
| Wed | 12/2 | Molecular genetics/phylogenetics | |
| Fri | 12/4 | Molecular genetics/phylogenetics | |
| Mon | 12/7 | Molecular genetics/phylogenetics | |
| Wed | 12/9 | Review for final  (*Revisions if any to 4-cr project due*) | |
| Thur | 12/17 | **FINAL EXAM (8:00-11:00 AM)** | |