GENERAL GENETICS

Biology 375 Spring 2017

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LECTURES: MWF, 9-9:50am. Forestry 206

TEXTBOOKS: *Genetics: A Conceptual Approach* by Benjamin A. Pierce, 6th Edition. W.H. Freeman and Company [ISBN-10: 1-319-05096-4]

RESOURCES: The publisher provides on-line resources for students who purchase the 6th 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 (https://moodle.umt.edu/) and/or electronically distributed to students' University e-mail accounts.

INTRODUCTION: BIOB375 is 3 credit-hour class that 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 a 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 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 and susceptibility to HIV infection; also, gene imprinting strongly influences brain and behavioral development in many mammals.

LEARNING OUTCOMES: Biology 375 will emphasize biological principles, scientific concepts, and experimental design. Expected outcomes are that you will thoroughly understand the mechanisms of inheritance, develop a firm grasp of the fundamental principles of gene structure and gene expression and gain experience in reading primary literature that uses genetics to address fundamental biological questions. Genetics is a problem-based science. Assignments 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 class regularly. Your active participation in lectures and discussions will count towards your participation grade.

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 the 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 after class. When in class students are expected to behave with respect towards others. Cell phones, iPods and other electronic devices must be turned off during lecture sessions as well as during exams. Written assignments are due at the start of class 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.s Tong and Weber at least 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 **600 points** you earn over the course of the semester:

(1) Two mid-term exams (100 pts each; 200 pts total) Material covered in class, including discussions and guest lectures will be on the exam. We will not examine you on details in the textbook that are not explicitly discussed in class.
(2) Assignments (100 pts). Problem sets and/or short essays based on the primary literature.
(3) Participation (100 pts). This will include online quizzes and/or in-class discussions of the primary literature.
(4) Comprehensive Final Exam (200 pts). About 50% of the final will focus on material covered in the last third of the course, the other 50% will focus on material covered in the first two-thirds of the class. Some of the questions will require you to synthesize material from throughout the course, including lectures, primary literature discussed in class and guest lectures. We will not examine you on details in the textbook that are not explicitly discussed in class.

We will use a sliding scale to be consistent with most other DBS classes so that at least the top 10- to 20 %-tile of students can expect to earn a grade of **A** or **A–**. That said, if more than 20% of students get 90% or more, they will all get As (in other words, we will not adjust grades against more students doing well, but if everyone does poorly, we will adjust grades to make sure that the grade distribution is not lower than most DBS classes). The median score of the class will approximately define the partition between grades of **B** and **C**. Pluses (+) and minuses (–) will be used (**A, A–, B+, B, B-, C+, C, C–, D+, D,** and **D–**).

BIOB 375 General Genetics — Spring 2017

Day/Date	Topic (guest lecturer)	Reading
M Jan 23	Introduction, Course logistics	
W Jan 25	Review 1: Mapping the route from genotype to phenotype	Ch. 1, pp. 430-433
F Jan 27	Review 2: Transmission genetics	Ch. 3
M Jan 30	Chromosomal basis of inheritance	Ch. 2, 4, 5
W Feb 1	Non-Mendelian ratios	Ch. 4 & 5
F Feb 3	Sex linkage and dosage compensation	Ch. 4
M Feb 6	X-inactivation and linkage	Ch. 5 & 7
W Feb 8	Linkage and gene mapping	Suppl. Reading
F Feb 10	Class Discussion	Problem Set1 due
M Feb 13	Using mapping to understand adaptation (Jones)	
W Feb 15	Variation in recombination rate within and among genomes	Ch. 7
F Feb 17	DNA structure, replication & repair	Ch. 10 & Ch. 12
M Feb 20	PRESIDENT'S DAY – NO CLASS	
W Feb 22	Discussion/ Review	
F Feb 24	**EXAM 1 [**Lectures & reading from (M) Jan 23 through (F) Feb 17]	
M Feb 27	Mutations: Molecular changes, Measuring mutation rates	Ch. 18
W Mar 1	Mutations: Spontaneous & induced	Ch. 18
F Mar 3	Transposons & large-scale changes in genome structure	Ch. 8 & Suppl. Reading
M Mar 6	Eukaryotic gene structure & expression	Ch. 14 & Ch. 17
W Mar 8	Introduction to Genomics	Ch. 20
F Mar 10	Metagenomics (Lukasik)	Suppl. Reading
M Mar 13	Class Discussion	
W Mar 15	Phylogenomics (Miller)	Ch. 20, 26.1 & 26.4
F Mar 17	New tools for genetic & genomic analysis, including CRISPR	Ch. 19 & Ch.17
	SPRING BREAK March 20 - 26	
M Mar 27	Genomics case study (Larson)	
W Mar 29	Class Discussion/ Review	
F Mar 31	**EXAM 2** [Lectures & reading from (F) Feb 17 though (W) March 17]	
M April 3	Epigenetics I	Ch. 21
W April 5	Epigenetics II	Ch. 21
F April 7	Quantitative inheritance & analysis of quantitative traits	Ch. 24 & Suppl. Reading
M April 10	Model genetic systems: Drosophila (Certel)	Suppl. Reading
W April 12	Model genetic systems: Yeast & regulation of the cell cycle	Ch. 23 & A12
F April 14	Class Discussion	
M April 17	The genetics of Cancer	Ch. 23
W April 19	The genetics of Apoptosis	Ch. 22
F April 21	Genetics & Evolutionary Medicine	Suppl. Reading
M April 24	The genetics of Aging (Lane)	pp. 329-330, 359-360 & Suppl. Reading
W April 26	The genetics of Behavior	
F April 28	The genetics of Speciation (Fishman)	
M May 1	Class Discussion	
W May 3	Guest lecture (Haig)	
F May 5	Student evaluations and review	
F May 12	**Comprehensive FINAL EXAM**	**10:00– 12:00**

NOTE: The BIOB 375 lecture schedule is subject to change. Certain topics may warrant extended classroom discussion or breakthroughs may occur in genetics and evolution that merit our attention.