Biology 3000K - Genetics
Fall 2008

Lecture: T/TH 1:00-2:15pm, E-154
Lab: Tuesday 2:30-5:30pm, E-206
Instructor: Mike Beach
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Office hours: M/W/F : 3pm-5pm

Textbook:
Genetics, Analysis & Principles. 2nd ed. Brooker.

Course overview and objective:

The first part of this course investigates classical genetics, beginning with Mendel's experiments and continuing through modern times. Understanding classical genetic principles is critical in preparing for the remainder of the course. Once we have accomplished this, we will briefly explore population genetics. This branch of genetics studies the distribution and maintenance of genes within a defined population. Once equipped with these principles we can proceed to the second half of the course, which will analyze the genetic material itself, nucleic acids.

Specific learning outcomes for this course:

1) to be able to apply the concepts of Mendelian genetics to solve problems regarding the inheritance patterns of animals, fungi, and plants.

2) to understand the inheritance properties of bacteria and their phages and be able to solve problems that involve these concepts.

3) to be able to create genetic maps; map distances between genes or mutations in animals, fungi, plants, bacteria and their phages.

4) to understand pedigree trees and solve pedigree analysis problems using them

5) to understand the structure of DNA, from the level of entire chromosomes to individual molecules.

6) to be able to apply your understanding of and how the structure of DNA relates to function; specifically in replication, expression of genes, recombination, repair, and mutation.

Lectures:

Lecture is the most critical time you will spend in this course. If you do not utilize this time properly, you will almost certainly not be able to make up for it outside of class. Studying "for hours" or reading the book virtually never substitutes for lecture. In order to be successful in Genetics, you must get the most from the lectures. This is achieved by: (1) being awake, alert, attentive, (2) asking questions, (3) listening more and taking fewer notes.

Students with disabilities who believe that they may need accommodations in this class are encouraged to contact the counselor working with disabilities at (678) 915-7226 as soon as possible to better ensure that such accommodations are implemented in a timely fashion.

Lecture Attendance:

Not officially monitored as part of your grade, however, see above. Also, **you are responsible for all announcements made in class regarding exams and changes in the syllabus.**

Studying for this course:

Studying for hours and hours every day won't work. Very long study sessions usually consist of memorizing the material or notes. For many biology courses this is fine; it doesn't work for Genetics, however. Genetics consists of conceptual ideas that can't be memorized, only understood. Studying eight hours a day memorizing your notebook or the textbook will still result in poor grades on exams and quizzes. Instead, you must attempt to *understand* the concepts. While it is theoretically possible to teach the concepts to yourself, (e. g. by reading the textbook), attempting this will almost certainly doom you to a low grade in this course.

The right way to understand the concepts is to attend lecture. See above, titled "Lectures". If you utilize lecture time to the fullest extent and understand the answers to homework problems, you may find that you don't need to study very much.

Point breakdown of the lecture portion of the course:

Quizzes:	~10 unannounced, in-class quizzes @ 12 pts. each (total will be 120 pts., regardless of the actual number of quizzes)
Exams:	3 semester exams @ 90 pts. each (total 270 pts.)
Final exam:	90 pts. (**Non**-cumulative)

Total points for lecture portion: 480 pts.

Laboratory:

In the laboratory you will learn to perform several of the most widely used genetic techniques today, along with on-line simulations and problem solving exercises. You will usually be provided with a copy of the lab exercise on the Wednesday before lab. No textbook is required for the lab but you will need your lecture textbook at times.

Laboratory Attendance:

Attendance is mandatory. Specific materials are required each week for lab, and it is therefore not possible to make up missed labs. A grade of zero will be assigned for the analysis/results when a lab is missed.

Pre-Lab assignments:

Pre-lab assignments are generally given out 1 week before the lab and are worth **50%** of the lab grade. They must be turned in the **Monday before the lab by 5pm**. No Pre-labs will be accepted after this time; a grade of zero will be assigned for the pre-labs turned in after this time. Pre-labs will usually consist of thought questions and analysis of hypothetical data that one might see in the actual lab. This is an important part of the course. Part of the process of becoming a scientist includes developing critical thinking skills. This means sometimes you will be asked questions whose answers are not in the textbook, or even still, in the pages of the *same* lab handout.

Point breakdown of the laboratory portion of the course:

Pre-Labs	13 @ 6 pts. each (total 78 pts.)
Analysis/results	13 @ 6 pts. each (total 78 pts.)

Total for lab portion: 156 pts.

Grading policy:

Lecture and Laboratory points (total = 636 pts.) are added together to give one overall grade. Grades are not curved.

Percent score	Letter grade
89.5 and above	A
79.5-89.4%	B
69.5-79.4%	C
60.0-69.4%	D
below 60%	F

Extra credit and make-up exams:

There is **NO WAY** to receive extra credit or increase your grade! If you are not satisfied with your progress, see me early in the semester. Make-up exams are **not** given. The exam schedule shown on the lecture syllabus is unlikely to change, so plan accordingly.

Lecture syllabus

Dates	Subject	Chapters
Aug. 19 & 21	Mendelian Genetics	Ch. 2
Aug. 26 & Aug. 28	Extensions of Mendelian Genetic Analysis	Ch. 4
Sept. 2 & 4	Mitosis, Meiosis; Chromosomal Basis of Inheritance	Ch. 3
Sept. 9 & 11	Pedigree Analysis; **Exam #1, Thu. Sep. 11**	Ch. 2, 22
Sept. 16 & 18	Gene Mapping in Eukaryotes	Ch. 5
Sept. 23 & 25	Mapping in Bacteria	Ch. 6
Sept. 30 & Oct. 2	Mapping in Bacteriophages	Ch. 6
Oct. 7 & 9	Population Genetics, **Exam #2, Thu. Oct. 9**	Ch. 25
Oct. 14 & 16	DNA structure, Chromosome structure	Ch. 9, 10
Oct. 21 & 23	Chromosomal mutations, DNA replication	Ch. 8, 11
Oct. 28 & Oct. 30	Transcription	Ch. 12
Nov. 4 & 6	Transcription, **Exam #3, Thu. Nov. 6**	Ch. 12,
Nov. 11 & 13	Translation, Mutation and Repair	Ch. 13, 16
Nov. 18 & Nov. 20	Gene Expression, Recombination and Gene Conversion	Ch. 14, 17
Nov. 25	Non-Mendelian Inheritance, Transposable Elements	Ch. 7, 17
Dec. 2 & 4	Recombinant DNA technology, Genome Analysis	Ch. 18, 21
	Final Exam, according to the university's final exam schedule	

Important note: The lecture syllabus is **tentative**. We will go as fast or as slow as the class dictates. How quickly each subject is covered will most likely **not** be exactly as shown above. However, the exam dates are spaced evenly so they will remain the same (unless specified otherwise in class). The material covered on the exams will of course be based on what material has actually been discussed in class up to that point.

Lab syllabus

Aug. 27	Dihybrid cross with yeast
Sept. 3	Virtual Fly Lab (Independent assortment of genes)
Sept. 10	Pedigree Analysis
Sept. 17	Pedigree Analysis, part II
Sept. 24	Designing genetic crosses
Oct. 1	Virtual Fly Lab II (Sex linkage and gene mapping)
Oct. 8	Genetic transformation of bacteria
Oct. 15	Gene recombination and mapping in bacteriophage T4
Oct. 22	Gene recombination and mapping in bacteriophage T4. part II
Oct. 29	Population genetics
Nov. 5	Complementation and Allelism in Yeast and T4
Nov. 11	Restriction mapping
Nov. 18	Mutation and repair of damaged DNA
Nov. 25	Regulation of gene expression in bacteria
Dec. 2	Tetrad analysis using *Sordaria*

Important note: The lab syllabus is **tentative**. The dates on which we will meet for the above labs **will be** rearranged so that they coincide with when those topics are covered in lecture. I will try to keep you informed as to how well we are sticking to the above syllabus and when we will need to make changes. For now, consider the above syllabus only as a rough guide of what will be covered in the lab.

Homework problems

Below are homework problems listed by chapter. Although they will not be graded, they represent the types of questions that would appear on quizzes and exams and are well worth the time you will spend trying to solve them.

Ch. 2
C5, C8, C11, C15, C17, C21, C25ABD, E11, E14.

Ch. 3
C7, C33, C34, C35, C36.

Ch. 4
C6, C7, C10, C11, C12ABC, C15, C16, C19, C26, C28, E3, E4, E7, E9.

Ch. 5
E11, E12, E15, E17, E18, E20, E21, E27.

Ch. 6
E7, E8, E9, E20.

Ch. 7
C3, C6, C7, C16.

Ch. 8
C17.

Ch. 9
C8, C20, C35.

Ch. 10
C8, C20, C35.

Ch. 11
C3, C7, C8, C15, C16, C27.

Ch. 12
C4, C5, C12, E1.

Ch. 13
C1, C4, C7, C8, C9, C10, C11, C29, C37, C38.

Ch. 14
C8, C11AB, C16, C27.

Ch. 16
C1, C4, C9, C23.

Ch. 17
C3, C11.

Ch. 18
C4, E9, E35, E36.

Ch. 22
C9, C10, C13C15.

Ch. 25
C4, C6, C10, E4, E6, E7AB.