

GENERAL GENETICS

Biology 375

Spring 2016

INSTRUCTOR: Dr. Sarah Certel
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Skaggs 393, 243-6479
Office hours: W 3:10-4, TH 10-11

LECTURES: MWF, 9:10-10:00, Forestry 206

TEXTBOOK: *Genetics: A Conceptual Approach* by Benjamin A. Pierce, 5th Edition.
W.H. Freeman and Company [ISBN: 978-1-46410-946-1]

ONLINE QUIZZES: LaunchPad, <https://reg.macmillanhighered.com> (see separate pdf file)

RESOURCES: The publisher provides on-line resources for students who purchase the 5th Edition. Follow the instructions in the course material bundle.

WEB PAGE: Additional reading assignments will be provided as PDF documents posted on the class Moodle page (e.g., <https://umponline.mrooms3.net>) and/or electronically distributed to students' University e-mail accounts.

INTRODUCTION: Biology 375 will focus on the molecular genetics of eukaryotes, with special emphasis on transmission genetics, gene structure and gene regulation. Our course will have two major components. First, students will acquire mechanistic understanding of particular genetic phenomena (e.g., DNA replication and repair, gene silencing, *cis*- and *trans*-regulation), and in the process, gain knowledge about experimental tools used to acquire that understanding. Second, students will learn how these tools and this understanding are being used to address questions on the leading edge of development, behavior, microbiology, neuroscience, evolutionary and cellular biology. To give but a couple of examples: gene copy number can influence cancerous cells; also, gene imprinting strongly influences brain and behavioral development in many mammals.

EXPECTED OUTCOMES: Biology 375 will emphasize biological principles, scientific concepts, and scientific design. Expected outcomes are to understand the mechanisms of inheritance, to grasp fundamental principles of gene structure, gene expression and to gain experience in reading primary literature that uses genetics to address fundamental biological questions. Genetics is a problem-based science. Problem sets, essays, and exams will be designed to encourage students to synthesize subject matter, not simply to test their ability to recall details.

LECTURES: Attendance at lectures is an important part of this course, and all students are expected to attend lectures regularly. Videos or animations as well as white board lectures may be presented. All presented classroom material may be used as a basis for exam, quiz, or problem set questions. Approximately one out of five lectures may be a white board lecture (no slides will be posted on the class moodle page).

MISCELLANEOUS INFORMATION

Prerequisites BIOB375 is one of two required cores in the newly approved Genetics and Evolution Option. To be registered in BIOB375 students must have successfully completed the Introductory Biology sequence (BIOB160 and BIOB171), and Genetics and Evolution (BIOB272). Transfer students' coursework in these areas is subject to review by the Biology Advisor, Dr. Kerry Bright (Biology.Advisor@mso.umt.edu)

Accommodations to ensure accessibility of students with disabilities will be gladly made. In order to qualify a student must be registered with Disability Services for Students (DSS). Arrangements for accommodations on exams will be made through DSS.

Academic misconduct will be reported and handled as described in the UM Student Conduct Code. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. <http://ordway.umt.edu/SA/VPSA/index.cfm/name/StudentConductCode>

Dropping course or changing grading status must strictly follow University policies and procedures described in the UM catalogue. NOTE: Students cannot change to AUDIT after the 15th day of instruction. Also, after the 30th day of the semester, dropping the course or changing grading status to CR/NCR IS NOT automatically approved. Such changes can be requested by petition, but the petition must be accompanied by documentation of extenuating circumstances. Requests to drop the course or to change grading status simply to benefit a student's grade point average will not be approved.

Student Behavior

To maximize your likelihood of success, you should attend each lecture, and complete assigned readings before class. Do not simply rely on PowerPoint presentations posted on-line. When in class students are expected to behave in a manner that is respectful of others. All disruptive electronic devices must be turned off during lecture, during Discussion and Review sessions as well as during exams. If you prefer, you may use laptops or eTablets to take notes during lecture, please be respectful of others when doing so.

Written assignments are due at the start of class on the assigned day unless otherwise noted.

GRADES and Assignments

Make-up exams will only be administered if arrangements are made **prior** to the exam. Students must provide documentation of the nature of the emergency or illness. Students who need to arrange a make-up exam because they will be off campus participating in University-related activities (track, ROTC, etc.) must contact Dr. Certel one week prior to the exam, and provide documentation of the activity. Problem sets and essays will only be accepted late if documentation is provided of an illness or traveling difficulty.

Grades will be based how many of **500 points** you earn over the course of the semester:

- (1) **Assigned online quizzes or problem sets** (10 pts each, 100 pts total)
- (2) **Two mid-term exams** (75 pts each; 150 pts total)
- (3) **Problem sets** (100 pts). Two problem sets worth 50 points each will be assigned throughout the semester.

- (4) **One essay** (30 pts). Essays will answer an assigned question and provide a defense of your position in a 350-400 word persuasive essay. **Optional revised essay (15 pts extra credit).**
- (5) **Group primary literature presentation** (20 pts).
- (6) **Comprehensive Final Exam** (100 pts). Approximately 70% of the Final Exam will focus on material covered in the last third of the course; the remaining 30% will focus on material covered in the first two-thirds of the class.

As in other DBS classes, the top 10 to 20 %-tile of students will receive a grade of **A** or **A-**. The median score of the class will approximately define the partition between grades of **B** and **C**. A total score of 399 points (59.9%) or less will be failing (grade of **F**). Pluses (+) and minuses (-) will be used (**A**, **A-**, **B+**, **B**, **B-**, **C+**, **C**, **C-**, **D+**, **D**, and **D-**).

These cutoffs may be adjusted downward (in favor of the student) to better reflect natural breaks in the class scores.

<u>Day/Date</u>	<u>Topic</u>	<u>Reading</u>	<u>Assignment</u>
M Jan 25	Introduction and Course Logistics		Practice Online Quiz
	Section I: <i>Inheritance -Past and Present</i>		
W Jan 27	Genetics importance and history	Ch. 1 pp. 7-13	
F Jan 29	Chromosomal basis of inheritance	Ch. 2,4	
M Feb 1	Chromosome Structure and Behavior	Ch. 8	Online quiz 2
W Feb 3	Chromosome behavior II (CNV)	Ch. 11	
F Feb 5	Chromosome behavior III (Sex determination)	Ch. 4	Problem Set #1
M Feb 8	Mendel's Laws of Inheritance		Online quiz 3
W Feb 10	Linkage, Recombination, Gene Mapping	Ch. 7	
F Feb 12	Pedigree Analysis	Ch. 6	Problem Set #1 Due
M Feb 15	Presidents Day (No class)		
W Feb 17	EXAM I		
	Section II: <i>Fundamentals of Gene Structure, Function, and Transmission</i>		
F Feb 19	DNA: replication and recombination	Ch. 10/12	Online quiz
M Feb 22	DNA repair and gene mutations	Ch. 18.1, 18.3, 18.5	
W Feb 24	Gene Structure: Transcription	Ch. 13	Online quiz
F Feb 26	Gene Structure and Expression	Ch. 17	
M Feb 29	Control of Gene Expression II (alt. splicing, RNAi)		Problem Set #2
W Mar 2	Gene Mutations I	Ch. 18	
F Mar 4	Gene Mutations II (molecular changes)		
M Mar 7	Gene Mutations III (transposable elements)		Problem Set #2 Due
W Mar 9	RNA regulatory machinery	Ch. 17.5	
F Mar 11	Epigenetic Gene Regulation I	Ch. 15	Online quiz
M Mar 14	Epigenetic Gene Regulation II		
W Mar 16	Gene Function: Translation		Online quiz
F Mar 18	Gene Function: Translation II (HD)		
M Mar 21	Gene Function: Translation III (HD)		
W Mar 23	EXAM II		
	Section III: <i>Methods of DNA manipulation</i>		
F Mar 25	DNA amplification, CRISPR, transcriptome analysis		
M Mar 28	Functional Genomics: application to evolution	Ch. 20	Online quiz
W Mar 30	Proteomics	Ch. 20	
F April 1	Writing Essay		
April 4-8	Spring Break		
	Section IV: <i>Systems Genetics - From Gene to Phenotype</i>		
M April 11	Forward and Reverse Genetics: Designing your own experiments		
W April 13	Model genetic systems I: <i>Drosophila</i>	Writing Essay Due	Online quiz
F April 15	Model genetic systems II: <i>Drosophila</i>		
M April 18	Environmental Effects on Genotype Expression (Cystic Fibrosis)		
W April 20	Immunology: Genetic Rearrangement	Ch. 22.6	
F April 22	Immunology: Genetic Rearrangement	Ch. 22.6	
M April 25	Quantitative Genetics	Ch. 24	Online quiz
W April 27	Group Paper presentation I		
F April 29	Group Paper presentation II		
M May 2	Gene Variation and Drug Response	Writing Essay EC Due	
W May 4	Genetics of Innate Behavior (winners and losers)		
F May 6	Catch-up or Review		

Final Exam, Wednesday May 11th (10:10-12:10 pm)