

BIOL 2310: Human Genetics, Fall 2015

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COURSE DESCRIPTION

In this course we explore the three branches of genetics: inheritance genetics and chromosomal mutations, molecular genetics (DNA structure, gene expression), and molecular biotechnology (molecular markers, gene cloning, DNA fingerprinting). Emphasis will be placed on DNA technology as it relates to current genetic issues.

Biology majors: This course will not meet the upper-division genetics requirement, nor may it be used as an elective for the major. Satisfies G.E. area B2.

Criminal Justice majors: This course is required for students with a Forensic Science Concentration.

REQUIRED TEXTS/MATERIALS

Understanding DNA and Gene Cloning: A Guide for the Curious, by Karl Drlica, ISBN: 0471-43416-7

Visit the Blackboard course site often for quizzes and material. There will be no quiz announcements.

I will not be making PowerPoint lectures available for student download, so take notes during lecture.

CENSUS DATE

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

This course can be taken for a letter grade, or it can be taken on a credit/no credit basis. Students can only drop this course prior to the census date of September 21. Before the census date they can change their grading option without my permission, but after the census date it requires my signature on the "Registration Options" form to do so. I am willing to sign this form up to the last class meeting (December 11).

GRADING PROCEDURE

Blackboard quizzes	200
In-class forensic exercise	50
Group poster assignment	
Participation	100
Presentation	100
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Total	450 points

No +/- grading will be applied to your final grade.

BLACKBOARD QUIZZES

There will be a weekly quiz over each assigned chapter, for a total of 10 quizzes. Quizzes will be timed (~20-45 minutes), and will typically consist of several multiple choice or true/false questions. Questions can come from lecture, BB items, and in-class videos.

IN-CLASS FORENSIC EXERCISE

As we progress through the course, we will address several topics in genetics that have applications for forensic analysis. In this in-class exercise, you will be expected to respond to a specific scenario that describes a crime perpetrated by a person who has left DNA evidence at the crime scene (you will be allowed to choose from a set of possible scenarios). In your response, you will describe the best methodology and procedure to use to solve this crime, based on the molecular tools available to you in the scenario.

POSTER PRESENTATION (GROUP ASSIGNMENT)

Each student in the class will select a topic relating directly to human behavioral genetics, from a list of available topics provided by the instructor. Topics will be posted on Blackboard under the “Groups” tab. All students in a group will work together to search for material on this topic, and create a **single** poster to present as a group at the end of semester Poster Session. All of the posters will be pinned to the classroom walls, and some group members will stand by the poster and answer questions, while other group members walk around and evaluate the posters of other groups. Midway through the session, circulating group members will trade places, and stand by their poster for the remainder of the session while their partners take their turn to evaluate other group’s posters.

Participation points (100) can only be earned by documenting your contributions on Blackboard.

Each group member’s contribution to the poster will be documented using the following structure:

1. Every topic is complex and multi-layered. The group’s Discussion Board will be used to discuss what each group member will focus on. Every group member chooses a different aspect of the topic to research.
2. Each group member creates a new wiki page for their research focus, with a title like “Becky Ross, Schizophrenia Poster, Environmental influences”.
3. Group members will post their section summary **on their wiki**, and other group members will use the “Comments” tab to make suggestions and revisions.
4. More lengthy discussions **about poster formatting** can be documented on the group’s Discussion Board.
5. To earn full points, a group member must:
 - post their own work on their own wiki
 - make constructive comments regarding **every other** group member’s work on member wikis
 - discuss the formatting, organization, and printing of the poster on the Discussion Board

Any contributions which are not documented in this way (emailing, texting, Google Docs, etc.) won’t be considered for credit.

It is easy to use Microsoft PowerPoint to prepare a poster presentation, simply by adding components (text boxes, images) to a single slide. You must format the slide as a custom size and indicate how large a print you want your final poster to be. **Your poster for class must be printed on a large format printer at a professional printing service (Kinko’s, Staples, etc), and must be a minimum of 42 x 48 inches in size.** Although I provide some rough guidelines for pricing below, talk to your print shop ahead of time to find out at what size they print posters, cost, and how long it takes.

Color printing is not required, but your poster will be assessed by other students and color posters tend to achieve higher assessments.

- The main goal of a poster is to relate the main points of your topic with as little effort as possible on the part of the audience to read, interpret, and understand. Clearly explain the ideas with very short, concise sentences. **Use bullet points instead of paragraphs when you can.**
- Use a large enough font size (to test this, print your poster on a single letter size sheet and hold at arm’s length...can you read it?)
- Sections should have appropriate labels.
- Include a Title, and the list of student authors.
- Graphics are required (figures, special equations, photos). Do not include figures unless they are needed to convey or explain data...don’t include pictures just because they add “pizzazz”. Make sure your figures aren’t fuzzy and pixelated when they are magnified to poster-size.
- Include a short list of the sources you used (the Ebstein *et al* paper, OMIM, NCBI, Center for Evolutionary Psychology, new media) on a separate sheet of paper, to post up next to your poster.
- **Do NOT plagiarize sources. Re-write everything in your own words. Plagiarism is very easy to detect using Google and specialized software, and if I detect plagiarism in your work I will regretfully give you an F in the course.**

LECTURE OUTLINE

Reading assignments listed on the outline are for *Understanding DNA and Gene Cloning: A Guide for the Curious* by Drlica.
Extra content: Links to “BB” items can be found on the BIOL 2310 Blackboard site.

Day	Lectures	Reading	Extra Content
Week 1 Aug 24-28	Introduction		BB module: Tour of basic genetics (all modules) BB module: Can DNA demand a verdict?
Week 2 Aug 31-Sept 4	Cell division and Chromosomes	p 10-12	BB module: Chromosomal abnormalities BB module: Karyotypes (all modules)
Week 3 Sept 7-11	Heredity	Ch 14	BB module: How inheritance works (all modules) BB module: Inherited DNA and chromosomes (all modules)
Week 4 Sept 14-18	Heredity cont.		BB module: Visible inherited traits (all modules) BB module: Genes and blood type BB module: Sex linkage
Week 5 Sept 21-25	Structure of DNA Reproducing DNA	Ch 2 Ch 3	Monday: Census Date BB module: What is mutation? BB module: The outcome of mutation BB module: Mutation and haplotypes
Week 6 Sep 28-Oct 2	Gene Expression	Ch 4	In-class video: Epigenetics Thursday: Deadline to join poster group
Week 7 Oct 5-9	Expression cont.		BB module: The epigenome at a glance BB virtual lab: Gene control BB module: Nutrition and the epigenome BB video: Epigenetics and the human brain
Week 8 Oct 12-16	Microbial Growth Plasmids and Phages	Ch 5 Ch 6	Tuesday: Reading Day (no class) BB module: Transgenic mice
Week 9 Oct 19-23	Cutting and Joining DNA Using Complementary Base Pairing	Ch 7 Ch 8	BB module: What is cloning? BB module: Why clone?
Week 10 Oct 26-30	Application of Human Genetics	Ch 15	BB module: DNA applications BB virtual lab: DNA extraction
Week 11 Nov 2-6	Applications cont.		BB virtual lab: PCR BB virtual lab: Gel electrophoresis
Week 12 Nov 9-13	Applications cont.		BB module: What is gene therapy? BB module: Gene delivery, tools of the trade Thursday: In-class poster draft review
Week 13 Nov 16-20	Cancer Genes	Ch 13	BB virtual lab: DNA microarrays BB module: Measuring gene expression
Week 14 Nov 23-27	Addiction Genes		BB module: The science of addiction: genetics and the brain (all modules) Thursday-Friday: Thanksgiving Holiday
Week 15 Nov 30-Dec 4	Stem cell research Genomics	Ch 16	BB module: The nature of stem cells BB module: Reversing cell differentiation BB module: Stem cells in use Tuesday: In-class forensic exercise
Week 16 Dec 7-11	Personalized medicine		BB module: Your doctor's new genetic tools BB module: Family health history (all risk modules)
Week 17 Dec 14-18	Poster Session Tuesday, December 15 8:30 -10:30 am in regular classroom		

STUDENT LEARNING OBJECTIVES:

Students who successfully complete this course will:

- Describe the topics studied in genetics, and examine fundamental genetic principles and the progression of structural levels of genetic organization and evolution.
- Investigate the chemical basis of life with emphasis on structure and function of nucleic acids.
- Understand the cell cycle and how it relates to mitosis and meiosis.
- Understand Mendelian transmission genetics and the various levels of mutation (chromosomal, nucleic acid).
- Describe the process of DNA replication, transcription and translation and understand gene expression in eukaryotes, especially in oncogenesis.
- Explore the many fields of and methodologies of biotechnology, including DNA fingerprinting, genomics, and genetic engineering.