

Biology 225: Genetics
University of Indianapolis Fall 2007

Instructor: Dr. Sandra Davis Phone: 788-3289
Lilly Hall 130C Email: sdavis@uindy.edu

Office Hrs: Tue.-Fri. 11:00am-12:00 pm, or by appt. Feel free to drop by my office, if the door is open, I will be most likely willing to talk to you.

Textbook: *iGenetics: A Mendelian Approach*, by Peter Russell, 2006, Benjamin-Cummings.

Recommended: *Student Handbook and Solutions Manual*, by Russell and Chase

Locations/Times: Lecture: Tuesday & Thursday 1:00-1:50pm; Lilly Hall 126
Lecture/Discussion: Friday 12:00-1:50pm; Lilly Hall 023
Lab: Wednesday 12:00-1:50pm; Lilly Hall 023

Course Objectives: This is an introductory genetics course dealing with the organization, transmission, expression and evolution of the genetic material. We will discuss genetics at the molecular, cellular, individual and population level. Genetics has assumed a pivotal role in biological sciences today because knowledge of the structure and function of genetic material is essential for the understanding of most aspects of a living organism. The current explosion of genetic research has had a major impact on all areas of biology, including medicine and agriculture. It is rare for a week to go by without some important application of genetics being reported in a newspaper or popular magazine. It is the goal of this course to give you a basic understanding of the field of genetics so that you can apply this knowledge to other areas of biology and follow the rapid developments in this exciting science.

Genetics can be divided into three major areas:

1. Transmission genetics, which deals with the transmission of genes between generations. This encompasses Mendelian or classical genetics.
2. Molecular genetics involves a study of gene structure and function at the molecular level. This area has undergone very rapid expansion since the 1970s when the first genes were cloned.
3. Population genetics examines the extent of genetic variation within and between populations. An understanding of population genetics is essential for our understanding of evolution, the central underlying theme of all of biology.

Prerequisite: BIOL 165. Much of the work in all these areas of genetics involves calculating ratios, frequencies, probabilities, etc. In other words, genetics is much more mathematical than some other areas of biology, so be prepared. Dust off your statistics and your algebra; you'll need it here. If you don't feel you have the background for this course, please come see me.

Course components:

Lecture: Class periods will consist of lecture, discussion, and group work. Attendance will be taken according to University policy, but will not be counted in your grade. Although attendance is not strictly required for you to pass this course, you are responsible for all material covered in lectures, whether or not it is covered in the textbook. In addition, some time will be devoted to discussing worksheets, which will be collected during the class period (see below). Therefore, it is **very important** and **expected** that you attend all lectures.

Worksheets: An important component of learning genetics is problem solving. Hence, there will be a total of 10 worksheets consisting of various types of problems that you will be expected to complete during the course. You will be given worksheets in class or you may print them out from the web. You are expected to try all the problems and complete the worksheet as fully as you can. The second hour of the 2-hr Friday class meeting will be spent with the students in small groups or as a class discussing some of the more complex problems. At the end of this time, worksheets will be collected. **NO WORKSHEETS WILL BE ACCEPTED AFTER THIS POINT.** If you do not hand in your worksheet at this point you will receive 0 points. Each worksheet is worth 10pts for a total of 100pts. In addition, the format of worksheet questions will be very similar to exam questions, so it is very important to complete the worksheets. NOTE: the time devoted in class to discussing the worksheets is inadequate to complete a worksheet from scratch, so you must work on it before coming to class. Also, although we will sometimes be working on these worksheets in groups and hence I encourage co-operation and discussion, the final product should be an individual effort (I don't want 25 xeroxed copies of the same thing). If 2 individuals have identical answers on their worksheets, both will receive a 0. The time given in class is to discuss different ways to solve problems, helping each other understand concepts, etc., not to copy answers to the questions you didn't finish from your friends.

Exams: Dates of the exams are listed on the course schedule. There will be 3 exams worth 100pts each and one final exam (during exam week) worth 150pts. The final will be comprehensive. The format of all exams will be a mixture of some short answer, maybe matching or multiple choice, and mostly problems. The questions on the exams will be similar in format to the questions on the worksheets and the problems at the end of textbook chapters. I curve only in one case: if the exams have been, in my opinion, too difficult, I will curve the class accordingly. I will NOT use a curve if I feel that people just didn't try. I have no problem with giving everyone in the class an A if they all score above 90%, but I've yet to see it happen. Since you are not being curved, it will be of benefit to you to study with your peers. Being able to logically explain a concept to another student equates with at least partial understanding of the topic. **I frown deeply upon missed exams.** Unless I am notified of an appropriate excuse in advance, any make-up exams will be of the format all problems and essay type questions. I will not give makeup exams in cases of oversleeping, personal problems, work schedules, etc. If you come to me with such an excuse you will receive a 0 on that exam. In cases of illness, death in the family, etc. I require appropriate documentation: doctor's note, obituary, etc. This is not personal so do not be offended when asked. I do call to verify such excuses. Furthermore, **you must notify me within 24 hrs. of a missed exam or you will not be allowed to make it up.** I will try to return exams as promptly as possible. If you feel I have erred in grading, please let me know, and I will

regrade your entire paper. You might get points back, but then again, I might see something I missed before...

Lab component: As labs provide hands-on experience with the topics covered in lecture and discussion, it is vital that students attend all lab sessions. As such, if a student misses more than one lab session, that student's lab grade will be reduced by 5% for each additional lab missed, and that student will receive a zero on all associated assignments for that lab. If you have a legitimate and verifiable excuse for missing a lab, as with exams, you must notify me within 24hrs. of the missed lab, and we will attempt to allow you to make up the missed lab in another instructor's lab session. It is the student's responsibility to arrange his or her schedule to accommodate the lab schedule, not the instructor's. Grades for the lab will include:

1. You will be periodically asked to turn in your results from experiments along with interpretations or answers to questions that you should be able to complete after finishing that week's exercise. This component may also consist of quizzes given at the beginning of the lab period if I feel students are coming to class unprepared. These will be worth a total of 100 pts.
2. There will be two lab practical exams. These will be comprised mostly of short answer questions about the labs and experiments performed. You should be familiar with the procedures used and you may be asked to perform similar calculations or data manipulations as done in the labs. These will be worth 50 points apiece, for a total of 100 pts.

Grading: your grade for the course will be based on the points you earn on the following:

<u>Assignment</u>	<u>Points Possible</u>
Lecture exam I	100
Lecture exam II	100
Lecture exam III	100
Final exam	150
Worksheets	100
Lab turn-ins	100
Lab Exams	100
Total	750

Letter grades will be assigned according to the percentage of points accumulated out of the total possible using the following scale:

98-100%	735-750 pts.	A+
93-97.9	697-734	A
90-92.9	675-696	A-
87-89.9	652- 674	B+
83-86.9	622- 651	B
80-82.9	600- 621	B-
77-79.9	577- 599	C+
73-76.9	547- 576	C
70-72.9	525- 546	C-
67-69.9	502- 524	D+
63-66.9	472- 501	D
60-62.9	450- 471	D-
Below 60	0- 449	F

Web page: In order to make study materials and myself more accessible, I have put together a web page for the course. You can find the page at: pages.uindy.edu/~sdavis

Here you will find important announcements, worksheets, lecture outlines, study materials, etc.

Finally, CHEATING: If I suspect cheating, I WILL pursue it according to University policy. I have a ZERO TOLERANCE POLICY on this subject. Nuff said.

Lecture Schedule

Week	Tuesday	Thursday	Friday	Text Readings
1	08/28- The study of genetics	08/30-The cell cycle & Mitosis	08/31- Sexual reproduction & Meiosis	Chap. 1; Chap. 3: pp 39-52
2	09/04- Mendelian Genetics	09/06- Mendelian Genetics	09/07- Probability Worksheet 1 Due	Chap. 2: pp 13-30
3	09/11- Chromosomal Theory of Inheritance	09/13- Sex linkage	09/14- Pedigree Analysis Worksheet 2 Due	Chap. 3: 52-66 Chap. 2: 30-33 Chap. 3: 66-69
4	09/18- Modification of Mendelian Ratios I	09/20- Modification of Mendelian Ratios II	09/21- Exam I	Chapter 4: pp. 79-88
5	09/25- Epistasis	09/27- Gene linkage and recombination	09/28- Gene Mapping: 3-point crosses Worksheet 3 Due	Chap. 4: pp. 88-103; Chap. 6:129-147
6	10/02- The molecular structure of DNA	10/04- The replication of DNA	10/05- The replication of DNA Worksheet 4 Due	Chap 10: 251-264 Chap 11
7	10/9- Gene function:	10/11- Gene expression: transcription	10/12- Gene expression: translation Worksheet 5 Due	Chap. 12, 13, 14
8	10/16- Fall Break: No Classes!!	10/18- Gene expression: translation	10/19 – Exam II	Chap. 14
9	10/23- Mutation, DNA repair	10/25 – Mutation, DNA repair	10/26 – The molecular organization of chromosomes Worksheet 6 Due	Chap. 15; Chap. 10: pp.264-274
10	10/30 – Variation in Chromosome #: aneuploidy	11/01- Variation in Chromosome #: euploidy	11/02- Variation in Chromosome structure Worksheet 7 Due	Chap. 8: 200-208; Chapter 8: pp. 187-200
11	11/06- Variation in Chromosome structure	11/08- Genetics of Bacteria	11/09- Genetic Recombination in Bacteria Worksheet 8 Due	Chapter 8: pp. 187-200; Chapter 9
12	11/13- Gene Cloning	11/15- Gene Cloning	11/16- Exam III	Chap. 16
13	11/20- Applications of DNA technology	11/22- Thanksgiving Break NO CLASSES!!	11/23- Thanksgiving Break NO CLASSES!!	Chp. 17
14	11/27- Applications of DNA technology	11/29- Applications of DNA technology	11/30- Genetics and Cancer Worksheet 9 Due	Chp. 17, 22
15	12/04- Population Genetics	12/06- Population Genetics	12/07- Catch up/ review Worksheet 10 Due	Chp. 24
16	Final Exam: TBA			

This schedule is tentative, and lecture subjects may change. Dates of Exams however are fixed, and will only change with regards to the subject matter covered. Additional outside readings are not listed, but will be assigned in class.

Lab Schedule

Week	Wednesday	Readings from <i>iGenetics</i>
1	08/29- Mitosis/ Meiosis	Chap. 3
2	09/05- Fruit Fly Genetics I: P x P	Chap. 2
3	09/12- Probability	Chap. 2
4	09/19- Extensions of Mendelian Genetics: Blood typing; Fruit Fly Genetics II: F ₁ x F ₁	Chap. 4
5	09/26- Polytene chromosomes; Polymerase Chain Reaction	Chap 10
6	10/03- Fruit Fly Genetics III: Examination of F ₂	Chap. 12
7	10/10- Chromatography of Fruit Fly Eye Pigments; Genotyping flies with PCR	Chap. 11
8	10/17 – LAB EXAM 1	
9	10/24- Protein synthesis: Say it with DNA	Chap. 13, 14
10	10/31 - Bacterial Transformation I	Chap. 16
11	11/07- Bacterial Transformation II; Karyotyping	Chap. 16
12	11/14- DNA fingerprinting	Chap. 17
13	11/21- Thanksgiving Break	
14	11/28- GMO foods; Movie: Applications of DNA technology	Chap. 17
15	12/05- Lab Final	Chap. 24

This a TENTATIVE LAB SCHEDULE: It is subject to change as the semester progresses.