

BIOL 4350 DNA: CODE OF LIFE FALL 2018

Dr. Jennifer Cooper
Office hours: M 12:30-1:30
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Include **BIOL 4350** in subject line of all emails.
Check your CSU Stan email **every day**.

COURSE DESCRIPTION

This course will focus on exploration and discussion of genetic concepts that have the most relevance for everyday life: inheritance of simple and complex traits, cancer genetics, the genetic foundation of behavior and mental illness, and how recent developments in molecular genetic techniques have impacted biotechnology and forensic science.

Upper Division G.E. courses are designed to be taken after upper-division status (completion of 60 units) is attained.

Non-Biology majors:

If your catalog year is 2017-18 or earlier, this course satisfies G.E. area F1.

If your catalog year is 2018-19 or later, this course satisfies G.E. area UD-B.

Biology majors:

If your catalog year is 2017-18 or earlier, and if you are in the Honors program, this course satisfies G.E. area F1. If you are not in the Honors program, this course will not meet the upper-division genetics requirement, nor may it be used as an elective for the major.

If your catalog year is 2018-19 or later, this course satisfies G.E. area UD-B, whether or not you are in the Honors program.

This course is based on discussion, not lecture. To do well, one must devote the necessary time and effort to preparing for class discussion every class meeting. **You will be asked to explore and achieve basic mastery of scientific concepts on your own time.** Class discussion will reinforce and enhance your understanding of these concepts. Expect to dedicate a minimum of **10 hours** of preparation and/or review outside of class every week. **If you are not prepared to dedicate the time and effort needed for this course, you should reconsider your enrollment.**

REQUIRED TEXTS/MATERIALS

- Learning materials will consist entirely of no-cost, web-based resources; there is no required textbook.
- **I-clickers are required**, and will be used every class meeting.
- A package of 3" x 5" index cards to use for in-class writing and drawing activities.

CENSUS DATE

Students must attend the first three class sessions or they will be dropped from the course.

This course can be taken for CREDIT/NO CREDIT. Students can change the grading option or drop the course prior to the census date of September 19. After this date, a student cannot **withdraw** from the course, but I will be happy to sign a change of grading option form at any time during the semester.

GRADING

Grades are determined by the points you earn, out of a total of 500. I use whole letter grades (no +/- grades).

I reserve the right to deduct points from those students who consistently fail to participate in class discussions.

In-class quizzes (20 x 8 points each)	160 points
In-class activities and exercises	100 points
I-clicker knowledge-based questions	165 points
I-clicker opinion-based questions	25 points
Final exam essay	50 points

IN-CLASS QUIZZES

To assess whether you have prepared for the class discussion, there will be a total of 20 short in-class quizzes, administered at the beginning of every class. Quizzes will typically consist of 8 multiple choice or T/F questions. Questions will be based on the online learning modules and activities (available on BlackBoard), as well as your understanding of any in-class videos we watched in the preceding class period.

You will need **short (15 question) Scantrons** for these quizzes; I will not accept long Scantrons.

If you prepare for class discussion, you will be more likely to earn points on that day's quiz.

IN-CLASS ACTIVITIES AND EXERCISES

As we progress through class discussions, I will occasionally stop and assess your understanding. You will use a blank index card to answer a question, or explain a concept in your own words, or draw a figure representing a process. You will turn these cards in to me, and I will award points based on the quality of the work. In half of these exercises, you will be allowed to consult with your group members.

i-CLICKER QUESTIONS

To earn daily in-class i-clicker points, you must vote on every question.

Knowledge-based questions

Every class period, you will be asked a set of questions that asks you to demonstrate your grasp of essential **information** or **ideas** that we are **currently discussing**. If you pay attention, ask questions, and engage in discussion, you will probably be able to understand and answer correctly. Please shield your i-clicker hand unit from the eyes of your classmates when you vote. For some questions, I will allow group members to discuss before answering.

Opinion-based questions

Every class period, you will be asked a set of questions that asks you to demonstrate your willingness to share your opinion. Often you will be shown a question and asked to **discuss it with your learning group members** before you vote. There are no correct or incorrect answers; instead, you get points for participating. I will walk around the room and listen to discussions, and qualitatively assess student participation.

FINAL EXAM ESSAY

During the final exam period you will write a 1-page essay. You will answer one of three question prompts, using the answer sheet I provide you. Your essay will be crafted from material you pull from your memory, as you will not be allowed any notes or other memory aids. You will be given 45 minutes to write your essay response. The essay is scheduled for the first 45 minutes of the final exam period. I have posted on Blackboard a fairly long list of possible question prompts that you might see, to guide you as you prepare for this essay.

PERSONAL INTEGRITY AND CLASSROOM BEHAVIOR

Cheating and plagiarism will be dealt with as severely as university and state regulations allow. This includes receiving an F in the course, and being reported to University Judicial Affairs.

You are expected to have finished the web-based activities before class begins, therefore I expect you to put your electronic devices away at the beginning of class. Turn your cell phones to vibrate. **Do not text in class.** It is rude.

COURSE OBJECTIVES

- Provide an overview of the issues, principles, methodologies, and perspectives of genetics;
- provide a working background to critically evaluate relevant issues within the field of genetics and develop continuous inquiry and life-long learning;
- explore the relationships between the fields of genetics, biology, chemistry, ecology, ethics and the other sciences with an emphasis on how these fields are closely inter-related;
- develop more informed and responsible citizens with respect to issues concerning genetic technology, genetic services and genetic health.

Day	Topic for Discussion	Preparation
8/23	Introduction	Discussion group formation. Background knowledge probe
8/28	Cell division and Chromosomes	BB module: Inside a Cell BB module: Tour of basic genetics (4 modules)
8/30	Cell division and Chromosomes	BB module: Genetic Disorders (4 modules) BB module: Karyotypes (2 modules)
9/4	What is a gene? and Heredity	BB module: How inheritance works (4 modules) BB module: More about DNA & genes (6 modules) BB module: Observable Human Characteristics BB doc folder: 23 & me: Observable Human Characteristics
9/6	What is a gene? and Heredity	BB module: Genes and blood type BB article: Double Immunity BB module: Sex linkage BB doc folder: Color blind test BB video: X linked recessive
9/11	Structure of DNA and Gene mutations	BB module: What is mutation? BB module: The outcome of mutation BB module: Mutation and haplotypes
9/13	Gene Expression	BB module: Epigenetics and Inheritance BB module: The Epigenome learns from its experiences BB video: The epigenome at a glance In-class video: Epigenetics
9/18	Gene Expression	BB virtual lab: Gene control BB video: DNA Packaging BB module: Nutrition and the epigenome BB video: Epigenetics and the human brain
9/20	Cutting and Joining DNA Organismal cloning	BB module: What is cloning? BB module: Why clone? BB video: The science behind dog cloning
9/25	Making Transgenic Organisms	BB video: Transgenic animal creations BB module: Transgenic mice BB module: Pharming for Pharmaceuticals BB module: Genetically modified foods
9/27	Application of Human Genetics	BB module: DNA applications 1 BB virtual lab: DNA extraction
10/2	Application of Human Genetics	BB virtual lab: PCR BB virtual lab: Gel electrophoresis
10/4	Application of Human Genetics	BB module: Can DNA demand a verdict? BB video: The Innocence Project
10/9	Application of Human Genetics	BB module: What is gene therapy? BB module: Approaches to gene therapy BB module: Gene delivery, tools of the trade
10/11	Microarrays and Editing genomes	BB video: What is CRISPR? BB video: How CRISPR works BB virtual lab: DNA microarrays BB module: Measuring gene expression
10/16	Cancer Genes	BB module: Cancer BB module: The eukaryotic cell cycle and cancer BB module: Are telomeres the key to aging and cancer? BB module: Precision cancer care

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10/18	Obesity Genes	BB article: Obesity gene? Gene discovered that could be an important cause of obesity BB article: Good news for feast lovers? Obesity – promoting genes discovered BB module: Evolution and Obesity
10/23	Behavior Genetics	BB module: Neurons transmit messages in the brain BB module: Crossing the divide BB module: The other brain cells BB article: Major personality study finds that traits are mostly inherited BB article: Why it is useful to understand the role of genetics in behaviour
10/25	Behavior Genetics	BB article: Twin Study on Male Homosexuality BB video: Nature or nurture – are people born gay? BB video: Homosexuality has genetic or biological basis
10/30	Behavior Genetics	BB video: Should you blame genes for your grades? BB article: Hundreds of new genes may underlie intelligence
11/1	Behavior Genetics	BB article: Two genes linked with violent crime BB video: NOVA, Criminal minds, born or made?
11/6	Behavior Genetics	BB article: Five major mental disorders share genetic roots BB video: What's the genetic link between mental disorders? BB video: What triggers schizophrenia? New genetic mutations shed light on disorder
11/8	Behavior Genetics	BB module: The science of addiction (5 modules) BB article: The amount of sex you have may determine how vulnerable you are to drug addiction
11/13	Genomics	BB article: An overview of the human genome project BB image: Human Genome Project timeline BB video: Gene Patents: 5 Things You Should Know BB article: Can genes be patented?
11/15	Stem Cell Research	BB module: The nature of stem cells BB module: Reversing cell differentiation BB video: NOVA Science NOW: Stem Cells Breakthrough BB video: Unlocking stem cell potential
11/20	Stem Cell Research	BB module: Stem cell quick reference BB module: Stem cells in use BB module: The stem cell debate: is it over?
11/22	Thanksgiving Holiday NO CLASS	
11/27	Personalized Medicine	BB module: DNA applications 3 (Genes and Medicine)
11/29	Personalized Medicine	BB module: What is precision medicine? BB video: Mayo clinic: Pharmacogenomics: right drug, right dose, right time BB module: Your doctor's new genetic tools
12/4	Neanderthal Genes in Human Genome?	BB doc folder: 23&me: Neanderthal Ancestry Images BB article: Neanderthal DNA has subtle but significant impact on human traits BB article: Neanderthal gene cluster more common in Europeans BB module: DNA applications 2
12/6	Population-specific Genetic Markers in Humans: "Where are you from?"	BB doc folder: 23&me Ancestry Composition Images BB video: Momondo: The DNA Journey BB article: Genetic mapping fact sheet
12/18	FINAL ESSAY (first 45 min of period) 11:15 a.m.-12:00 p.m.	