Biology 221: Genetics

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Course Materials:
Required Text: **Pierce's Genetics: A Conceptual Approach 6th edition**
This text should be brought to class every day

Course Description:
A survey of genetics covering classical Mendelian genetics and modern molecular genetics. Topics will include Mendelian and non-Mendelian inheritance; DNA structure and replication; gene expression and regulation in both prokaryotes and eukaryotes; DNA mutation and repair; cancer; developmental genetics; and population genetics. Laboratory work will provide opportunities to use classical genetics, but will focus on biochemical and molecular techniques currently used in research and medical laboratories. (**Prerequisites: BIO115 and CHM111 or CHM121**)

Course Objectives:
●Understand how traits are passed from parents to offspring
●Use knowledge of Mendelian and non-Mendelian genetics to determine the mode of inheritance of traits and genetic disorders
●Understand the "central dogma" of molecular biology
●Identify the differences between prokaryotes and eukaryotes with regard to DNA replication, transcription, and translation
●Recognize the connections between DNA mutation, gene regulation, and cancer
●Analyze the ways in which cells become highly differentiated from one another despite containing identical DNA
●Understand the concepts behind, and master the techniques of: DNA extraction; gel electrophoresis; polymerase chain reaction (PCR); and transformation of competent cells
●Use bioinformatics to analyze DNA sequence data
●Gain an understanding of the effects of human genetic disorders on individuals, families, and society

Course Policies:

Grading:

Exams (4):	40%
Lab reports/posters (2 reports, 2 posters):	35%
Lab practical*:	5%
Clickers/problem solving:	20%

Exams: Closed book; may include multiple choice, problems, short answer, and other question styles. Exams 1-3 are non-cumulative. The cumulative final exam can count twice, replacing one low or missing exam score.

Lab reports/posters: Prepared following each of the four projects; formatted according to guidelines provided on the Tartan.

Lab practical: A practical examination to evaluate your mastery of the basic laboratory skills used throughout the semester. *If for any reason (snow days, equipment issues, etc.) we fall more than 1 week behind in lab, we will not have a lab practical and the lab reports/posters will count as 40% of your grade.

Problem Solving/Clickers: You will frequently be asked to perform activities in small groups to facilitate learning concepts and applications of genetics. Your class participation grade will reflect your attendance and the performance of your group in these exercises. Your participation in "clicker" questions will also factor into this grade.

Extra Credit Opportunities:

Each student may earn up to 3 bonus points that will be added to their final grade. One way to earn these points will be to complete a **service learning project at The Gate**. I strongly encourage anyone who plans to become a medical professional or a teacher to choose this option. Alternatively, you may accrue 0.1 points each time you attend a genetics SI session, and 0.25 points each time you attend a designated event and turn in the required summary via email within 1 week. Absolutely no individual extra credit opportunities will be available. A maximum of 3 bonus points will be applied to your final grade.

Grade Scale:

97-100	A+	87-89.99	B+	77-79.99	C+	67-69.99	D+	Below 60 = F
93-96.99	A	83-86.99	B	73-76.99	C	63-66.99	D	
90-92.99	A-	80-82.99	B-	70-72.99	C-	60-62.99	D-	

If you are struggling with the material please see me for help EARLY IN THE SEMESTER! The earlier you seek help the more time you have to improve your grade! Final grades are non-negotiable.

Attendance/Make ups:

Attendance at all lectures and laboratories is mandatory. Please see me immediately if you are involved in a formal, documented school activity that will force you to miss multiple lectures, any laboratories, and/or any exams. Information about ongoing/extended absences for medical reasons can be found in the *disabilities and extended absences* section.

Make-up exams are allowed only when formal documentation of a school activity or medical care is provided AND I am contacted prior to your missing the exam. If you know that you will need to miss an exam because of a formal, documented school activity let me know now and I will arrange for you to take the exam early. You will not be able to use the immediate feedback form if you take the exam early or late. If you are extremely ill, contact me before the exam takes place, and have a dated note from a medical facility indicating that you are to be excused from school on the day of the exam, I will give you an alternative exam upon your return to campus. If you miss an exam for any other reason, your score on the cumulative exam will count for the missing exam.

Laboratory project activities generally cannot be made up. You are allowed to miss one laboratory session without penalty provided that you complete the required written work. Subsequent absences will result in a 20 point reduction (out of 100 possible points) on a project report. When possible, arrangements should be made to attend the other lab section if you will miss lab due to travel for school activities. **You will not be allowed to enter the laboratory if you are late or if you are not properly dressed** (you will be considered absent).

Class Participation cannot be made up! I will drop two of your problem solving grades, allowing you to miss two without penalty (if you don't miss any, the last one and the lowest one will be dropped). Clicker points will be awarded as follows: 3 or fewer missed days = 100%, 4-5 missed days = 80%, 6-7 missed days = 60%, etc.

Deadlines:
Lab reports and posters are due at the beginning of class as detailed on the schedule. Lab reports handed in after the deadline but less than 24 hours late will be docked 10 points (out of 100). Reports will be docked 20 points if they are 24-48 hours late, 30 points if they are 48-72 hours late, etc. IF YOU ARE MORE THAN 5 MINUTES LATE TO CLASS/LAB ON THE DAY A REPORT/POSTER IS DUE IT WILL BE CONSIDERED LATE!

Reading:
You are expected to complete the assigned reading prior to class. If you don't keep up with the reading, it will be detrimental to your class participation grade. **Working problems from the ends of the chapters is the best way to review for exams!**

***Cheating/Plagiarism*:**
I have no tolerance for cheating or plagiarism. Avoid working together when writing your lab reports/posters to avoid the appearance of plagiarism. You will work in groups in the laboratory, but **you should still have unique abstracts, introductions, materials and methods, results, and discussion sections in your lab reports. Your data may be the same, but you should not have identical tables/graphs/calculations/text to your lab partner(s).** A peer review process will occur for some assignments in this class. In these instances I will collect your rough drafts to ensure that any similarities that occur in you and your lab partner's reports/posters are a result of the peer review process and not an initial joint effort or plagiarism. **Using another student's clicker is cheating**. If you are unsure if what you are about to do constitutes cheating or plagiarism, ask me. The first offense of cheating or plagiarism will result in a zero on the assignment, and a letter to the registrar. This zero cannot be dropped or replaced. A second

offense will result in a failing grade (F) in the course. If you have cheated or plagiarized in this course in the past, a single incident of cheating or plagiarism that occurs this semester will result in a failing grade (F) in the course.

Classroom behavior:
Please turn off all cell phones and other electronic gadgets before class. These items must be stored at the front of the room during exams. **If you have a cell phone on you during an exam you will receive a grade of zero.** Translators are not allowed during exams. If you are late to class please sneak in quietly. **You will not be allowed to enter the laboratory late** (you will be considered absent – see policy above). If you engage in disruptive behavior (talking, giggling, acting out) you will be told to leave the classroom. We may discuss some rather controversial issues in class. Please be respectful of your classmates even if you do not share their opinion on an issue. The aim of these discussions is to expose you to different viewpoints.

Disabilities and extended absences:
Students with a disability requiring accommodations or any student who believes that he or she will require accommodations should contact Kim Ochsenbein in the Academic Support Center located in the lower level of Thaw Hall (865) 981-8124. Students are encouraged to make contact before or during the first week of classes.
Students wanting an absence due to medical issues to ***NOT*** apply to the standard absence policy for this class (ie. you want to "make up" missed activity or lab points) must contact Kim Ochsenbein. She will discuss the situation with you, review documentation, and determine if any accommodation for attendance is warranted beyond the stated class policy. Faculty will notified via an accommodation letter if absences are to be allowed beyond the stated policy.
No emotional support animals are allowed in the lab at any time. Service Animals must be coordinated in advance with the Dean of the College and the Lab Instructor.

Tentative Lecture and Laboratory Schedule*

Date	Topic	Text Chapter	Assignment Due
Th Jan 9	Review: prokaryotes vs eukaryotes, mitosis, meiosis, Genetics Concept Assessment	Ch 1 & 2	
Tu Jan 14	Service learning opportunity, finish review, intro to genetics and Mendel	Ch 2 & 3	
LAB	*Safety, basic skills, and yeast complementation (project 1)*		
Th Jan 16	Mendelian inheritance, probability	Ch 3	Service learning interest form (if interested)
Tu Jan 21	Mendelian inheritance, multi-locus crosses	Ch 3	
LAB	*Yeast complementation (project 1) continued*		
Th Jan 23	Non-Mendelian inheritance	Ch 5	
Tu Jan 28	Sex, sex linkage, sex influence	Ch 4 & 5	
LAB	*Peer review project 1 poster and intro to project 2*		Project 1 poster draft (printed and electronic copies)
Th Jan 30	Pedigrees, linkage and recombination	Ch 6 & 7	
M Feb 3, 9 am	*send as .pdf, .ppx, or .ppt file attached to email DO NOT send link to Google Drive		Project 1 poster emailed to Brenda.eingle@ maryvillecollege.edu
Tu Feb 4	Linkage and recombination	Ch 7	
LAB	*ID Bacteria (project 2)*		
Th Feb 6	Review (or snow make-up day)		
Tu Feb 11	**EXAM I**	Ch 1-7	
LAB	*ID Bacteria (project 2)*		
Th Feb 13	Chromosomal abnormalities and genetic testing	Ch 6 & 8	
Tu Feb 18	DNA structure, Chromosome structure	Ch 10 & 11	
LAB	*ID Bacteria (Project 2) and introduce Project 3*		
Th Feb 20	Replication (Prokaryotes)	Ch 12	
Tu Feb 25	Transcription & RNA molecules (Prokaryotes)	Ch 13 & 14	
LAB	*Comparison of genomic DNA to cDNA (Project 3),* Peer review of project 2 reports		Project 2 lab report draft (printed copy)
Th Feb 27	Translation (Prokaryotes)	Ch 15	
Tu Mar 3	Replication (Eukaryotes)	Ch 12	Project 2 lab report final (printed copy)

LAB	*Comparison of genomic DNA to cDNA (project 3)*		
Th Mar 5	Transcription & RNA Modification (Eukaryotes)	Ch 13 & 14	
Tu Mar 10	Translation (Eukaryotes)	Ch 15	
LAB	*Comparison of genomic DNA to cDNA (Project 3)* *And intro to project 4 / Bacterial genetics*	Ch 9	
Th Mar 12	Review		
Mar 14-22	SPRING BREAK		
Tu Mar 24	**Exam II**	Ch 6, 8 -15	
LAB	*Plasmids / antibiotic resistance (project 4)* *Peer review project 3 reports*		Project 3 poster draft (printed and electronic copies)
Th Mar 26	Regulation of gene expression (prokaryotes & Eukaryotes)	Ch 16 & 17	
M Mar 30, 9 am	*send as .pdf, .ppx, or .ppt file attached to email. DO NOT send link to Google Drive		Project 3 poster emailed to Brenda.eingle@ maryvillecollege.edu
Tu Mar 31	Epigenetics	Ch 21	
LAB	*Plasmids/ Antibiotic resistance (project 4)*		
Th Apr 2	Mutation & repair	Ch 18	
Tu Apr 7	Peer review project 4 reports (in lecture)		Project 4 lab report draft (printed copy)
LAB	Mutation & transposition *Clean up lab*	Ch 18	
Th Apr 9	Intro to quantitative and population genetics	Ch 24 & 25	Project 4 lab report final (printed copy) -note shorter than usual turnaround time!
Tu Apr 14	Intro developmental genetics and the genetics of the immune system	Ch 22	
LAB	*Lab practical*		
Th Apr 16	Into to cell cycle control & cancer	Ch 23	
Tu Apr 21	**Exam III**	Ch 9, 16-18, 21-25	
LAB	*Clean up and/or catch up if we are behind for any reason*		
M Apr 29 – 3:30 pm	**Cumulative Final Exam**		

*The possibility of snow in the spring semester makes this schedule VERY tentative. A snow day causing lab cancellation could shift deadlines for the rest of the semester. Check the Tartan for updates!