ENTO 827: POPULATION AND ECOLOGICAL GENETICS

Instructor
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Office Hours
The primary methods of contacting me are via email and discussion board in Blackboard. You can expect a response to messages received Monday – Friday within 24 hours.

Course Description
Population genetics is the study of patterns of genetic variation in populations of organisms. It is both a theoretical and an empirical science. Theoretical population genetics is concerned with understanding how, given the basic laws of genetic inheritance, processes such as migration, mating behavior, demographic changes and natural selection will affect genetic diversity. Conversely, empirical population genetics compares observed patterns of genetic variation to theoretical predictions to make inferences about the population and ecological processes that are acting on a particular species.

Throughout the course, students’ understanding of population genetics theory will be reinforced with examples of applications. These will include estimating migration rates and population sizes, testing for evidence of natural selection, inferring breeding structures and family relationships, identifying appropriate populations for conservation efforts and forensic DNA analysis. A wide variety of computer programs are available, many free of charge, to perform specific analyses of population genetic data. The course will not consider the use of specific programs. Instead, students will gain the knowledge to make informed choices when analyzing population genetic data and will be aware of the strengths and limitations of particular methods.

Prerequisites
Introductory Genetics, Introductory Algebra
**Required Materials**

A computer with an internet connection and a web browser is required to access the class Blackboard site. A spreadsheet program (e.g. Microsoft Excel) and a word processor program (e.g. Microsoft Word) are required to complete problem-solving exercises and assignments.

**Objectives**

By the end of the course, students will be able to:

- Articulate key theoretical concepts in population genetics.
- Demonstrate that the fundamental theories of population genetics apply to a wide variety of organisms.
- Explain how theoretical models can lead to testable predictions of patterns of genetic variation in natural populations.
- Explain how comparing observed patterns of genetic variation to theoretical predictions can be used to make inferences about genetic, demographic and ecological processes.

**Instructional Method**

Access to all instructional materials will be via Blackboard. Lectures will be delivered using narrated slide presentations. A live tutorial session will be held each week via Adobe Connect. Tutorial sessions will focus on a set of numerical problems, simulation exercises or similar activity provided no less than one week in advance. The tutorial sessions will be recorded and made available for future reference.

**Textbook**


**Topic Outline**

The following list is provisional and may be modified as appropriate.

- Fundamental concepts: Probability, modeling, simulation.
- Mutation and variation
- Allele and genotype frequencies: Hardy-Weinberg law
- Population size and genetic drift
- Introduction to coalescence
- Linkage disequilibrium
- Structured populations
- Natural selection
Molecular evolution

Assessment

There will be two exams, a midterm and a final, each worth 100 points. Both exams will be open book and will be provided via Blackboard one week before the deadline for completed exams to be returned to the instructor. The deadline for returning the midterm exam is Wednesday, October 9 2013, 5pm Central Time. The deadline for returning the final exam is Wednesday December 11 2013, 5pm Central Time. There will be six problem-solving assignments, worth 15 points each, covering material related to the exercises covered in tutorials.

Points break down:

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<table>
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<tbody>
<tr>
<td>Midterm</td>
<td>100</td>
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<tr>
<td>Final</td>
<td>100</td>
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<tr>
<td>Assignments (6 x 15 points)</td>
<td>90</td>
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<td><strong>Total</strong></td>
<td><strong>290 points</strong></td>
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Grades

The final grade for the class will be based on the percentage of the total points earned from exams and assignments according to the following scale:

\[
\begin{align*}
& \geq 90\% \quad A \\
& \geq 80\% \quad B \\
& \geq 70\% \quad C \\
& \geq 60\% \quad D \\
& < 60\% \quad F \\
\end{align*}
\]

Make-up, Extra Credit and Late Submissions Policy

No make-up exams will be offered. No extra credit will be available. Exams and assignments that are not received by the deadline will be subject to a penalty of 20% of the available points per day (or part thereof).

Academic Honesty

The University of Nebraska-Lincoln has a clear policy about academic dishonesty that is described in the Student Code of Conduct. The code can be found in the Undergraduate Bulletin and online at [http://stuafs.unl.edu/ja/code](http://stuafs.unl.edu/ja/code). As a student at
UNL, you enjoy rights and protections under the code and are obligated to conduct yourself in compliance with the code.

As the Student Code of Conduct indicates, academic sanctions for misconduct subject to appeal are at the discretion of the instructor, and may include giving the student a failing grade for the course. In this course, the least penalty that will be imposed for misconduct is a one letter grade reduction in the course grade, but in most instances the penalty for cheating will be a failing grade in the course.

**Pledge of Instructional Standards**

Entomology instructors will provide our students a complete syllabus meeting all UNL standards, our classes will be based on current science and will follow published schedules and descriptions, and our instructors will be timely in returning grades and in responding to our students.

**Students with Disabilities**

Students with disabilities are encouraged to contact the instructor for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Nebraska-Lincoln to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Services for Students with Disabilities (SSD) office, 132 Canfield Administration, 472-3787 voice or TTY.