Population Genetics – BSC 472
Spring 2003

The course

3 credit hours
Day and Time– Tuesday and Thursday / 1:00-2:15pm
Where– WSB 132
Prerequisites – BSC 370 or consent of instructor

Instructor– Brian Kreiser
Office– JST 409; phone - 266-6556
Office Hours– MWF 11:00-12:00 and by appointment.
Email– You can reach me through the WebCT email system.

Text– Principles of Population Genetics, 3rd ed. D.L. Hartl and A.G. Clark. 1997. Sinauer Associates, Inc.
WebCT– You will find announcements and lecture notes on WebCT. See attached handout for details.

Background

Population genetics is concerned with the processes that affect the patterns of genetic variation within a species (i.e. how evolutionary changes occur). The focus of population genetics on mechanisms provides both applied and theoretical contributions to many fields such as ecology, systematics, agriculture, wildlife management and conservation biology. In the past several decades the field of population genetics has experienced a renaissance with the advent of a suite of molecular techniques that allow us to characterize levels and patterns of genetic variation. I have the following goals in this course:

1. Provide you with a solid background of population genetics theory
2. Provide you with an introduction to the molecular tools employed by the modern population geneticist.
3. Introduce you to the primary literature in order to stimulate discussion of the application of the molecular tools and how the data are interpreted.

Expectations

Along with traditional exams, I will assign problems sets and supplemental reading throughout the semester. Problem sets will be discussed in class and then graded. Supplemental reading will serve as the basis of periodic class discussions. A paper that requires a synthesis and analysis of the primary literature will also be required.

Two One Hour exams = 30% [15% each]
Final = 25% [Final exam is Tuesday May 6, 11:00a.m. – 1:30p.m.]
Paper = 30%
Problem sets = 10%
Participation = 5%

Exams— Exams will primarily be short answer, problem solving and discussion. Not only will you be required to understand the facts, but I will expect you to be able to apply your knowledge. There are a total of 3 exams (2 in class exams and the final exam), which will count towards 55% of your grade.

Problem Sets— I will assign problems for each chapter that we cover. I expect you to attempt these problems and be prepared to discuss them in class on the day indicated on the syllabus. At the start of class I will check to see that you attempted the homework, and then we will review these problems. You can correct and add to your homework, but do so a separate piece of paper. At the end of class I will collect the problem set and assign a grade based on effort, not necessarily accuracy.

Participation— I encourage you to ask questions during class and/or office hours. Problem set will also be worked in class as a group and your participation is expected. In addition, I will occasionally assign supplemental reading from the primary literature that will be the basis of in class discussion.

Paper— You will prepare a 7-10 page double spaced paper (not including Figures and Tables). Other stylistic guidelines will be announced later. I expect a well-organized paper. If I must struggle to read and understand your paper then you can expect that your grade will reflect this. This paper will require you to delve into the primary literature and synthesize and analyze what you have read. THIS IS NOT A BOOK REPORT. Two options exist for your paper:

I. Compare/contrast two (or more) studies on the same or closely related organism that use different techniques to address questions relating to population genetics (e.g. gene flow, population structure, conservation biology, biogeography). You must also provide your own analysis/interpretation of the data.
II. Explore a question of a more theoretical nature (e.g. evolutionary rates of microsatellite loci, data analysis). With this option you will pick a question that is open to debate or subject to alternative methods of analysis and provide background on the question and then compare/contrast the views of two or more studies and provide you own analysis/interpretation.

The topic of your paper is subject to my approval. I will be happy to help you pick a topic and provide you with some guidance as how to get started looking in the literature.

The paper will be graded in stages as described below. Note that each stage has a separate completion date.
1. Pick organism/topic and provide a short annotated bibliography. **Due in class on February 18**.
2. Summarize 2-3 main papers for your topic (you can still use others in your final paper). Your summary should include the questions addressed, techniques used, conclusions and critique of the conclusions drawn by the authors. **Due in class on April 15**. (Once you have completed this you are just about done).

3. The final paper combines summaries and compares/contrasts the results of the two approaches. Your analysis will include if you feel that the conclusions of the authors are warranted, were the techniques/analyses they used appropriate, what further questions are suggested to you by these papers, etc…. Your analysis is not just an addendum to the summaries that you prepared for part 2 of the assignment but should be integrated into the text of the paper. I expect that you will have thought about these papers and attempted to come up with some additional insights about the topic or question. **Due in class on May 1**.

Papers are expected on the days and times listed. Late papers without a valid/documented excuse will be penalized. I will be delighted to look at rough drafts and discuss them with you if given enough time (e.g. 5 pm the day before the due date is not enough time).

Grade distribution
A = > 90%
B = 80-89%
C = 70-79%
D = 60-69%
F = < 59%
The grading scale may be subject to change at my discretion, although the cut off points will not be adjusted higher than the ones listed above.

Missed exams and assignments policy– A make-up exam for the midterm will only be given provided you have a documented/valid excuse. Missing the midterm will mean that the final exam will count for an additional 15% of your grade.
Problem sets are expected in class on the day announced. Late assignments will not be accepted without a documented valid excuse.

Attendance policy– While there is no official attendance policy, attendance is strongly encouraged. Participation does count for 5% of your grade.

Academic Honesty– I will hold you to the Code of Student Conduct. Any case of cheating will be penalized to the fullest extent as described on page 73 of the 2001-2002 Undergraduate Bulletin.

Dropping classes
The last day to drop a class without academic penalty is Tuesday February 18.

Other important dates
Mardi Gras = March 4
Spring Break = March 10-14
Last day of classes = May 1
Final exam = Tuesday May 6, 11:00a.m. – 1:30p.m.

If a student has a disability that qualifies under the Americans with Disabilities Act and requires accommodations, he/she should contact the Office of Support Services for Students with Disabilities (OSS) for information on appropriate policies and procedures: Box 8586; Tel: 266-5024; TTY: 266-6837; FAX: 266-6035.

Lecture Schedule

Date	Day	Section	Topic
Jan. 7	T	1	Introductory remarks, go over syllabus, basic terms and probability rules, allele frequencies
9	TH	1	Allozymes, RFLPs, blots, PCR,
14	T	1	Sequencing, microsatellites, RAPDs, AFLPs
16	TH	2	Hardy-Weinberg, allele frequencies
21	T	2	Linkage disequilibrium
23	TH	2	Finish section 2, problems and discussion
28	T	3	Population structure and Wright's F-statistics
30	TH	3	Inbreeding
Feb. 4	T	3	Finish section 3, problems and discussion
6	TH	4	Genetic drift and effective population size
11	T	4	Problems, discussion and review for test
13	**TH**	**test #1**	
18	**T**	**4 / paper**	The coalescent - paper topic and bibliography due
20	TH	5	Mutations and the neutral theory
25	T	5	Migration
27	TH	5	Finish section 5, problems and discussion
Mar. 4	T	6	Mardi Gras ,Selection coefficients
6	TH	6	Types of selection
11	T	-	Spring Break
13	TH	-	Spring Break
18	T	6	Finish section 6 and discussion
20	TH	6 & 7	Problems from section 6, molecular divergence, molecular clock
25	T	-	
27	TH	7	Synonymous vs. nonsynon, McDonald/Kreitman test (recover from hangover)
Apr. 1	T	7	Problems, discussion and review for test
3	**TH**	**test #2**	
8	T	7	mtDNA and cpDNA transmission and evolution
10	TH	7	Phylogeography & conservation genetics
15	**T**	**7 / paper**	Systematics - part 2 of paper due
17	TH	8	Quantitative genetics - the basics
22	T	8	Artificial selection and heritability
24	TH	8	QTLs, problems and discussion
29	**T**	**final paper**	Graduate student presentations - final paper due
May. 1	TH	-	Graduate student presentations
6	**T**	**final exam**	Final exam 11:00-13:30