

Principles of Genetics

Biology 3060

Summer 2017

Instructor: Gregory J. Podgorski, BNR 141
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Classes: M - F, 10:40 – 12:20, DE 109 (Logan Campus)

Office Hours: M 1:30 – 2:30 pm; W 9 – 10 am; and by appointment

Text: Pierce, B. A., *Genetics – A Conceptual Approach, 5th ed* (2014) W.H. Freeman

Objectives: Provide content knowledge of major areas of genetics.
Strengthen problem solving skills.
Develop teamwork skills for tackling scientific problems.
Highlight the link between genetics and society.

Points:

Reading quizzes	15%
Group problem sets	30%
Two Hourly Exams	16% each
Comprehensive Final	23%

Overview of the Course: This course takes a student-centered, team-based approach to learning genetics. The aim is to improve genetics learning by having you work with the material instead of simply listening to lectures. I will help guide your learning, but you will take the lead.

An important part of your learning ownership is daily assigned readings. These readings will provide you with background information that make it possible to use class time to focus on difficult concepts and to have you work with the material. Quizzes on the readings will be given almost every day of class. Quizzes will be available on Canvas no later than 5 pm the day before they are due and need to be completed before class. Full instructions to quizzes will be available at the start of the semester.

Classes will open with a block of lecture on the most important or difficult concepts of the material we'll tackle that day. Once lecture is finished, you will work in teams on genetics problems while I move from team to team to answer questions and see how you're doing. Most classes will conclude with a short wrap-up that involves the entire class.

There will be three problem sets that will be due roughly every two weeks. Each group will submit one problem set, with the same score generally issued to every student in the group.

Expect to spend a significant amount of time outside of class on assigned readings and on problems sets.

Exams will be a mix of multiple choice and true/false questions, with the possibility of an occasional short answer question. All exams will be taken outside of class at USU testing centers and will be administered via Canvas. The final will be comprehensive.

Point-Awarding Activities and Grading:

Reading quizzes: Reading quizzes will be given almost every day of class. The purpose of these quizzes is to ensure that you come to class prepared with the background information needed to understand more difficult concepts and to work on genetic problems.

The required reading for each class will be announced on Canvas no later than 5 pm of the day before class. This isn't a lot of lead-time, but it's impossible to post a detailed schedule for the entire semester. Wherever possible, assigned reading will be posted well ahead of the 5 pm deadline.

To help you anticipate the readings, the chapter sections that were required reading for the summer 2016 version of this course are listed on the last page of this syllabus. This course will follow these past reading assignments closely. Therefore, if want to read ahead and are wondering what's likely to be assigned, look to last year's course as a guide.

Reading quizzes will be completed in Canvas. They will be available no later than 6 pm the day before they are due and they will close at 10:30 am the following morning. The number of questions will vary, but generally be in the range of 10 – 20 per quiz. All questions are weighed equally. The reading quiz score constitutes 15% of your overall course score.

Problem Sets: You will work in nearly every class in a group of 5 - 6 students to solve problems on three problem sets. Each problem set will be submitted through Canvas and is due at 6 pm on the dates shown in the lecture schedule. There will be a 10% point reduction if the problem set is submitted late **but within 24 hours** after the due date. Beyond this time, submissions will **not be accepted**. New problems may be added to a set up to 24 hours before the due date.

The problem sets allow you to work with peers in honing genetics problem-solving and teamwork skills. Some work outside of class almost certainly will be required to complete the problem sets. Only one problem set per group will be submitted. It is up to team members to decide on a system of how to work on and submit problem sets. With two possible exceptions, everyone in the group receives the same score. Late submissions count against all group members, so it is imperative to have a clear understanding of who will submit each problem set.

One possible exception to the same-score-for-all-group-members rule is the case of a disagreement over the group's answer. If you don't agree with the group's answer, you may submit your own answer to a question as part of your group's answer set (no individually submitted answers). I'm anticipating this to be a rare event. If this prediction is wrong, this policy may need to be revisited.

The other way a student may receive a score different from the group's is because of poor participation, either through a lack of attendance or lack of effort while being physically present. I expect each student to be in class to work with their team on the vast majority of days and to be actively engaged with teammates every class.

Groups will be assigned by the instructor. The expectation is that everyone will participate actively in their group. I will occasionally ask questions about group dynamics. If there is a problem, I will work with the group or individual to address it. It is possible for points NOT to be awarded to an individual if a pattern of non-participation occurs.

Group work in this interactive broadcast class presents special challenge. I expect students on the Logan Campus to reach out to students working at regional campuses. For students at regional campuses, the challenge will be engagement. You'll need to make your voice heard and not take a backseat to people participating in face-to-face conversations in the lecture room.

Exams: There will be two hourly exams and one comprehensive final exam. Exam questions will focus primarily on the concepts covered in class during lectures and in the problem sets. Only rarely will a question come solely from readings. All exams will be taken at USU testing centers and will be administered via Canvas.

Grading: The most stringent possible grading scale is shown at right. Some grade cutoffs may be adjusted downwards, but I can't know whether this will occur or where a new cutoff will be until all scores are tabulated at the end of the semester. Points *may* be added to exams, problem sets, or the reading quiz score at the instructor's discretion.

<u>Grade</u>	<u>Percentage</u>	<u>Grade</u>	<u>Percentage</u>
A	92-100%	C	72-77%
A-	90-91%	C-	70-71%
B+	88-89%	D+	68-69%
B	82-87%	D	60-67%
B-	80-81%	F	< 60%
C+	78-79%		

ADVICE: Genetics is a challenging course in the regular academic semester and even more so in the compressed summer semester. Realize that you're going to need to spend a lot of time on this course and that you must keep up with readings and problem sets. Also, be careful to avoid the trap of having your teammates do the problem solving for you. You can easily get a great score on the problem sets, but things won't go well in the exams when you have to do similar problems on your own. Finally, be sure to let me know if you have questions or need help. Whatever you do, don't let time slip away only to realize the night before an exam that you don't understand the material.

Course Policies: These revolve around a few simple themes: I want you to participate actively, both individually and within your group, and to come to class prepared. The most important points are:

- ◆ You must actively participate in your group
- ◆ Deadlines for problem set submissions are firm
- ◆ Extra credit activities will not be available
- ◆ Grading of exam questions or problem sets is open for discussion up to 48 hours after scores are returned to the class, but not beyond this time

Everyone knows that the unexpected can be expected. I'm reasonable and will be happy to discuss unforeseen events with you and possibly make adjustments, but there must have a well-justified reason for making exceptions to the policies above.

eText Access: If you've opted for an extext, obtain access going to <http://www.macmillanhighered.com/launchpad/pierce5e/5599870> and following the instructions.

(The next paragraph is information provided by the text's publisher.) You have three options to enroll in the course: you can purchase direct access, you can buy an access code, or you can get free 21 day access while deciding. [Your registration options are explained here.](#) To navigate and start using LaunchPad, the site that host the etext, please consult the [Get Started guide](#) and/or [view this video](#). If you have problems registering, purchasing, or logging in, you can contact Customer Support through an [online form](#), by [chat](#), or by calling (800) 936-6899 from 9 a.m. to 3 a.m. EST, 7 days a week

Canvas: Daily reading lists, PowerPoints presented in class, your quiz, exam and problem set scores, instructions for submitting problem sets, announcements, and a copy of this syllabus will be available on Canvas. You should check this site frequently.

Office Hours and Meeting with the Instructor: Feel free to stop by during regular office hours. If you cannot come during these times, send me an e-mail or see me after class to set up an alternative time to meet.

Target Lecture Schedule: I'll attempt to stay as close as possible to the lecture schedule listed in this syllabus. However, it's almost certain that some adjustments will be needed as the semester unfolds.

Critical Deadlines: Deadlines for adding and dropping the course with various notations on your transcript and for changing to P/D⁺/D/F are all given in the [Summer Schedule of Classes](#). If you find yourself wondering about any of these options, please check the posted dates carefully.

Academic Honesty/Integrity Policy: The [USU Academic Honesty and Integrity Policy](#) will be followed in this course. These policy statements apply to all aspects of the course, including problem set submissions. In some years, I've encountered problems with students copying answers from keys posted for previous genetics courses. This is a violation of policy.

Sexual Harassment: Sexual harassment is defined by the Affirmative Action/Equal Employment Opportunity Commission as any "unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature." If you feel you are a victim of sexual harassment, you may talk to or file a complaint with the Affirmative Action/Equal Employment Opportunity Office located in Old Main, Room 161, or call the AA/EEO Office at 797-1266.

Students with Disabilities: The Americans with Disabilities Act states: "Reasonable accommodation will be provided for all persons with disabilities in order to ensure equal participation within the program. If a student has a disability that will likely require some accommodation by the instructor, the student must contact the instructor and document the disability through the Disability Resource Center (797-2444), preferably during the first week of the course. Any request for special consideration relating to attendance, pedagogy, taking of examinations, etc., must be discussed with and approved by the instructor. In cooperation with the Disability Resource Center, course materials can be provided in alternative format, large print, audio, diskette, or Braille."

Withdrawal Policy and "I" Grade Policy: Students are required to complete all courses for which they are registered by the end of the semester. In some cases, a student may be unable to complete all of the coursework because of extenuating circumstances, but not due to poor performance or to retain financial aid. The term 'extenuating' circumstances includes: (1) incapacitating illness which prevents a student from attending classes for a minimum period of two weeks, (2) a death in the immediate family, (3) financial responsibilities requiring a student to alter a work schedule to secure employment, (4) change in work schedule as required by an employer, or (5) other emergencies deemed appropriate by the instructor.

Principles of Genetics (Biol 3060) Summer 2017

Target¹ Lecture Schedule

Meeting			Topic	Chapter ²
1	M	5/8	Introduction to Course; Introduction to Genetics	1
2	T	5/9	Chromosomes & Cellular Reproduction; Basic Principles of Heredity	2&3
3	W	5/10	Basic Principles of Heredity	3
4	Th	5/11	Basic Principles of Heredity	3
5	F	5/12	Sex Determination & Sex-Linked Characteristics	4
6	M	5/15	Sex Determination & Sex-Linked Characteristics	4
7	T	5/16	Extensions & Modifications of Basic Principles	5
8	W	5/17	Extensions & Modifications of Basic Principles	5
9	Th	5/18	Extensions & Modifications of Basic Principles	5
10	F	5/19	Pedigree Analysis <i>Problem Set 1 Due at 6 pm</i>	6
11	M	5/22	Linkage, Recombination, & Eukaryotic Gene Mapping	7
12	T	5/23	Linkage, Recombination, & Eukaryotic Gene Mapping	7
13	W	5/24	Linkage, Recombination, & Eukaryotic Gene Mapping <i>Exam 1 (schedule at testing center)</i>	7
13	Th	5/25	Chromosome Variation	8
14	F	5/26	Chromosome Variation	8
	M	5/29	<i>Memorial Day Holiday!</i>	
15	T	5/30	Chromosome Variation	8
16	W	5/31	Chromosome Structure	11
17	Th	6/1	Quantitative Genetics	24
18	F	6/2	Quantitative Genetics <i>Problem Set 2 Due at 6 pm</i>	24
19	M	6/5	Population Genetics	25
20	T	6/6	Population Genetics	25
21	W	6/7	Population Genetics <i>Exam 2 (schedule at testing center)</i>	25
22	Th	6/8	DNA: The Chemical Nature of the Gene; DNA Replication & Recombination	10&12
23	F	6/9	DNA Replication & Recombination	12
24	M	6/12	Transcription	13
25	T	6/13	Transcription	13
26	W	6/14	RNA Molecules & RNA Processing	14
27	Th	6/15	RNA Molecules & RNA Processing	14
28	F	6/16	The Genetic Code & Translation	15
29	M	6/19	The Genetic Code & Translation	15
30	T	6/20	Gene Mutations & DNA Repair	18
31	W	6/21	Gene Mutations & DNA Repair <i>Problem Set 3 Due at 6 pm</i>	18
32	Th	6/22	Gene Mutations & DNA Repair	18
	F	6/23	<i>Final Exam (schedule at testing center)</i>	

Reading Guide from Summer 2016 Course

Chapter	Readings
1	Do a quick reading of sections 1.1 and 1.2, but spend some time thinking carefully about the overview in section 1.3. There will only be a few exam questions from Chapter 1, but this chapter helps set the foundation for the course.
2	This chapter should largely be review from Biology 1610. You should read all of the chapter EXCEPT: detailed stages of prophase I (fig. 2.14); details of condensin/shugoshin in sister chromatid separation (p. 323 & 33); and Meiosis in Life Cycles of Animals and Plants (p. 33 – 37). Pay special attention to Section 2.3 Be aware that although this material should be familiar, almost everyone will need to review it carefully. The relationships between chromosomes, meiosis, and heredity are fundamental to genetics and turn out to be a common stumbling block for beginning geneticists.
3	This is an important chapter. Once again, it should be review, but my experience is that most students need a careful review of this foundational material. We won't cover section 3.4, <i>Chi Square Analysis</i> . Pay special attention to <i>Predicting the Outcomes of Genetic Crosses</i> (p. 51 - 55), especially the multiplication and addition rules.
4	We'll cover most of this chapter. However, you won't need to memorize specific human sex chromosome abnormalities.
5	We'll cover MOST of the chapter EXCEPT: The complex genetics of coat color in dogs (p. 117 – 119); cytoplasmic inheritance maternal effect and genomic imprinting (p. 121 – 125 for these three later sections). This is an important chapter that also contains the first material that will be new to most students. Pay close attention.
6	We WILL cover sections 6.1 & 6.2, but will NOT cover sections 6.3 – 6.5. Most of the material in sections 6.1 and 6.2 should be familiar from Biology 1610, but we'll extend some of these ideas to more complex pedigrees.
7	We WILL cover sections 7.1, 7.2 (EXCEPT <i>Testing for Independent Assortment</i> and <i>Evidence for the Physical Basis of Recombination</i>), only SOME of section 7.3 (<i>Effect of Multiple Crossovers</i> , <i>Mapping with Genetic Markers</i> , and <i>Locating Genes with Genomewide Association Studies</i> will be covered), and all of 7.5. We will NOT cover the first part of section 7.3 (<i>three point test crosses</i>) will cover NONE of section 7.4.
8	We will cover ALL of this chapter.
9	We will NOT cover this chapter.
10	MOST of this chapter will be covered. The sections NOT covered are <i>DNA as the Source of Genetic Information</i> ; <i>Watson and Crick's Discovery of the Three Dimensional Structure of DNA</i> ; and <i>RNA as Genetic Material</i> (important historical experiments p. 274 – 279 that, unfortunately, we won't have time for).
11	ALL of this chapter will be covered. However, don't worry about the detailed comparisons of mitochondria and chloroplasts from different species.
12	MOST of this chapter will be covered. The sections NOT covered are: <i>Meselson and Stahl's Experiment</i> and <i>Gene Conversion</i> .
13	We will cover ALL of this chapter.
14	MOST of this chapter will be covered. The sections NOT covered are <i>Minor Splicing</i> ; <i>Self-Splicing Introns</i> ; and <i>RNA Editing</i> (p. 387 - 388). Read sections 14.3 (tRNA) and 14.4 (Ribosomal RNA) for an overview – don't worry about the considerable details.
15	MOST of this chapter will be covered, but we will GO EASY on the DETAILS of initiation, elongation, and termination <i>factors</i> as well as <i>Breaking the Genetic Code</i> , and <i>Nonstandard Protein Synthesis</i> . <i>The One-Gene, One-Enzyme Hypothesis</i> section will NOT be covered.
16	We will cover SOME of this chapter. Sections NOT covered will be: <i>Negative and Positive Control: Inducible and Repressible Operons</i> ; <i>Positive Control and Catabolite Repression</i> ; <i>the trp Operon of E. coli</i> ; and Sections 16.3 (Attenuation and Premature Transcription Termination) and 16.4 (RNA Molecules in Control of Gene Expression).

17	SOME of this chapter will be covered, but we will GO EASY on the DETAILS of <i>Some Genes are Regulated by RNA Processing and Degradation</i> (Section 17.4). We won't cover <i>Regulation by Processes that Affect Translation or Modifications of Proteins</i> (section 17.6).
18	MOST of this chapter will be covered, but we will GO EASY on the DETAILS of the names of specific chemical mutagens and their mechanisms of action. <i>Detecting Mutagens with the Ames Test</i> will NOT be covered. Also NOT covered are <i>Transposable Elements in Bacteria</i> and <i>Transposable Elements in Eukaryotes</i> .
19 – 20; 22 – 23; 26	We will NOT be able to cover these chapters. It's too bad, especially for the Biotechnology and Genomics chapters, but there's simply not enough time.
24	MOST of this chapter will be covered, but we will GO EASY on the DETAILS of section 24.2. For this section (24.2), the essence of statistical methods, but NOT the detailed formulas, will be emphasized.
25	MOST of this chapter will be covered, but we will GO EASY on the DETAILS section 25.3, and formulas other than the Hardy-Weinberg equilibrium.

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