University of Tennessee at Chattanooga
Biology 325: Genetics
FALL 2005
T/TH 9:25-10:40
HOLT HALL, Room 124

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Textbook: Benjamin A. Pierce (2005) ***GENETICS, A Conceptual Approach,*** 2nd Edition

Let me begin by saying that it is my sincere hope that you will find the field of genetics intriguing as well as interesting. I feel compelled to warn you, however, not to be misled by the title of this course "Introduction to Genetics". It has been my experience in the past that the majority of my students have found this course very challenging. I think in talking to any former student, they will be quick to advise you that if you expect to do well in this course, it will not happen with a minimal amount of effort. You should expect to allow time beyond lecture and reading to stay current on the information you will be responsible for. Class attendance is not mandatory, but you need to consider it essential. Homework and extra credit assignments should be taken seriously and will not be accepted after the start of the class date they are due. You will be asked to demonstrate both a solid understanding of genetics concepts and proficiency at an array of analytical tasks. Note that this does not necessarily mean you will have to be especially strong at mathematics *per se* -- in fact, often it will be more like solving puzzles -- but it will likely be a bit different from what you're used to in biology courses. I will do my best to make the process less painful (and more interesting), but it will require a great deal of effort on your part. I strongly encourage you to keep up with the reading, come to lecture regularly and work through the problems at the back of each chapter. In addition, I will provide a series of problem sets for you so you know what to expect on exams. You may want to form a study group with other students in the class -- two or more heads are usually better than one. I also encourage you to come to my office hours to talk about the course or to get help with problems, concepts, etc., or you can call me or send an e-mail.

Introduction:
The purpose of this course is to introduce students to modern genetics and the methods of genetic analysis. Genetics deals with the transfer, structure, and function of genetic material. In doing so genetics draws heavily upon a variety of fields including probability and statistics, cell biology, microbiology, ecology, botany, developmental biology, and biochemistry. Genetics is therefore an integrative science, incorporating a diverse range of scientific and mathematical disciplines.

Genetics is typically divided into three broad and overlapping areas of study, classical transmission genetics, population and evolutionary genetics, and molecular genetics. Because most genetic phenomena cannot be understood simply by direct observation, all genetic sub-disciplines rely heavily upon data analysis and conceptual problem-solving skills. Thus, although acquiring a certain degree of factual information is essential for studying genetics, developing an ability to analyze data and draw logical inferences is of paramount importance.

Course Objectives:
The overall objective of this course is to give students an appreciation of the methods and techniques used by biologist to study, analyze and interpret genetic phenomena. More specifically, the goals of this course are to:

- Discuss the basic principles, extensions and limitations of Mendelian genetics
- Introduce the use of probability theory and statistics to interpret genetic phenomena
- Encourage the development of conceptual problem-solving skills in students
- Discuss how linkage, sex linkage and recombination led to the Chromosome Theory of Inheritance
- Discuss how genes are transmitted and vary within and between populations, and how these phenomena affect biological evolution
- Introduce gene mapping by linkage analysis in eukaryotes, and by interrupted mating in prokaryotes
- Discuss the structure, replication, expression and function of nucleic acids, genes, chromosomes and genomes
- Discuss the molecular basis for mutation and genetic variation
- Discuss non-Mendelian patterns of genetic transmission
- Discuss how recombinant DNA technologies are used to study and manipulate genes

Tentative grading scheme:
There will be three mid-term exams worth 100 pts each, and one Final exam worth 150 pts. In addition, homework assignments will be given throughout the course, and will be worth a combined total of 150 points. The content of the final exam will be 50% new material and 50% comprehensive.

- Homework assignments will be handed out at the beginning of a class period, and will be due the **beginning** of the next class period (Homework assignments turned in after the lecture has begun will be considered **LATE**…..see late homework policy below).

Grading

Mid-term Exam I, 100 pts	90%-100%	= A	(540-600 pts)
Mid-term Exam II, 100 pts	80%-89%	= B	(480-539 pts)
Mid-term Exam III, 100 pts	70%-79%	= C	(420-479 pts)
Homework assignments, 150 pts	60%-69%	= D	(360-419 pts)
Final Exam, 150 pts	<60%	= F	(<360 pts)
600 total pts			

Important Dates
- September 15 (Thursday), Exam I
- October 13 (Thursday), Exam II
- November 17 (Thursday), Exam III
- December 13, Final Exam, Thursday 8 am-10 am

Late Homework Policy:
Each individual is entitled to one late homework without penalty. However, the homework **must** be turned in no later than the **beginning** of the very next class period that follows the homework due date. For example, if homework was assigned on Thursday and due on the following Tuesday, late

homework assignments will be accepted no later than the very next Thursday (1 week from original assignment). Any homework turned in after this date **will receive a ZERO**.

If you have a second or third or…..late homework, 2 points will be deducted from your homework for each day (not class period) it is late. Again, no homework will be accepted, for grading, 1 class period after the original due date.

Exam make-up policy:
There will be NO make-up exams. A missed exam will receive a grade of ZERO. However, if a student has a valid excuse for missing an examination, then the score for the missed exam will be equal to the percentage score of the student's final exam. **This option of allowing a student to substitute the percentage grade of the final exam for a missed mid-term exam (because of illness, a family death or because of other activity) is solely at the discretion of the instructor**. If you have a legitimate emergency, please contact the instructor **before** the exam in order to discuss the situation.

Cell Phone Policy: Cell phones are to be turned off during class period. Cell phones cannot be used during exams, even as a calculator. If a cell phone is seen on your desk during an exam, your test will be collected and you will receive a **ZERO** for that exam.

University Policies and Procedures.
Please refer to the Student Handbook for policies on topics such as the honor system. If you are a student with a disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) and think that you might need special assistance or a special accommodation in this class or any other class, call the Office for Students with Disabilities/College Access Program at 425-4006 or stop by their office – 110 Frist Hall.

The syllabus is tentative, and subject to change.

TENATIVE SCHEDULE

Date	Topic	Chapter (pages)	Suggested Problems
Tuesday, August 23	Lecture 1, Introduction, Mendelian genetics I: Monohybrid crosses and Principal of Genetic Segregation	Ch. 1 (1-14) Ch. 3 (47-55)	**Ch. 1:** 5, 8-11, 14, 16-17, 20, 22
Thursday, August 25	Lecture 2, Mendelian genetics II: Dihybrid crosses and Principal of Independent Assortment, Probability	Ch. 3 (61-65; 55-60)	**Ch. 3:** Worked #1, 3 2-4, 7-9, 12, 14-16, 19-20, 25-29, 31
Tuesday, August 30	Lecture 3, Meiosis and Mitosis, Chromosome Theory of Heredity, Sex linkage	Ch. 2 (20-37) Ch. 4 (75-79; 83-92)	**Ch. 2:** 5-6, 8, 13-16, 20, 23, 25-26 **Ch. 4:** Worked #2, 4 1, 5, 10-15, 19-21, 28, 30, 33-34
Thursday, September 1	Lecture 4, Extensions/exceptions of Mendel's Principals, Chi-Square test	Ch. 5 (101-112; 115; 119-122) Ch. 3 (65-68)	**Ch. 5:** Worked #2 1-7, 9, 13-14, 17-18, 22-23, 25, 30 **Ch. 3:** Worked #4; 10, 33
Tuesday, September 6	Lecture 5, Population Genetics **(End of Exam I material)**	Ch. 23 (676-683)	**Ch. 23:** Worked #1 1-3, 25, 27, 29
Thursday, September 8	Lecture 6, Genetic mapping in eukaryotes I	Ch. 7 (160-179)	**Ch. 7:** Worked #1, 2 1-3, 5-6, 8-9, 13-16, 18-19, 23

Tuesday, September 13	Lecture 7, Genetic mapping in eukaryotes II, Genetic analysis and mapping in prokaryotes I	Ch. 7 (160-179) Ch. 8 (201-216; 219-222)	
Thursday, September 15	**EXAM I (January 6-January 20)**		
Tuesday, September 20	Lecture 8, Genetic analysis and mapping in prokaryotes II	Ch. 8 (201-216; 219-222)	**Ch. 8:** Worked #1 2-5, 8, 10, 17-22
Thursday, September 22	Lecture 9, DNA: the Genetic Material	Ch. 10 (267-282)	**Ch. 10:** Worked #1, 2 1, 3-12, 14, 16, 19-20, 22-27, 29-30, 32-33
Tuesday, September 27	Lecture 10, DNA organization	Ch. 11 (287-293)	
Thursday, September 29	Lecture 11, Structure and organization of eukaryotic chromosome	Ch. 11 (295-299)	**Ch. 11:** Worked #1 1-4, 6-7, 9-10, 19, 21-22, 24, 28
Tuesday, October 4	Lecture 12, DNA replication and recombination **(End of Exam II material)**	Ch. 12 (318-334; 336-342)	**Ch. 12:** Worked #1-3 1-5, 7-11, 13-14, 16, 19, 21-22, 25
Thursday, October 6	Lecture 13, Transcription I	Ch. 13 (349-364)	**Ch. 13:** Worked #2 1-12, 14-16, 19, 21-23, 25-26, 31, 33
Tuesday, October 11	Lecture 14, Transcription II	Ch. 14 (372-394)	**Ch. 14:** Worked #1-2 2, 4, 6-9, 12, 19-23
Thursday, October 13	**Exam II (January 25-February 17)**		
Tuesday, October 18	Lecture 15, Translation I	Ch. 3 (47-48) Ch. 15 (402-415)	**Ch. 15:** Worked #1-4 1, 4-5, 6-12, 14, 16-22, 26, 28-30
Thursday, October 20	Lecture 16, Translation II	Ch. 14 (389-392) Ch. 15 (415-425)	**Ch. 15:** Worked #1-4 1, 4-5, 6-12, 14, 16-22, 26, 28-30
October 24 & 25	FALL BREAK		
Thursday, October 27	Lecture 17, Control of Gene expression in prokaryotes I: Lac operon	Ch. 16 (433-451)	**Ch. 16:** Worked #1-4 2-6, 20-25
Tuesday, November 1	Lecture 18, Control of Gene Expression in Prokaryotes II: trp operon Control of Gene Expression in Eukaryotes I **(End of Exam III material)**	Ch. 16 (454-463)	**Ch. 16:** 10-13, 15
Thursday, November 3	Lecture 19, Control of Gene Expression in Eukaryotes II		
Tuesday, November 8	Lecture 20, DNA Mutation and Repair I	Ch. 17 (ALL)	**Ch. 17:** Worked #1-2 1-2, 4-15, 17-18, 20, 23
Thursday, November 10	**Exam III (February 22-March 22)**		
Tuesday, November 15	Lecture 21, DNA Mutation and Repair II	Ch. 17 (ALL)	**Ch. 17:** Worked #1-2 1-2, 4-15, 17-18, 20, 23
Thursday, November 17	Lecture 22, Chromosomal Mutations	Ch. 9 (236-242;244-245;247-254;257-260)	**Ch. 9:** Worked #1 1, 5-6, 9, 16,19-20
Tuesday, November 22	Lecture 23, Recombinant DNA	Ch. 18 (510-533; 542-544)	**Ch. 18:** Worked #1 2-8, 10-13, 15, 19, 30-33, 35-36

November 23-28	THANKSGIVING HOLIDAY		
Tuesday, November 29	Lecture 24, Recombinant DNA	Ch. 18 (510-533; 542-544)	**Ch. 18:** Worked #1 2-8, 10-13, 15, 19, 30-33, 35-36
Thursday, December 1	Lecture 25, Catch up and review		
	No More Classes!!!		
Tuesday, December 13	**FINAL EXAM, 8-10 a.m.**		