1-2015

BIOB 375.01: General Genetics

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GENERAL GENETICS

Biology 375 Spring 2015

INSTRUCTOR: Prof. Frank Rosenzweig
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GRAD ASST: Ms. Amy Gallagher
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HSB302
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http://www.cas.umt.edu/dbs/labs/miller/

LECTURES: MWF, 09h10 – 10h00. Forestry 206

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

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: BIOB375.01 (CRN33402) 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 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 and susceptibility to HIV infection; also, gene imprinting strongly influences brain and behavioral development in many mammals.

EXPECTED 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 on fundamental principles of gene structure, gene expression and 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 may be presented, and examples featured in these videos may be used as a basis for exam questions.

REVIEW SESSIONS: Optional review sessions will be held at least 2 days prior to each exam at a time and location to be established in class.

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. 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 on the date indicated on the course Syllabus, 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 Prof. Rosenzweig 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)
(2) Problem sets (100 pts). Two problem sets worth 50 pts each will be assigned in mid-February and in mid-March. You will have one week to complete each of these/
(3) Two essays (50 pts each; 100 points total). Take home questions will be in a short essay format. You will answer the assigned question and defend your position in a 350-400 word persuasive essay. To support your position, you must provide a minimum of 4 references in a separate bibliography, and cite according to ASM style conventions described at http://jb.asm.org/site/misc/journal-ita_org.xhtml#top
(4) Comprehensive Final Exam (200 pts). 50% of the Final Exam 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.

Consistent with most other DBS classes, the top 10- to 20 %-tile of students can expect to earn 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 359 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–**).

BIOB 375 General Genetics — Spring 2015

Day/Date	Topic and Lecturer (Rosenzweig unless noted as G=Guest)	Reading	Homework
M Jan 26	Introduction, Course logistics and a few words about DNA	Ch. 1, pp. 278-285, 325-328	
W Jan 28	Review 1: Mapping the route from genotype to phenotype	Ch. 1, pp. 411-415	
F Jan 30	Review 2: Transmission genetics	Ch. 3	
M Feb 2	Review 3: Chromosome basis of inheritance (G)	Ch. 2	
W Feb 4	Chromosome behavior (Sex determination & sex-linkage)	Ch. 4	
F Feb 6	Departures from Mendelian ratios (beyond BIOB272)	Ch. 5	
M Feb 9	Segregation of alleles, recombination and linkage	Ch. 7	
W Feb 11	Variation in recombination rate within and between genomes	Ch. 7 & Suppl. Reading	
F Feb 13	DNA structure & replication	Ch. 10 & Ch. 12	
M Feb 16	PRESIDENT'S DAY – NO CLASS		PSet #1
W Feb 18	DNA replication & repair (G)	Ch. 10 & Ch. 12	
F Feb 20	Gene mutations I	Ch. 18	
M Feb 23	Gene mutations II (molecular changes)	Ch. 18	PSet #1 due
W Feb 25	Gene mutations III (Transposable elements, Tri Repeats) (G)	Ch. 18	
F Feb 27	**EXAM 1 through Feb 25** [12 lectures]		
M Mar 2	Large-scale changes in genome structure	Ch. 8 & Suppl. Reading	
W Mar 4	Eukaryotic gene structure & expression I	Ch. 14 & Ch. 17	
F Mar 6	Eukaryotic gene structure & expression II	Ch. 14 & Ch. 17	
M Mar 9	Genomics & Proteomics: Detecting changes (G)	Ch. 20 & pp. 555-562	
W Mar 11	Principles of genomic analysis I. Metagenomics (G)	Suppl. Reading	
F Mar 13	Principles of genomic analysis II. Phylogenomics (G)	Ch. 20, 26.1 & 26.4	
M Mar 16	New tools for genetic & genomic analysis	Ch. 19	PSet #2
W Mar 18	Regulation of gene expression (alternative splicing, RNAi)	Ch. 14 & Ch.17	
F Mar 20	Epigenetic regulation of gene expression I	Ch. 21	
M Mar 23	Epigenetic regulation of gene expression II	Ch. 21	PSet #2 due
W Mar 25	OPEN		
F Mar 27	**EXAM 2 through Mar 25** [11 lectures]		
	SPRING BREAK March 30 through April 3		
M April 6	Molecular genetics of epistasis & pleiotropy	Ch. 5 & Suppl. Reading	Essay #1
W April 8	Quantitative inheritance & the analysis of quantitative traits	Ch. 24 & Suppl. Reading	
F April 10	Genetic testing & counseling	Ch. 6	
M April 13	Genetics & Evolutionary Medicine (G)	Suppl. Reading	Essay #1 due
W April 15	Model genetic systems. I. Yeast & regulation of the cell cycle	Ch. 23 & A12	
F April 17	Cancer genetics	Ch. 23	
M April 20	Model genetic systems. II. *Drosophila*	Ch. 22 (p. 636-643) & A2	
W April 22	Model genetic systems. II. *Drosophila* (Forward Genetics)		
F April 24	Model genetic systems. III. *C. elegans* (G)	Suppl. Reading & A6	Essay #2

M	April 27	The genetics of Apoptosis	Ch. 22
W	April 29	The genetics of Aging	pp. 316-317, 344-346 & Suppl. Reading
F	May 1	The genetics of Macroevolution: Hopeful monsters & speciation genes (G)	
			Essay #2 due
M	May 4	Graduate Student presentations (A Gallagher & A Andis)	Suppl. Reading
W	May 6	OPEN	
F	May 8	Student evaluations and review	
T	May 12	**Comprehensive FINAL EXAM**	**10:10 – 12:10**

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.

BIO375 Guest Lecturers: Sarah Certel, Vaughn Cooper, Lila Fishman, Matt Herron, John McCutcheon, Scott Miller, Margie Kinnersley, Eugene Kroll, Katja Voronina