

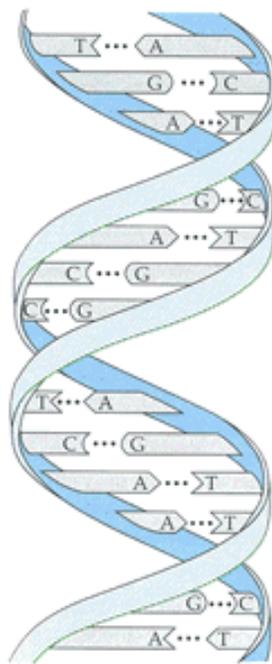
NATURAL SCIENCE II: HUMAN GENETICS

V55.0303
Fall 2005

Mondays and Wednesdays
2:00 p.m. – 3:15 p.m.
Silver 207

Professor Trace Jordan

Morse Academic Plan
Silver Center, Room 903B
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Office Hours: Tuesdays and Wednesdays, 4:00 – 5:00 pm



1. Course Description

We are currently 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 the principles of inheritance, beginning with the cell and extending to analyzing the mode of inheritance in family pedigrees. In this context, 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 mutations affect gene function. 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 course concludes with an investigation of how genes vary in populations and how geneticists are contributing to our understanding of human evolution and diversity. 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 foundational knowledge of the biological mechanisms of inheritance.
- To develop skills in problem solving and interpreting scientific information.
- To understand and experience the methods of scientific investigation.
- To critically 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

Ricki Lewis, *Human Genetics: Concepts and Applications*, 6th Edition (McGraw Hill, 2005).

Human Genetics Laboratory Manual.

Articles about recent discoveries in genetics from *The New York Times*, *Scientific American*, or other sources will be assigned throughout the semester as part of the required readings.

4. Grade Allocation

Midterm Exam 1	15 %	Monday, October 17, 2:00 – 3:15 p.m.
Midterm Exam 2	15 %	Monday, November 21, 2:00 – 3:15 pm
Final Exam (cumulative)	25 %	Monday, December 19, 2:00 – 3:50 p.m.
Laboratory	25 %	
Homework	10 %	
Presentation	10 %	

In-class assignments will be given regularly in lectures and some of these will be collected and reviewed. There will be no formal grade component for these assignments, but they will be used in deciding cases of borderline grades at the end of the semester.

5. Lecture, Reading, and Laboratory Schedule

Readings from Ricki Lewis, *Human Genetics* (6th Edition) are listed by chapter number and page numbers. Other readings will be distributed in class or posted on the course Blackboard site. It is most beneficial for you to complete the reading before the lecture.

	<i>Date</i>	<i>Lecture Topic</i>	<i>Reading</i>	<i>Laboratory Project</i>
1	W Sept 7 <i>Sept 8/9</i>	Course Overview	Ch. 1, pp. 1 – 17	<i>No laboratory</i>
CELLS AND CHROMOSOMES				
2	M Sept 12	Structure and Function of Cells	Ch. 2, pp. 21 – 33	
3	W Sept 14 <i>Sept 15/16</i>	Cell Division and Origins of Cancer	Ch. 2, pp. 33 – 38 + Ch. 18, pp. 353 – 359	<i>Lab 1: Microscopy of Cells</i>
4	M Sept 19	Meiosis and Development	Ch. 3, pp. 47 – 69	
5	W Sept 21 <i>Sept 22/23</i>	Cytogenetics	Ch. 13, pp. 239 – 260	<i>Lab 2: Mitosis</i>

PRINCIPLES OF INHERITANCE				
6	M Sept 26	Mendelian Inheritance	Ch. 4, pp. 73 – 89	
7	W Sept 28 <i>Sept 29/30</i>	Sex-Linked Traits	Ch. 6, pp. 111– 129	<i>Lab 3: FlyLab</i>
8	M Oct 3	Exceptions to Mendels' Laws	Ch. 5, pp. 93 – 107	
9	W Oct 5 <i>Oct 6/7</i>	Multifactorial Traits	Ch. 7, pp. 133 – 149	<i>Lab 4: Human Genetic Traits</i>
	M Oct 10	<i>No class – Columbus Day</i>		
10	W Oct 12 <i>Oct 13/14</i>	Genetics of Behavior	Ch. 8, pp. 153 – 164	<i>Review for Midterm 1</i>
	M Oct 17	Midterm Exam 1		

DNA & GENETIC INFORMATION				
11	W Oct 19 <i>Oct 20/21</i>	DNA Structure & Replication	Ch. 9, pp. 167 – 181	<i>Lab 5: Isolation of DNA</i>
12	M Oct 24	Gene Expression	Ch. 10, pp. 185 – 200	
13	W Oct 26	Sickle Cell Anemia	Ch. 12, pp. 215 – 217	<i>Lab 6: Sickle Cell Anemia</i>
14	M Oct 31	Gene Mutation	Ch. 12, pp. 217 – 236	

GENETIC TECHNOLOGY				
15	W Nov 2 <i>lab</i>	Recombinant DNA Technology	Ch. 19, pp. 373 – 385	<i>Lab 7: Student Presentations 1</i>
16	M Nov 7	The Age of Genomics	Ch. 22, pp. 425 – 436	
17	W Nov 9 <i>Nov 10/11</i>	Stem Cells	Ch. 2, pp. 39 – 43	<i>Lab 8: Student Presentations</i>
18	M Nov 14	Science and Ethics of Cloning	Ch. 3, pp. 58 – 59	
19	W Nov 16	Reproductive Technologies	Ch. 21, pp. 409 – 420	<i>Review for Midterm 2</i>
	M Nov 21	Midterm Exam 2		
	W Nov 23 <i>Nov 24/25</i>	<i>No class -- Thanksgiving</i>		<i>No Lab - Thanksgiving</i>

GENES AND POPULATIONS				
	<i>Date</i>	<i>Lecture Topic</i>	<i>Reading</i>	<i>Laboratory Project</i>
20	M Nov 28	Principles of Population Genetics	Ch. 14, pp. 267 – 272	
21	W Nov 30	Forensic DNA Fingerprinting	Ch. 14, pp. 272 – 278	
	<i>Dec 1/2</i>			<i>Lab 9: DNA Fingerprinting</i>
22	M Dec 5	Genes & Evolution	Ch. 15, pp. 281– 299	
23	W Dec 7	Genes & Human Origins	Ch. 16, pp.303 – 324	
	<i>Dec 8/9</i>			<i>Review for Final Exam</i>
24	M Dec 12	Human Genetic Diversity	TBA	
25	W Dec 14	Conclusion: Our Genetic Future		

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 regularly during the semester. The final exam will be **cumulative** and will cover topics from throughout the course. Homework assignments provide practice with some types of questions that will appear on the exams.

If you will miss **one midterm exam** because of illness, you must contact Professor Jordan 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 Jordan **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 2006 semester. No alternative date for the final exam will be offered at the end of the spring semester so avoid making travel plans to leave NYU before the date of the final exam.

Homework

The homework assignment will contain questions that review the course material and/or questions that relate to the laboratory. Certain questions on the homework assignments may require you to access information on relevant web sites. Each homework 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.

All homework must be submitted on time for full credit. Any late assignments will be penalized 1 point per day (excluding weekends). If you miss a lecture or laboratory session due to a documented absence you are still required to complete the homework assignment. Contact your laboratory instructor to arrange a suitable deadline for submitting the work.

Presentations

A portion of the course grade is allocated to a presentation on a topic related to the course material. The presentation will take place in the laboratory sessions and further guidelines will be distributed during the semester.

7. Laboratory Sessions

The laboratory sessions will be held in Silver 201. There will be no laboratory session during the first week of classes and the sessions will begin on **Thursday, September 15** or **Friday, September 16**. The laboratories will be taught by three graduate student instructors.

Crystal Whitted
clw296@nyu.edu

Sheila Borges
sheila.borges@nyu.edu

Lab Section	Day and Time	Lab Instructor
Section 2	Thursday, 11:00 a.m. – 12:40 p.m.	Crystal Whitted
Section 3	Thursday, 1:00 p.m. – 2:40 p.m.	Crystal Whitted
Section 4	Thursday, 3:00 p.m.– 4:40 p.m.	TBA
Section 5	Thursday, 5:00 p.m.– 6:40 p.m.	TBA
Section 6	Friday, 9:00 a.m. – 10:40 a.m.	Sheila Borges
Section 7	Friday, 11:00 a.m. – 12:40 a.m.	Sheila Borges

8. Laboratory Policies

- Each weekly experiment 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 project #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.
- You will be at a disadvantage in the course if you miss any of the lab sessions. 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.