Please check http://home.moravian.edu/users/bio/mecjj01/bio210f07/index.html for the latest updates to this syllabus.

FALL 2007 BIOLOGY 210

Genetics Home Page

News

From a few years ago: "Word that genetic researchers have discovered a cell of rice contains more genes than a human cell has caused widespread outrage as people across the globe attempt to prove that humans are easily as smart as a grain of rice." (read more)

Molecular geneticists have identified a virus which may be related to the recent appearance of Colony Collapse Disorder, which is having a devastating effect on honeybee populations in the United States. It is still unknown whether this virus is a cause of CCD or merely an opportunistic pathogen, but given that honeybees are crucial for the pollination of an estimated $15 billion of crops per year, studies are continuing. (read more)

"That fruit fly hovering over your kitchen counter may be attracted to more than the bananas that are going brown; it may also want a sip of your carbonated water." Eeeeew. (read more)

Just a few days ago, "Researchers at BRIC, University of Copenhagen, have identified a new gene family (UTX-JMJD3) essential for embryonic development. The family controls the expression of genes crucial for stem cell maintenance and differentiation, and the results may contribute significantly to the understanding of the development of cancer." (read more)

Classes

Lectures will be held in Room 335, Priscilla Payne Hurd Academic Complex
Mondays, Wednesdays, and Fridays, 7:50 am to 8:40 am

Lab

Lab meets in Room 301, Collier Hall of Science
Monday, Tuesday, and Wednesday afternoons, 12:45 to 3:45

Text

The text required for this course is the 3rd edition of *Genetics: From Genes to Genomes*, by Hartwell, Hood, Goldberg, Reynolds, Silver, and Veres, published by McGraw-Hill, 2008.

Our text claims to have an associated website; it does not in fact have any such thing worthy of the name. If the text directs you to material at "www.mhhe.com/hartwell3", don't bother (unless you're really bored or really desperate).

Course Objectives

This is a one-semester course intended to give you a solid grounding in genetics, one of the keys (some would indeed argue **the** key) to understanding all the rest of biology. As Thedosius Dobzhansky famously said, "Nothing makes sense except in the light of evolution." Well, evolution doesn't make sense except in the light of genetics.

By the end of the semester, students should have an understanding of (and appreciation for):

- mitosis and meiosis
- the principles governing inheritance
- genetic linkage and recombination
- chromosomal and molecular mutations
- the basic structures and roles of DNA, RNA, and proteins
- the molecular processes governing genetic function
- quantitative genetics
- population and evolutionary genetics
- the techniques used in modern genetic investigations
- what kinds of questions can be answered using genetics

Students should be able to:

- predict and interpret the outcomes of genetic crosses
- read and understand primary articles in the genetics literature
- articulate current events in genetics research
- describe their research findings in standard format
- use a pooter

Course Policies

Below you will find various course policies, including:

- Reading
- Late Assignments

- Extra Credit
- Food
- Cell Phones
- Lab Conduct
- Group Lab Reports
- Studying Genetics
- Academic Honesty

Attendance

This is an early-morning class, and for many of us (including me), that ... isn't our favorite time. Too bad.

It's important that you be in class. As you will discover, there will be no lecture notes for me to give you should you miss a meeting, no little PowerPoint handouts. Classes will be devoted to reviewing the topic(s) for the day, informed by your preparatory reading. Needless to say, that reading is critical to your ability to participate in class, clarify any difficulties you're having, and succeed in learning as much as you can about genetics.

Grading

I do not grade on a curve, so I hope that each of you will do your best to help your fellow students: if they benefit, it does you no harm. In fact, one of the best ways to learn something is to explain it to someone else, so talk to your classmates (see "Studying Genetics" below). Grades for this course will be determined as follows:

I'm going to be using the point system for this course, so you don't have to worry about calculating percentages for individual components. I'll try to keep an up-to-date total here on the website, so you can always determine your grade so far by comparing what you've earned with the max possible. (And don't you just hate Max, that little weenie?) Given my grading scale (see below), you can therefore calculate your own grade in the course at any time.

You want to learn genetics. I want to help you learn genetics. Quizzes are a demonstrably valuable tool to help learning. Ergo, I will be giving quizzes throughout the semester. They will be very low-impact individually, but I expect they will cumulatively be worth 100 points or so by the end of the semester. If you're not in class for a quiz, there will be no opportunity to make it up. However, I will be dropping several of the lowest quiz grades, so missing a few quizzes won't do your grade irreparable harm.

There will be three **exams** not including the final. Each will focus primarily on the material covered since the previous exam, but anything covered during the semester up to that point is fair game. The final will be semi-cumulative: about half of the exam will focus on material since the previous hour exam, but the other half will range over material from the entire semester. Barring extenuating circumstances (and it is entirely up to me to decide what is an acceptable circumstance), no make-up exams will be given.

The three hour-exams will each contribute 100 points toward your final grade, and the final exam will contribute 200 points.

There will be no make-up exams except in cases where I had advanced warning of your missing the exam, or you were unable to notify me due to circumstances beyond your control. Note that in **any** case, I may decide not to allow a make-up exam regardless of circumstance.

Homework problem sets will be assigned. I will be selecting them throughout the semester, based on our pace and what I feel will be most helpful to you. I will assign points to these based on how difficult I feel they are. As I don't have them all mapped out, I can't know how much they will contribute to your final grade, but I estimate between 300 points or so.

(I may, at my discretion, drop the lowest grade from the homework assignments. Do not count on this. If you find yourself thinking that you're sunk if I don't drop those scores, you'd better come talk to me. *Immediately.*)

I will probably give occasional **miscellaneous assignments** over the course of the semester. These will be worth whatever points I announce at the time. Late assignments **will not be accepted**. I anticipate that there will be a total of 100 to 200 points in this category by the end of the semester.

Class participation will necessarily be somewhat subjective, but will encompass just that: participating in class. Asking questions, answering questions, being prepared to discuss whatever topics arise, doing your share of the work in lab — you're not children, you know what is meant by the term "participation." I assume a certain amount of participation on everyone's part; I will award up to 50 points for participation "above and beyond" at the end of the semester toward your final grade. Conversely, I will also dock up to 50 points for anyone who is not holding up their end in class.

Keeping an accurate, legible, and comprehensible **laboratory notebook** is an ***absolute requirement*** of this course. I've ordered lab notebooks for you to use for this course. We will go over some strategies for keeping notes in lab the first week. I will collect the copies (make sure you know how the notebook works!) at the end of the semester; your lab notes will be worth 200 points.

In addition, I will be asking for formal **lab reports** for our lab experiments. I anticipate having 4 reports worth a total of 700 points. **Laboratory technique** will account for another 100 points of your final grade.

In summary, then:

Quizzes	100 points
Hour Exams	300 points total
Problem Sets	300 points

Misc. Assignments	100-200 points
Laboratory Notebooks, Reports, and Technique	1000 points
Final Exam	200 points
Anticipated Total	**2000-2100 points**

I reserve the right to tweak these distributions as I see fit: if for example no one appears to be doing the reading, I may institute short, sporadic quizzes. These will in all likelihood be given in the first few minutes of class, and no make-ups will be given. In order for them to be taken seriously, I will have to shoehorn them into the grading scheme outlined above.

Here is the grading scale I use in all my classes:

numeric grade	**letter grade**
93.3 - 100	A
90.0 - 93.2	A-
86.7 - 89.9	B+
83.3 - 86.6	B
80.0 - 83.2	B-
76.7 - 79.9	C+
73.3 - 76.6	C
70.0 - 73.2	C-
66.7 - 69.9	D+
63.3 - 66.6	D
60.0 - 63.2	D-

Just to review, this is what the Student Handbook has to say about grades:

A and A-
: These grades are given for achievement of the highest caliber. They reflect independent work, original thinking, and the ability to acquire and effectively use knowledge.

B+, B, and B-
: These grades are given for higher than average achievement. Evidence of independent work and original thinking is expected.

C+, C, and C-
: These grades are given when the student has devoted a reasonable amount of time, effort, and attention to the work of the course and has satisfied the following criteria: familiarity with the content of the course, familiarity with the methods of study of the course, and active participation in the work of the class.

D+, D, and D-
: These grades are given for unsatisfactory work, below the standard expected by the College. They indicate work which in one or more important aspects falls

below the average expected of students for graduation. The work is, however, sufficient to be credited for graduation, if balanced by superior work in other courses.

Reading

In this course, the reading is critically important. Classtime will be spent discussing the reading for that day; I will not be lecturing. If you don't keep up with the reading — and by that I mean **active** reading, not just using a highlighter — you won't be able to keep up in class, you won't fully understand what's being taught, the class will rapidly become a waste of time for you.

Late Assignments

Assignments turned in late will not be accepted. Period.

Extra Credit

On a 100-point hour exam, I will give you 110 points-worth of questions. Thus, you can miss (nearly) 10% of the questions on any hour exam and still get the full 100 points. With the exception of these additional points on exams, there will be no opportunity for extra credit in this course. Spend your energy learning the course material; "extra credit" is a sham and a cheat.

Food

No eating in class, unless you can convince me it's medically necessary. *I* don't eat in class!

Cell Phones

Cell phones are tools of Satan. They are without significant positive value in my world and while I don't expect you to share my view of them, I expect you to spare me from being rudely reminded of their existence. If you are expecting an ***urgent*** phone call while in class or lab, alert me to that fact ahead of time. Otherwise, if your cell phone goes off in class or lab, you can expect me to penalize you some number of points, based entirely on my whim. Some day this will be looked on as one of my loveable eccentricities, but until then you'll just have to put up with my sociopathy.

Lab Conduct

There is to be ***NO*** food or drink in the lab at ***ANY*** time. Rules have gotten stricter, fines have gotten much higher, and our loveable Republican "smaller government" is coming after undergraduate institutions like never before. If I see any comestibles or potables in lab you will be docked points in accordance with my mood; if I see you put anything into

your mouth, I may well dock you several hundred (yes, *hundred*) points. This is a serious infraction of laboratory protocols.

The only thing worse is endangering other students or their data, whether through carelessness or malice. If I find anyone doing something which might result in harm to another student or compromise their experimental results, I will fail the perpetrator for the course. I am by and large a fairly easy-going guy, but there are some things which are simply beyond the pale; this is one of them.

Group Lab Reports

For certain labs I will require group (rather than individual) lab reports. When submitting group reports, please be sure to:

- Use "we," not "I" — this is to be a *group* effort.
- Include the title, date, and the names of your group members.
- Every member of the group must initial the report, indicating that they are satisfied with it and agree to its contents.

If you have any questions about this format, please don't hesitate to ask me.

Studying Genetics

Science is a collaborative venture. I urge you to get together with your fellow students as much as possible to study the material for this course in groups. Discussing problems, studying for exams with other students, and asking each other questions on the reading assignments are all examples of activities which will benefit you and which I encourage. Obviously you cannot consult with others during exams or quizzes, but the homework may be something of a grey area for many of you. For my courses, you must prepare your own answers to assigned problems, but I feel that getting together with other students in the course to discuss and think through problems together is not only perfectly acceptable, it is a very good idea. If you have arrived at what you believe to be the correct answer, put it aside for fifteen minutes before writing it down; this way you can be more confident that you really know what it is you're saying, and your answers won't be identical to your partners'.

Note that the idea of collaborative learning in this way does not mean that you should ask for answers from others who have already taken this or a similar course, nor should you necessarily just accept an answer from a classmate whom you think is likely to be right. Everybody is mistaken sometimes, and if you don't understand **why** his or her answer is the right one, well, then you don't understand it. And that is not where you want to be. Conversely, if you're sure you've got the right answer, don't just tell your study group and be done with it. Try to help them arrive at the same conclusion you did step by step; someone else may come up with a very different view of the problem which forces you to rethink your approach. And rethinking your approach, even if it doesn't turn out to change your mind about your answer, is critical to your success as a scientist.

My concern is not that you "learn" genetics, seeing it as a (very large) pile of facts, but that you **understand** it. Your fellow students and I are resources to help you; it's up to you to do the work necessary to gain that understanding.

You should expect to spend ***at least*** 2 hours studying on your own for every hour in the classroom. At a ***minimum***. That's true for every class, not just mine. If you're content to just slouch through, willing to trade a better grade in the course for whatever you think is more important than your studies, you're welcome to do so. But if you want to excel, not only for the sake of a higher mark on your transcript, but also for the sake of your education, you owe it to yourself to put in enough effort that you can honestly say to yourself at the end of the semester, "I did my best, and I learned as much as I could in that course." If you do, I'll do everything I can to make this a worthwhile experience for you.

Academic Honesty

I adhere to the Academic Honesty policy of the College. There is nothing more important to me than personal integrity — not happiness, not power, not even genetics, nothing — and I conduct myself and all of my classes in that spirit. If you're not familiar with College policy, you should be.

Syllabus

Meeting number	Date	In-Class	Background Reading
1	Mon., Aug. 27	organizational meeting	
2	Wed., Aug. 29	intro to genetics and genomics	chapter 1
3	Fri., Aug. 31	Mendelian inheritance I	chapter 2
	Mon., Sept. 3	No Class (Labor Day)	
4	Wed., Sept. 5	Mendelian inheritance II	chapter 2
5	Fri., Sept. 7	Okay, it's not that simple: single gene inheritance	chapter 3 pp. 45–56
6	Mon., Sept. 10	Okay, it's not that simple: multi-gene inheritance	chapter 3 pp. 56–71
7	Wed., Sept. 12	The chromosome theory & mitosis	chapter 4 pp. 81–93
8	Fri., Sept. 14	Meiosis & validation of the chromosome theory	chapter 4 pp. 93–112
9	Mon., Sept. 17	Linkage, recombination, and mapping I	chapter 5 pp. 123–136

10	Wed., Sept. 19	Linkage, recombination, and mapping II	chapter 5 pp. 136–154
11	Fri., Sept. 21	DNA role & structure	chapter 6 pp. 167–180
12	Mon., Sept. 24	hour exam	chapters 1–5
13	Wed., Sept. 26	DNA function	chapter 6 pp. 180–200
14	Fri., Sept. 28	Mutation	chapter 7 pp. 207–224
15	Mon., Oct. 1	Gene structure & function	chapter 7 pp. 224–244
16	Wed., Oct. 3	Genetic code & transcription	chapter 8 pp. 255–275
17	Fri., Oct. 5	Translation & gene expression	chapter 8 pp. 275–291
	Mon., Oct. 8	No Class (Fall Break)	
18	Wed., Oct. 10	Fragmenting and analyzing genomes	chapters 9 & 10 pp. 301–310,351–366
19	Fri., Oct. 12	Genome structure and complex traits	chapters 10 & 11 pp. 366–375, 394–399, & 419–423
20	Mon., Oct. 15	Chromosome structure	chapter 13
21	Wed., Oct. 17	Chromosome rearrangements	chapter 14 pp. 489–515
22	Fri., Oct. 19	Aneuploidy	chapter 14 pp. 516–525
23	Mon., Oct. 22	Prokaryotic genetics I	chapter 15 pp. 539–553
24	Wed., Oct. 24	Prokaryotic genetics II	chapter 15 pp. 553–572
25	Fri., Oct. 26	Organellar genetics	chapter 16 pp. 581–603
26	Mon., Oct. 29	hour exam	chapters 6–15
27	Wed., Oct. 31	paper	
28	Fri., Nov. 2	paper	
29	Mon., Nov. 5	Prokaryotic gene regulation I	chapter 17
30	Wed., Nov. 7	Prokaryotic gene regulation II	chapter 17
31	Fri., Nov. 9	Eukaryotic gene regulation I	chapter 18

32	Mon., Nov. 12	Eukaryotic gene regulation II	chapter 18
33	Wed., Nov. 14	Cell division	chapter 19 pp. 685–696
34	Fri., Nov. 16	Cancer	chapter 19 pp. 696–709
35	Mon., Nov. 19	Developmental genetics	chapter 20 pp. 717–732
	Wed., Nov. 21	No Class (Thanksgiving Break)	
	Fri., Nov. 23	No Class (Thanksgiving Break)	
36	Mon., Nov. 26	*Drosophila* morphogenesis	chapter 20 pp. 732–748
37	Wed., Nov. 28	Population genetics I	chapter 21
38	Fri., Nov. 30	hour exam	chapters 16–20
39	Mon., Dec. 3	Population genetics II	chapter 21
40	Wed., Dec. 5	Molecular evolution	chapter 22 pp. 791–813
41	Fri., Dec. 7	paper	
42	Mon., Dec. 10	paper	
	December	**FINAL EXAM probably in PPHAC**	

Life is fluid, so this syllabus is subject to change. This is only the second time I've taught this course, which is both good and bad: I may have to change the syllabus to best help you learn about genetics, but this is certainly preferable to rigidly adhering to some timetable in lockstep. So come to class and you'll always know what's going on with the syllabus; changes will of course also be posted here, but you should be in class anyway!

Lab Syllabus

Session	Date	Activity
1	Aug. 27–29	Lab orientation & overview handling flies nomenclature basics set up mapping cross 1
2	Sept. 3–5	set up mapping crosses 2 & 3 set up mutagenesis cross 1
3	Sept. 10–12	examine and score F_1 flies from mapping cross 1 flip to fresh vials to generate F_2
4	Sept.	examine and score F_1 flies from mapping crosses 2 & 3

	17–19	set up crosses to generate F_2 identify a new mutant male and set up cross
5	Sept. 24–26	examine and score F_2 flies from mapping cross 1 discuss lab report format
6	Oct. 1–3	examine and score F_2 flies from mapping crosses 2 & 3 set up mapping cross 4 examine and score F_1 flies from mutagenesis cross 1 set up mutagenesis crosses to generate F_2
7	Oct. 8–10	[no lab — Fall Break]
8	Oct. 15–18	**mapping lab report 1 due** examine and score F_1 flies from mapping cross 4 set up cross to generate F_2 for mapping cross 4 examine and score F_2 flies from mutagenesis cross set up a cross to establish a mutant stock set up mutagenesis cross 2
9	Oct. 22–24	
10	Oct. 29–31	examine and score F_2 flies from mapping cross 4 examine and score F_1 flies from mutagenesis cross 2
11	Nov. 5–7	discuss results
12	Nov. 12–14	**mapping lab report 2 due** examine and score F_2 flies from mutagenesis cross 2
13	Nov. 19–21	[no lab — Thanksgiving break]
14	Nov. 26–28	
15	Dec. 3–5	clean up **mutagenesis lab report due**

Life is fluid, so this syllabus is subject to change. I don't anticipate any significant deviations, but remember that it's written in electrons, not stone.

Stasy Yemelyanova

Anastasia (Stasy) Yemelyanova will be serving as my teaching assistant for this class. Stasy is a senior, and took this class two years ago. She did very well in the course, and is very knowledgeable about genetics. If you have a question and your classmates can't help you, don't hesitate to ask her. Her email address is redfox [at] inbox [dot] com and her cell phone number is 610-570-2512 (but please don't call after midnight).

Prof. Jones

If you ever have questions that you can't answer yourself, realize that there are a lot of resources available to you: if your classmates can't help you, feel free to ask me. This is part of my job, and one which I don't shirk. Depending on what the problem is, the most reliable method is probably email (I sometimes don't realize I have voicemail for a day or two). My email address is cjones [at] moravian [dot] edu and my office (and lab) phone number is 610-861-1614.

If you need to speak with me sometime when I'm not on campus (a rare event!), call me at home any time between 9 am and 9 pm. Students often tell me they don't feel comfortable calling me at home because they think I mind. Consider the logic here: there's nothing that says I have to give you my home phone number, yet I have done so in class. So ***why*** would I give you that number if I didn't want you to use it? Note that "use" is not the same thing as "abuse:" don't call me at 3 am the day before an assignment is due and expect much sympathy (or pleasant conversation)!

Here's a copy of my current class schedule. My official office hours are from 10am to 11am Mondays and 9am to 10am Tuesdays and Wednesdays. If I'm not in my office (Room 310, Collier Hall of Science), try my lab (Room 233, Collier Hall of Science — between the elevator and the loading dock on the main floor). That said, feel free to get hold of me any time; if I can't spare the time to talk then, I'll tell you so, and we can set up an appointment at our mutual convenience.