BIOL365 — Advanced Genetics
Spring 2016

Course Description

This is an advanced genetics course emphasizing current knowledge and research in diverse aspects of genetics, primarily in eukaryotes. Topics include genome structure, transcriptional control, genetic regulatory pathways, and recombinant DNA technology

Course Objectives

My goal for BIOL365 is to make you comfortable with the terms, concepts, and practices of modern genetics.

In addition to the text, we'll be using articles from the primary literature to hone your skills in analyzing the work of other researchers as well as to see how what we're learning in the classroom relates to what's going on in genetics labs today.

In the laboratory, our primary project will be to precisely engineer particular mutations into the genome of *Drosophila melanogaster*. We'll be doing this from square one, as the CRISPR technology we'll be using was only described in flies a couple of years ago, so there are no well-established guideposts. In addition, we'll be carrying out other experiments as time allows. These experiments will not only give you hands-on experience with the techniques, but also the experimental strategies of molecular genetics.

By the end of the semester, you should:

• understand the terms and concepts of molecular and classical genetics
• be able to explain those terms and concepts clearly to others
• be able to solve molecular genetics problems
• be able to carry out many common molecular genetic laboratory procedures
understand why you're carrying them out!
• be able to read a research article in any area you're at least somewhat familiar with and be able to confidently analyze its conclusions, strengths, and weaknesses
• be able to devise experimental strategies to answer research questions in molecular genetics

In short, by May I hope that you will feel (and be!) fairly self-sufficient in navigating the ins and outs of a significant part of genetics. More importantly, you'll feel confident in being able to learn what you need on your own — no one course, or even 4 years of them, can prepare you with everything you're going to need to know.

Required textbook: Genetic Analysis, 2nd edition, by Philip Meneely

Course Components

Hour exams (3 x 100 points each) = 300 points

Presentation = 200 points
Paper = 200 points
Lab Reports = approx. 700 points
Miscellaneous Assignments = approx. 200 points
Final exam = 200 points

The more mathematically inclined among you may have noticed that this adds up to 1800 points. To make it a round 2000, I'm giving you 200 points to distribute towards your final grade as you see fit (with some limitations). You may distribute them among the exams, the presentation, or the paper, according to your strengths. I will pro-rate everything accordingly. Thus if you split your extra points between the presentation and the paper, each of these will be worth 300 points total. I will ask you to decide on how you want to distribute your points after you've gotten the first hour exam back.

Attendance

If you are going to be absent from class or (Heavens forbid!) lab, please do me the courtesy of letting me know in advance if at all possible. Don't forget that it is your responsibility to notify me if you will be away for a field trip, sporting event, or other school-related function. It is not my responsibility to keep up with all the myriad activities which you might be involved in, according to the student handbook (and common courtesy as well).

Reading

In this course, the reading is critically important. Class time 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.

Electronic Devices

It is important that you are in class mentally as well as physically. Laptops, tablets, and their ilk can be very valuable for searching out, organizing, and recording information, but can also be distracting to the user and to those around them. I rely on you to spend your time in class

focused on what we're doing in class. If you see some benefit from using an electronic device for some reason, I trust that you will do so only for legitimate reasons and that you will be mindful of the potential for distracting others in our crowded classroom.

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 the 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 entire 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.

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, but other assignments may be something of a grey area for 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" some more advanced aspects of 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. (It amazes me every year how little time some students put into their classes, at least based on their course evaluations.) 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 molecular genetics, not happiness, not power, nothing - and I conduct myself and all of my classes in that spirit. If you're not familiar with College policy, you should be.

Academic and disability support

The Academic Support Center houses Disability Support and Greyhound Tutoring. Students who wish to request accommodations in this class for a disability should visit the Academic Support Center, located in the lower level of Monocacy Hall, or call 610-861-1401. Accommodations cannot be provided until authorization is received from the Academic Support Center.

Course Meeting Schedule

Date	Class session	Background reading
Mon, January 18	1	
Wed, January 20	2	Chapter 1
Fri, January 22	3	Chapter 1
Mon, January 25	4	[snow day]
Wed, January 27	5	Chapter 2
Fri, January 29	6	Chapter 2
Mon, February 1	7	Chapter 3
Wed, February 3	8	Chapter 3
Fri, February 5	9	**exam 1**
Mon, February 8	10	Chapter 4
Wed, February 10	11	Chapter 4
Fri, February 12	12	Chapter 4
Mon, February 15	13	Chapter 5
Wed, February 17	14	Chapter 5

Fri, February 19	15	Chapter 6
Mon, February 22	16	Chapter 7
Wed, February 24	17	research article TBA
Fri, February 26	18	**exam 2**
Mon, February 29	19	Chapter 8
Wed, March 2	20	Chapter 9
Fri, March 4	21	Chapter 10
Mon, March 7	[Spring Break]	
Wed, March 9	[Spring Break]	
Fri, March 11	[Spring Break]	
Mon, March 14	22	research article TBA
Wed, March 16	23	research article TBA
Fri, March 18	24	Chapter 11
Mon, March 21	25	Chapter 11
Wed, March 23	26	Chapter 12
Fri, March 25	[Easter Break]	
Mon, March 28	27	Chapter 13
Wed, March 30	28	Chapter 13
Fri, April 1	29	Chapter 14
Mon, April 4	30	**exam 3**
Wed, April 6	31	student presentations
Fri, April 8	32	student presentations
Mon, April 11	33	student presentations
Wed, April 13	34	student presentations
Fri, April 15	35	student presentations
Mon, April 18	36	student presentations
Wed, April 20	37	student presentations
Fri, April 22	38	student presentations
Mon, April 25	39	student presentations
Wed, April 27	40	student presentations
Fri, April 29	41	student presentations

May 4, 11:30 am FINAL EXAM