Bio 135 PB – Genetics (0.75 credits)

Mills College, Spring 2016
M/W 1-2:15pm, GSB 109

Instructor: Robin Ball, rball@mills.edu
Office hours: M 9:30-11am, NSB 127

Teaching assistant: Caitlin Spencer, cawspencer@gmail.com
Caitlin will lead a workshop once a week and will have office hours to help with homework. The schedule will be announced in class.

Course Description:
In General Biology you learned how genetic material is made of DNA and is passed on from cell to cell and through the generations via mitosis and meiosis. If every cell has the same set of DNA, then how do the cells know which genes to express? We will begin the course focusing on DNA, transcription and translation, with an emphasis on how gene expression is regulated. We will learn how new technologies have allowed researchers to study and manipulate DNA to address agricultural and medical problems. Following our discussion of biotechnology, we will revisit Mendel and modes of inheritance in more detail, including how complex human traits are inherited. We will finish up the class by learning about mechanisms that lead to genetic variation and how these changes can lead to disease.

Through the lectures and homework problems, you will learn about the experiments that led to important genetic discoveries. You will practice solving problems where you figure out inheritance patterns, create genetic maps and design experiments using recombinant DNA technology. You will learn how to find information about a particular disease or gene, and you will get more experience reading the primary literature, in order to write a final paper about a specific human genetic disease of your choice. By the end of this class, you will be well-versed in the world of DNA and genes and well-prepared for the genetics you will encounter on the MCATs and in Medical School.

Textbook: *Genetics: Analysis & Principles. 5th edition.* Robert J. Brooker. McGraw Hill publishers, 2014. ISBN: 978-0073525341

Note: This textbook comes with access to study-related website. You may find this material useful, but website access is not required for this course; a used copy of the textbook, which may not include these materials, is acceptable. You may use a different edition of the book, but I will refer to figures and page numbers from the 5th edition.

Do the reading, but focus on the material from lecture. You are not expected to know information in the text that was not discussed in lecture.

Course website: Please check the Blackboard course site regularly. You will find the lecture notes (these are very useful) and slides there. The homework assignments and keys will be posted on this site, as well.

Grading

9 homework problem sets (7 pts each)	63 pts
5 of 6 quizzes (lowest dropped, 10 pts each)	50 pts
Research paper	47 pts
Paper topic: 2 pts	
Reference list: 5 pts	
Brief presentation: 5 pts	
Paper: 35 pts	
Exam 1 (lec 1-7)	65 pts
Exam 2 (lec 8-13)	60 pts
Exam 3 (lec 14-20)	60 pts
Final exam (cumulative)	100 pts
Attendance and participation	10 pts
Total	**455 pts**

Homework problem sets

Homework questions will be posted on Blackboard several days before the due date. Homework is due in class on the due date. The homework is intended to review concepts and provide practice with problems presented in class the previous weeks. Students are encouraged to work together on problem sets; however, each student must turn in work individually, and questions must be answered in her/his own words. Due to grading limitations, only a subset of assigned problems, chosen at random, will be graded each week. A key will be posted on Blackboard after each problem set is due, so that you may check your answers on your own.

Quizzes

There will be 6 short (10 minutes) quizzes at the start of class. The quizzes are meant to help motivate you to stay caught up in the material and test yourself before the exams. Your lowest quiz grade will be dropped. There are no make-up quizzes.

Exams

There will be three exams and one cumulative final exam. The exams will have some short answer, fill in the blank and multiple choice questions, but the majority of the exams will be longer problems similar to the homework.

Research paper

As post-bac students you have been taking the prerequisite classes for medical school, but you may be wondering what any of this has to do with medicine. Genetics is the basis for many human diseases, and for those diseases that aren't directly caused by DNA mutations, a patient's genetic make-up will still influence how the disease manifests itself and how the disease is treated. Now is your chance to apply what you have learned about genetics to a human disease that you choose. What causes the disease? Which genes are mutated and what effect does that have on the proteins and cells? How is this disease passed on from generation to generation? You will address all of these questions in a 5 page paper based on your own independent research into the scientific literature. More details about the assignment will come in a separate handout.

Attendance/participation
I expect everyone to attend lecture regularly and come to class prepared to learn. This means you should be alert and focused on the course material. I will notice if you stop attending class and I will notice if you are checking your email or phone during class. This is distracting to the other students sitting around you, so please be respectful of the rest of the class. I will give you questions to work on during class, so I expect everyone to work together and to try to answer the problems.

Workshop
Caitlin will hold weekly workshops. This is the main way of providing you planned and structured assistance with the material. These are very beneficial and you should plan on attending. In workshop the TA will assist you in solidifying concepts covered in lecture. She will be prepared to focus on certain topics, but will also be flexible so as to address the needs of the students as best as possible. Please communicate with Caitlin about what would be most helpful for you during workshop.

Make-up policy
- There are no make-up quizzes, but your lowest grade will be dropped.

- Homework and the paper will lose 1 point for each day they are turned in late. If you can't come to class, then email me your homework on time so you don't lost points.

- Make-up exams are allowed only under extenuating circumstances (e.g. extended illness, death in the family), provided that the student provides the instructor with documentation of those extenuating circumstances. Make-up exams must be taken within a week of the regular exam date. If a student will be absent from an exam due to non-extenuating circumstances (trips for athletic teams, interviews, etc), the student must take the exam **prior to** the regular exam time. The student must notify the instructor at least 1 week before the regular exam time if (s)he would like to request such accommodations.

Academic integrity
As is made clear by the Student Honor Code, the content of all submitted examinations and other assignments must represent the student's own work unless otherwise specified (e.g. group projects). Representing another's work as your own may result in failing the assignment or the course. For policies on academic integrity, please refer the Mills College Student Handbook 2015-2016 [http://www.mills.edu/handbook.pdf].

Accommodations:
If you anticipate issues related to the format or requirements of the course, please discuss them with me. If you determine that formal, disability-related accommodations are necessary, it is important that you register with the Office of Student Access and Support Services so that accommodations can be arranged for this course and future courses here at Mills. Please do this well before you need the accommodation, so I have time to arrange alternatives.
Student Access and Support Services: Cowell Building, Room 111
Phone: 510-430-3241, Email: ssdhelp@mills.edu
http://www.mills.edu/student_services/disability_services/index.php

Lecture Schedule
Paper assignment due dates are in italics

Date	Day	Lecture Topic	Textbook	Assignments
		DNA and gene regulation		
Jan 20 Lec 1	W	Introduction to genetics	Ch 1	
Jan 25 Lec 2	M	DNA and RNA structure	Ch 9	
Jan 27 Lec 3	W	Chromosome structure	Ch 10	HW 1
Feb 1 Lec 4	M	DNA replication	Ch 11	Quiz 1
Feb 3 Lec 5	W	Transcription	Ch 12	HW 2
Feb 8 Lec 6	M	Transcription regulation prokaryotes	Ch 14	Quiz 2
Feb 10 Lec 7	W	Transcription regulation eukaryotes	Ch 15+16	HW 3
Feb 15	*M*	*President's Day – no class*		
Feb 17	W	**Exam 1** (Lec 1-7) (+ concept map due for 5 pts)		Exam 1
Feb 22 Lec 8	M	Translation and regulation	Ch 13+16	
		Biotechnology		
Feb 24 Lec 9	W	Recombinant DNA technology	Ch 20	
Feb 29 Lec 10	M	Biotechnology/CRISPR	Ch 21	Quiz 3
		How are genetic traits inherited?		
Mar 2 Lec 11	W	Review of mitosis and meiosis	Ch 3	HW 4
Mar 7 Lec 12	M	Mendelian inheritance I	Ch 2	Quiz 4
Mar 9 Lec 13	W	Mendelian inheritance II	Ch 4	HW 5
Mar 14	M	**Exam 2** (Lec 8-13)		Exam 2
Mar 16 Lec 14	W	Non-Mendelian inheritance **Last day to drop class**	Ch 5	*Paper topic*
Mar 21- Mar 25		*Spring break*		
Mar 28 Lec 15	M	Genetic mapping in eukaryotes	Ch 6	

Date	Day	Lecture Topic	Reading	Assignments
		How do genes change and evolve?		
Mar 30 Lec 16	W	Gene mutation and repair	Ch 18	HW 6
Apr 4 Lec 17	M	Recombination and transposons	Ch 19	Quiz 5 *Reference list*
Apr 6 Lec 18	W	Chromosomal mutations	Ch 8	HW 7
		Genomics and medical genetics		
Apr 11 Lec 19	M	Genomics I – Mapping and sequencing	Ch 22	Quiz 6
Apr 13 Lec 20	W	Genomics II - Bioinformatics	Ch 23	HW 8
Apr 18	M	**Exam 3** (Lec 14-20)		Exam 3
Apr 20 Lec 21	W	Medical genetics	Ch 24	
Apr 25 Lec 22	M	Genome wide association studies		
Apr 27 Lec 23	W	Cancer genetics	Ch 24	HW 9
May 2	M	Paper presentations		*Paper due*
May 4	W	Final review		
May 9 2-5pm	M	**Final Exam (cumulative)**		Final