FALL SEMESTER 2024 - BIOLOGY 3300-01 – GENETICS

Lecture: 8:00-8:50am MWF Sc 215

Instructor: Dr. Jennifer Cooper Office: SL 3005 Phone: 470-578-2405
email: jcoop135@kennesaw.edu *(this is the best way to contact me, but do not email with D2L)*

"Drop in" office meeting times: Mon. 9:30-10:30am, Wed. 10:00-11:00am, and Thurs. 2-2:30pm

Genetics

Heredity information is central to all aspects of biology. Cells cannot function without proteins, and proteins cannot be made without the hereditary information in genes. Genes heavily influence how organisms develop, function, and behave, as well as how species evolve. You became familiar with these concepts in introductory biology, and in this course we will delve more deeply into the study of genetics. Every biology course you take after this will require your knowledge of genetics!

COURSE DESCRIPTION

We will study fundamental principles and applications in genetics. We will investigate how traits are inherited and to use this information to predict and analyze genetic outcomes. We will also learn nucleic acid structure, how DNA replicates and how genes are expressed. Mutation at the gene and chromosomal levels will also be investigated, and their effect on gene structure and function examined. Finally, we will explore various genetic methods, including pedigrees, mapping, and molecular techniques. Prerequisites: A grade of 'C' or better in Biology 1107/1107L and Chem 1211/1211L. *NOTE: A list of course learning objectives is located at the end of the syllabus.*

Teaching philosophy

Genetics is like a puzzle: I can describe the pieces to you and explain how they fit together…but it will only fully make sense when you can put the pieces together by yourself. Therefore, I strongly believe that the only way to learn genetics is by actively applying concepts so that you understand how the "puzzle pieces" fit together. For this reason, we will practice solving problems and developing skills to fully understand genetic concepts both during lecture and outside of class. Many of the problems we will work on will be related to help you form a "big picture" of how heredity and molecular biology work.

Overall Learning Objectives:

1) Describe from the molecular to the cellular/organismal level how hereditary information is passed from one cellular/organismal generation to the next and identify inheritance patterns.

2) Explain from the molecular to the organismal level how hereditary information is expressed as phenotypes, including factors that can affect this expression.

3) Explain how genomes are organized and how genomes and/or their organization can vary.

4) Explain common technologies used in molecular genetics.

5) Solve problems using hereditary or molecular data.

Assessments

In order to earn a grade in this course, I need to assess your progress. Formative assessments (Mastering Genetics, D2L "quizzes", in class assignments) help me understand where to clarify the material, and give you an opportunity to practice. Summative assessments (tests) show me what you have learned.

Life Happens….

When you turn to the next page, you will see the specific details of our course. Before you turn the page, I want you to know that I understand that things happen and they may not fit the description of "acceptable excuses" listed here. For this reason, I will drop your 2 lowest practice assignment grades, offer one test re-take, and up to 1% extra credit. Additionally, if you are in an unexpected situation, please let me know as soon as possible so we can minimize its impact on your grade!

Virtual practice time will be held by appointment via Teams or Zoom. Make an appointment 4 hours in advance on the online calendar at **https://jcoop135.youcanbook.me** Virtual practice is a great time to ask a question over material, get help working a problem, or talk about study techniques.

"Drop in" meeting times will be Mondays 9:30-10:30am, Wednesdays 10:00-11:00am, and Thursday 2-2:30pm in my office SL 3005. Drop in meetings are great for reviewing test performance, grade discussions, and also everything we can do during virtual practice time. You can also just come by to say "hi!"

Contacting me/alternate meeting times: Feel free to email me with specific questions or concerns. Please put the class name in the subject line and sign your full name to the email. If you need to schedule a meeting with me outside of the above times, please email me to suggest 2 possible times/days to choose from. Any change to the regular drop in meeting times will be posted on our D2L website. PLEASE DO NOT email through D2L as this will delay your time to get a response. Please allow 24 hours for a response on weekdays and 48 hours on weekends.

REQUIRED ITEMS

1. ***Mastering Genetics*****,** Pearson Education Inc. (There is no substitute for this item). Comes with the eBook of *Essentials of Genetics* by Klug et al. Works in Chrome or Firefox. Do not purchase access now – there will be a link in our D2L pages for "Day One" access and access to KSU pricing within. More information about Day One access can be found at https://ksustore.kennesaw.edu/textbooks/day_one_access.php

2. A **textbook** like *Essentials of Genetics* by Klug et al (10th edition, Pearson ISBN: 9780136414964) OR some other essentials of genetics text published in the last 5 years. You can use the online one that comes with Mastering, or choose to purchase a print version. Problems sets will be provided for the Klug *Essentials* book only.

3. **Computer or tablet to bring to class:** some assignments will be completed online in class, so access to a device is important. A phone will not work for many assignments, so do not plan on using a phone. If you do not have a device, please let me know and also contact University Information Technology Services at 470-578-3555 to see if a device can be borrowed.

4. **Computer and internet access:** Assignments will be carried out fully online. If you do not have internet access or a device that can adequately access the internet, contact University

Information Technology Services at 470-578-3555. Note that the GA Department of Community Affairs has compiled a listing of public WiFi hotspots available throughout the state here: https://broadband.georgia.gov/georgia-internet-access-covid-19-update.

COURSE DELIVERY

This course is a face-to-face, in person lecture. KSU may shift the method of course delivery at any time during the semester in compliance with University System of Georgia health and safety guidelines. In this case, alternate teaching modalities that may be adopted include hyflex, hybrid, synchronous online, or asynchronous online instruction.

GRADING

1. The final course grade will be based on the number of points earned out of the total possible as follows:

4 Tests	76% of the course grade
In class work	4% of the course grade
Practice assignments	20% of the course grade
	100%

2. Grade scale: A = 88.5 - 100 % of total points; B = 78.5 – 88.49 %; C = 68.5 – 78.49 %; D = 58.5 – 68.49 %; F = below 58.5 %
3. As per the policy for all sections of BIOL 3300, there will be extra-credit of up to 1% of the total points possible for the course.
4. The grade scale will be strictly followed. Do not expect your grade to be "rounded up."
5. Grades will be posted in D2L and discussed in person. If you believe there is a problem with a grade posted in D2L or on MG, please contact me within 7 days of the grade being posted.

LECTURE POLICY

1. Regular attendance in our lecture is expected. It is *essential* for success in this class. Post-lecture questions or problems will be assigned in D2L or Mastering Genetics. These will be based on material practiced during lecture time. Attending and participating during lecture is the best way to prepare for these assignments. Reading the relevant chapter sections in the textbook *prior* to lecture is strongly advised. **Four percent of your grade is earned by completing assignments worked on during lecture.** Points are earned by answering questions/solving problems in class and submitting answers online or in writing. To receive points, you must complete the assignment by the due date (typically the next class period). The single lowest scoring in class assignment will be dropped from your grade.
2. Course information and materials (lecture announcements, lecture presentation materials, etc.) will be available at the course website in D2L.
3. Our classroom environment should enhance learning. If you have a question or just want me to slow down or repeat something, please feel free to "raise your hand" and ask! I will gladly repeat material or answer content-specific questions. Keep in mind that classroom behavior that interferes with either (a) the ability of all students to benefit from instruction or (b) the instructor's

ability to conduct the class is not acceptable. Please minimize distractions such as phone usage or off-topic computer use during class.

PRACTICE ASSIGNMENT POLICY

1. One key to doing well in genetics is to complete practice questions and work problems (the more the better). Therefore, **practice assignments** (**homework) will be given on a regular basis and are worth 20% of your overall grade.** All assignments will be completed outside of lecture and administered using the Quizzes tool in D2L or in Mastering Genetics (MG: homeworks and dynamic study modules). Assignments will be announced in lecture. All assignments are graded and you are responsible for their completion by the due date. Extra time on an assignment is only granted for valid, documented excuses (see test policy for more details). Complete the homework well in advance of the due date to prevent internet/computer/D2L/MG problems from interfering with your work. I am available to answer questions about the content of the homework. However, I cannot fix D2L, MG, your computer, web browser, or internet service. Please contact the Service Desk (470-578-3555) if you have D2L issues. Please contact Pearson at https://support.pearson.com/getsupport/s/ for help with MG. Additional information concerning accessing MG and D2L assignments will be available at the course website in D2L.

2. All practice assignments will be due at 11:59pm on Mondays.

3. Each homework *question* in an assignment is worth 1 point. Each assignment has equal weight in the gradebook.

TEST POLICY

1. Tests will consist of a mixture of multiple choice questions and problems. You may be asked to examine a diagram or graph in order to answer the questions. You will need a pencil, eraser, and a basic calculator. NO other items in your testing area are allowed. Please bring your photo ID to tests.

2. Make-up tests will be given for excused absences only. All make ups will be given on one day during finals week. No make ups will be given on Saturday or Sunday. There is no make-up for missing a make-up test.
   - Only the following are accepted for making up a missed lecture test: illness, death in the family, official KSU-related activity (participation in sporting event, etc.) or an absence required by government (e.g. jury duty or military orders).
   - You must contact the instructor within 24 hours of the original test date/time to be considered for a makeup. Failure to do so will result in a grade of zero on the test. If you know in advance that you will miss an exam, notify the instructor as soon as possible.
   - All absences must be supported by documentation (e.g. physician's note, death certificate, police report). If false or fabricated documentation is discovered, it will result in a zero on the corresponding test and a report to the office of Student Conduct and Academic Integrity.
   - Be aware that make-up tests may be of any format. (e.g. short answer questions or essay), and this is the choice of the instructor.

3. Four tests are scheduled. Tests 1 - 4 will be given during a regularly scheduled lecture period (see the lecture schedule).

4. As per all sections of Genetics, the instructor will provide an optional test re-take opportunity that may replace 15-20% of the test portion of the course grade. The optional test will be given in finals week during our assigned finals time. The date and time of finals is scheduled by the Registrar's Office and is NOT subject to change (refer to http://web.kennesaw.edu/registrar). This test re-take can be used to replace the lowest test score from one of the previously completed lecture tests (any lecture test taken during finals week is not eligible for re-take). It cannot be used to replace a test that was not taken. For example, say you scored 65% on test 2 and that is your lowest test score. During the re-test period, you may re-take a version of test 2. Whichever test 2 score is higher will be used to calculate your final grade. There is no make up for missing an optional test.

POLICY CONCERNING CHANGES TO THE SYLLABUS

Any changes in the syllabus will be announced in class and posted as an announcement at the course website in D2L. An updated syllabus will also be posted on the course website.

COURSE WITHDRAWAL POLICY

Students are solely responsible for managing their enrollment status in a class; nonattendance does not constitute a withdrawal.

Students who withdraw from courses before the withdrawal deadline **Oct. 25th**, as specified by the academic calendar will receive a grade of W. A student who officially withdraws from a course will receive a grade of "W" and receive no credit.

Students may drop one, some, or all of their classes during the drop/add period. Courses dropped in this manner do not appear on a student's transcript and are not considered as hours attempted for financial aid purposes. No grade is assigned for such courses. However, a student who wishes to withdraw from a course after the last day of the drop period for a term must withdraw through Owl Express. Students with an active registration hold on their record must clear that hold before being able to withdraw from their coursework.

If a student experiences significant personal hardship (e.g., medical or family emergency, prolonged illness), the Dean of Students can approve a hardship withdrawal from all courses in the term for which the student is currently registered. In the case of an approved hardship withdrawal from all courses, the Registrar will assign grades of "W" for those classes. The deadline for final approval of a hardship withdrawal by Dean of Students is the last day of class for which the hardship withdrawal is sought. If the hardship withdrawal process is not complete by the last day of class for which the hardship withdrawal is sought, a student must appeal for a retroactive hardship withdrawal from the Academic Appeals Committee.

Appeals for retroactive hardship withdrawals must be directed to the Academic Standing Committee. Retroactive hardship withdrawals are rarely granted if it has been more than one year since the last day of class for which the withdrawal is sought. Extraordinary justification must be shown. In the case of approved retroactive hardship withdrawals, the Registrar will assign a grade of "W."

If a student is suspended by the Office of Student Conduct following a violation of the University's Code of Conduct not related to academic dishonesty, the Office of Student Conduct may facilitate a University-initiated withdrawal from courses for which a student is registered for the term. The Registrar will assign grades of "W" for those classes.

A student will receive a refund only when the student withdraws from ALL courses for the applicable semester and only by the schedule outlined in the University refund policy.
Students should be aware that a reduction in their hours might result in the loss of full-time student status and thus affect their financial aid, scholarships, athletic and ticket eligibility, University housing accommodations, use of University resources and access to University facilities, immigration status for international students, and Veterans Educational Benefits. Students should contact the appropriate office and their academic advisor with questions about the impact of their withdrawal from a course before initiating a withdrawal. Veterans and dependents of veterans who receive educational benefits must notify the Veterans Education Benefits Area in the Office of the Registrar of any course load reductions.

Military Withdrawals
A student will receive a "WM" symbol for all courses and a full refund of tuition and mandatory fees and a pro rata refund of other fees for military and other service, as defined by BOR Policy Manual, Section 7.3.5.3. To request a military withdrawal, the student must submit a copy of official orders to the Office of the Registrar.

INCLEMENT WEATHER POLICY
If the University is CLOSED, there will be no class. Otherwise class will meet as scheduled. For the official status of the university check the KSU website: http://www.kennesaw.edu/ and click on "Campus Advisories" under the Quick Links tab of Online Resources.
The University will announce campus closures and delayed schedules in several ways. The cell phone number on file with the university will automatically receive KSU Alerts, so make sure your information in OwlExpress is accurate at all times. An email will also be sent to your university account.

ACCOMMODATION FOR STUDENTS WITH DISABILITIES:
Students with qualifying disabilities under the Americans with Disabilities Act (ADA) and/or Section 504 of the Rehabilitation Act who require "reasonable accommodation(s)" to complete the course may request those from Office of Student Disability Services. Students requiring such accommodations are required to work with the University's Office of Student Disability Services rather than engaging in this discussion with individual faculty members or academic departments. If, after reviewing the course syllabus, a student anticipates or should have anticipated a need for accommodation, he or she must submit documentation requesting an accommodation and permitting time for a determination prior to submitting assignments or taking course quizzes or exams. Students may not request retroactive accommodation for needs that were or should have been foreseeable. Students should contact the office as soon as possible in the term for which they are seeking accommodations. Please visit the Student Disability Services (SDS) website for more information, or call the office at 470-578-2666 (Kennesaw campus) or 470-578-7361 (Marietta campus). Please present documentation from SDS to your instructor.
Students with testing accommodations should notify me and their testing office at least one week in advance of an exam. *Please plan for your exam times to overlap with the regularly scheduled class exam time.*

KSU's ACADEMIC INTEGRITY POLICY
Every KSU student is responsible for upholding the provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. Section II of the Student Code of Conduct addresses the university's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to university materials, misrepresentation/falsification of University records or

academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the Department of Student Conduct and Academic Integrity (SCAI), which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement. See also https://scai.kennesaw.edu/codes.php

The College of Science and Mathematics encourages our students to use technology to help them learn. However, it is important for students to understand the difference between appropriate collaboration and inappropriate uses of technology for plagiarism and cheating. Students who participate in group texts or other group conversations through mobile apps such as GroupMe or WhatsApp are subject to consequences if any member of that group is found to plagiarize material or facilitate cheating. By virtue of membership in the conversation or participation in the group, any student who is part of a group conversation where cheating or plagiarism occurs may receive the same penalty as students who actively cheat within the group. Additionally, any students who are found to purchase, sell, or otherwise distribute or collect existing course material are also subject to academic dishonesty hearings. This includes the use of Quizlet, Hero, and individual or student organization files (e.g. test, quiz, assignment, or other).

Using AI (ChatGPT or other) is NOT allowed unless specific permission is given by the instructor. Use of AI may result in a grade of ZERO for the assignment and a report to SCAI. Be advised that AI tools frequently provide irrelevant or incorrect information. Additionally, the information provided is based on published materials and must be cited to avoid plagiarism. To avoid these issues, you should submit your own work.

Additional KSU policies for all courses can be found at the KSU Syllabus Information website.

TENTATIVE Schedule *(the instructor reserves the right to change the syllabus, schedule and test schedule as necessary throughout the semester; changes will be posted on D2L and/or emailed to your KSU address)*

	Topic	**Klug**
	Overview	Ch 1
	Mendelian Inheritance	Ch 3
	Chromosome Transmission	Ch 2
	Sex determination	Ch 5
	Modifications of Mendelian Inheritance	Ch 4
	Linkage, Recombination, Mapping	Ch 7
	Structure of DNA/RNA	Ch 9
	Structure/Organization of chromosomes	Ch 11
	DNA replication	Ch 10
	DNA technologies	Ch 17
	Gene transcription	Ch 12
	Translation	Ch 13
	Gene Regulation: bacteria	Ch 15
	Gene Regulation: Eukaryotes	Ch 16
	DNA mutation and repair	Ch 14
	Chromosome mutations	Ch 6
	DNA technologies	Ch 17

Tests:		
9/6	**Test 1**	
10/7	**Test 2**	
11/1	**Test 3**	
11/22	**Test 4**	
Mon. Dec. 9; 8am	**OPTIONAL test re-take during final exam period**	

COURSE LEARNING OBJECTIVES

1) *Cell and Organism Reproduction*: Students will be able to
   - describe cellular and chromosomal events that occur during the eukaryotic cell cycle and gamete formation
   - describe chromosome behavior and changes in chromosome structure and number as a cell progresses through a cell cycle, meiosis I and meiosis II
   - explain how meiosis and random fertilization contribute to genetic variation in sexually reproducing organisms
2) *Principles of Heredity:* Students will be able to
   - explain Mendel's principles of inheritance and apply these to problems of inheritance
   - describe the different forms of inheritance patterns (e.g. autosomal, sex linked, dominant, recessive) and identify these in genetic data
   - use probability in predicting and analyzing genetic outcomes.
   - describe various types of genetic crosses and indicate when/why they would be used by a geneticist
   - explain more complex modes of inheritance and use this information in predicting genetic outcomes and analyzing genetic data
3) *Pedigrees:* Students will be able to apply principles of heredity in assessment of pedigrees to identify genotypes of family members, conclude the mode of inheritance for a trait, and predict mating outcomes.
4) *Eukaryotic Gene Mapping:* Students will be able to
   - compare the effect of linkage and independent assortment on genetic outcomes and assess data to determine if genes are linked or on separate chromosomes
   - explain how crossing over produces recombination and use recombination frequencies to construct a genetic map
   - use genetic maps to predict gametic and mating outcomes
5) *Chromosome Variation and Structure:* Students will be able to
   - describe and recognize a variety of abnormalities in chromosome structure and number and explain how these anomalies arise and are detected
   - explain the molecular structure of chromosomes as it relates to storage, gene expression, and sequence function
6) *Nucleic Acid Structure:* Students will be able to
   - describe early studies that led to DNA as the genetic material and/or interpret results from these studies
   - describe the molecular structure of DNA and RNA and indicate similarities and differences
7) *DNA Replication:* Students will be able to
   - describe the historic experiment that demonstrated DNA replication follows a semi-conservative model
   - describe the process of DNA replication in prokaryotes at the biochemical level
   - explain how proofreading and repair is accomplished during DNA synthesis
   - describe how DNA is replicated in viruses, plasmids, and eukaryotes and identify similarities and differences between these and replication in prokaryotes
8) *Gene Expression:* Students will be able to

- describe at the biochemical level the events that occur to go from gene to phenotype
- identify different types of RNA, note their properties, how they are processed to yield a functional form, and their function in gene expression
- recognize the importance of regulating gene expression in prokaryotes and eukaryotes and describe the levels at which gene expression is controlled and the mechanisms used by prokaryotes and eukaryotes

9) *Mutations:* Students will be able to define and identify the various types of mutations that occur at the DNA and protein levels and explain and recognize the relationship between mutations and new alleles.

10) *Molecular Genetic Analysis:* Students will be able to

- explain major methods and techniques used in molecular genetics to isolate, clone, and sequence genes of interest.