

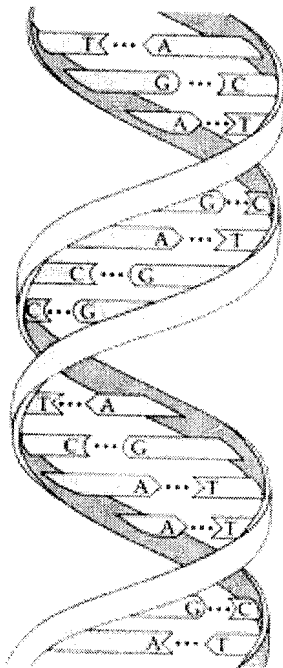
NATURAL SCIENCE II: HUMAN GENETICS

V55.0303
Fall 2007

Mondays and Wednesdays
11 am – 12.15 pm
Room Silver 207

Professor Justin Blau

Department of Biology
10th floor Brown Building
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Office Hours: by e-mail appointment



1. Course Description

We are witnessing a revolution in human genetics, where the ability to scrutinize and manipulate DNA has allowed scientists to gain unprecedented insights into the role of heredity. This course explores the foundations and frontiers of modern human genetics, with an emphasis on understanding the latest discoveries in this rapidly changing field of research. The course begins with an overview of cell structure and cellular processes. We then examine the principles of heredity, where simple Mendelian inheritance is contrasted with the effect of multiple genes and the environment that influence complex physical or behavioral traits. Descending to the molecular level, we investigate how genetic information is encoded in DNA, and how this information is unfolded during the process of development. We also examine how mutations affect gene functions, and cause birth defects, diseases, and cancers. Finally, we will cover new techniques that permit profound manipulations of the genetic material. These molecular foundations are used to explore the science and social impact of modern genetic technology, including topics such as cloning, genetic testing, and the new map of the human genome. The laboratory projects throughout the semester are designed to introduce students to techniques currently used by scientists, ranging from diagnosing inherited traits using family pedigrees to hands-on explorations of modern methods of genetic testing.

2. Course Objectives

- To acquire a foundation of knowledge of the biological mechanisms of inheritance.
- To understand the technological advances that will shape the future of our world.
- To develop skills in problem solving and interpreting scientific information.
- To engage in various methods of scientific investigation in the laboratory.
- To evaluate popular media reports on the latest developments in genetics research.
- To address the complex ethical, social and legal consequences of genetic information.

3. Course Texts and Readings

Required Texts:

- Michael Cummings, *Human Heredity Principles & Issues, 7th Edition* (Thomson, Brooks/Cole 2006).
- *Human Genetics Laboratory Manual* (NYU – Autumn 2006)
- Some articles will be assigned via the Blackboard site to complement the material presented in the Cummings textbook.

4. Lecture, Reading, and Laboratory Schedule

Readings from Cummings, *Human Heredity* "C" followed by the chapter or page numbers.

<u>Date</u>	<u>Lecture/Laboratory</u>	<u>Reading</u>
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#1	W Sept. 5	Why study Human Genetics? Introduction and Course Overview
<u>Sept. 6,7</u>		No labs this week

Module 1: Cells, Chromosomes, and Genes

#2	M Sept. 10	Cell Biology	C 18-24
#3	W Sept. 12	DNA structure and replication?	C 181-189, 192-193
<u>Sept. 13, 14</u>		No labs this week	PDF -Rosalind Franklin

#4	M Sept. 17	Chromosomes, Mitosis and the Cell cycle	C 24-29, 33, 190-2
#5	W Sept. 19	What is a gene?	C 199-210
<u>Sept. 20, 21</u>		Lab 1: Microscopy of cells	**** Homework 1 due here
**** Form final presentation groups			

#6	M Sept. 24	The Genetic Code and Mutations I	C 244-261
#7	W Sept. 26	The Genetic Code and Mutations II	C 244-261
<u>Sept. 27, 28</u>		Lab 2: Isolation of DNA	**** Homework 2 due here

Module 2: Mendel and Meiosis

#8	M Oct. 1	Mendel's Laws	C 43-52, 70-76
#9	W Oct. 3	Meiosis	C 30-36
<u>Oct. 4, 5</u>		Lab 3: Mitosis	

	M Oct. 8	No Class (Columbus Day)	
#10	W Oct. 10	Sex-linked Traits	C 78-85
<u>Oct. 11, 12</u>		Lab Session: Review for Exam I	

M Oct. 15 Midterm Exam I (up to lecture 10)

#11	W Oct. 17	"Exceptions" to Mendel	C 54
<u>Oct. 18, 19</u>		Lab 4: Fly lab	**** Homework 3 due here

#12	M Oct. 22	Multifactorial Traits	C 94-115
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Module 3: Human Variation

#13 W Oct. 24 Population genetics C 434-452
What is normal?

Oct. 25, 26 Lab 5: Human Genetic Traits

#14 M Oct. 29 Sex Determination C 164-174

#15 W Oct. 31 DNA Sequencing, Genomics C 342-358

Nov. 1, 2 Lab 6: Sickle Cell Anemia **** Group presentation proposals due

#16 M Nov. 5 DNA as an Identifier I C 324-335

#17 W Nov. 7 DNA as an Identifier II PDF: tbd

Nov. 8, 9 Lab Session: Review for Exam II **** Homework 4 due here

M Nov. 12 Midterm Exam II (up to Lecture 17)

Module 4: Genetics of Behavior

#18 W Nov. 14 Genes & Behavior I tbd

Nov. 15, 16 Lab 7: DNA Fingerprinting

#19 M Nov. 19 Genes & Behavior II tbd

W Nov. 21 No Class –Thanksgiving

Nov. 22, 23 No Labs -Thanksgiving

#20 M Nov. 26 Genes & Behavior III tbd

Module 5: Genetic Engineering

#21 W Nov. 28 Gene Therapy C 367-375

Nov 29, 30 Lab Session: Student Presentations I **** Homework 5 due here

#22 M Dec. 3 Stem Cells I tbd

#23 W Dec. 5 Stem Cells II tbd

Dec. 6, 7 Lab Session Student Presentations II **** Homework 6 due here

#24 M Dec. 10 Cloning by Nuclear Transfer C 292-4

#25 W Dec. 12 Biotechnology & the future C 314-22

Dec. 13, 14 Lab session: Review for Final Exam

M Dec. 17 Final Examination 10:00 AM – 11:50 AM in 207 Silver

5. Grades

Midterm Exam 1	15 %	Monday, October 15	11:00 AM – 12:15 AM
Midterm Exam 2	15 %	Monday, November 12	11:00 AM – 12:15 AM
Final Exam	25 %	Monday, December 17	10:00 AM – 11:50 AM
Laboratory	25 %		
Homework	10 %		
Group Presentation	10 %		

6. Coursework and Policies

Exams

- The exams will contain questions covering the **lectures, readings, and laboratory projects**. Study questions for the lecture topics will be distributed at least one week before each exam. The final exam will be **cumulative**, but will be more heavily focused on material covered after the second midterm. Homeworks provide practice with some types of questions that will appear on the exams.
- If you miss **one midterm exam** because of illness, you must contact Professor Blau by e-mail **before** the start of the exam and provide a doctor's note explaining your absence. **No make-up exams will be given for the course**. Instead, the final exam will count as **40% of your course total**. Since the final is cumulative and the most difficult exam of the course, this option is not advisable unless extreme circumstances prevail. If you miss **two midterm exams** you will be required to withdraw from the course.
- A make-up will be given for the final exam only under **exceptional circumstances** that must be discussed with Professor Blau **prior to the exam**. In this case a grade of **incomplete** will be given for the course and the make-up will be scheduled for the Spring 2007 semester. No alternative date for the final exam will be offered, so avoid making travel plans to leave NYU before 12/20/06.

Homework

- Six homework assignments will be given during the course of the semester. Homeworks will be posted on Blackboard, and will be due in specific laboratory sessions according to the syllabus. They will contain questions that review the course material and/or questions that relate to the laboratory. Each assignment will contain several questions, of which **one will be graded**. Assignments are worth 5 points, with up to 3 points for the graded question and 2 points for completing all the questions. Homework must be submitted on time for full credit. Any late assignments will be penalized 1 point per day (excluding weekends).

Group Presentation

As part of the course requirements, you will be assigned as part of a presentation project team of three students. This team will work collaboratively on selecting and evaluating a topic on modern genetics that appeals to your interests. The topic declaration for the project is due in the lab session on November 1 or 2. The team will then prepare an oral presentation that will be delivered in the laboratory sessions on November 29 or 30, or December 6 or 7. Further details about this Project will be provided early in the semester.

6. Laboratory Sessions

The laboratory sessions will be held in Silver 202. There will be no laboratory session during the first week of classes and the sessions will begin on September 13. The laboratories will be taught by three instructors:

Jessica Bader
jb2945@nyu.edu

Sharon Carmel
syc6@nyu.edu

Joyce Lee
jsl413@nyu.edu

Laboratory Schedule:

Section:	Time:	Teaching Assistant:
002	Thursdays @ 9:00 AM	Joyce Lee
003	Thursdays @ 11:00 AM	Joyce Lee
004	Thursdays @ 1:00 PM	Jessica Bader
005	Thursdays @ 3:00 PM	Jessica Bader
006	Thursdays @ 5:00 PM	Sharon Carmel
007	Fridays @ 9:00 AM	Sharon Carmel

Laboratory Policies

- Each weekly lab session is worth **50 points**:

Attendance	10 points
Quiz	10 points
Lab Assignment	30 points
- You must be **registered in a laboratory section** in order to receive credit for the course. The sections have a capacity of **20 students**, which is determined by the availability and logistics of laboratory equipment. If you are not appropriately registered for a laboratory section by lab #2 you will be required to drop the course.
- You are expected to arrive punctually for the beginning of the lab session. Arriving more than **10 minutes late** will result in a loss of attendance credit for the session.
- Questions for the **laboratory quiz** will be based on the description of the experiment in the laboratory manual and may also include pertinent material from the lectures and readings. Arriving more than 10 minutes late for the lab will exclude you from taking the quiz.
- The **laboratory assignment** must be completed and submitted during the laboratory period by working collaboratively with your laboratory partners. Some laboratories may have a take-home component in addition to the in-lab exercises.
- If you cannot attend a lab session because of illness, notify your lab instructor **before** the start of the laboratory session and provide doctor's note within one week. If you will miss a lab session due to special circumstances, including observation of a religious holiday, notify your lab instructor **in advance**. Because of the logistics of using the laboratory room, it is not possible to attend another laboratory section other than your own or to perform make-up experiments.
- Missing **more than three** laboratory sessions for any reason will result in receiving a score

of **zero** for the **entire** laboratory portion of the course.