NATURAL SCIENCE II:  
HUMAN GENETICS

V55.0303 – Section 010  
Fall 2006

Tuesdays and Thursdays  
2:00 p.m. – 3:15 p.m.  
Silver 207

Professor Trace Jordan

Morse Academic Plan  
Silver Center, Room 903B  
Phone: 998-8078  
E-mail: trace.jordan@nyu.edu  
Office Hours: Mondays and Tuesdays, 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, starting with the cell and extending to 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. The course continues with an investigation of how genes vary in populations and how geneticists are contributing to our understanding of human evolution and diversity. We conclude by examining of the relationship between genes and development, which provides the foundation for topics such as cloning, stem cells, and assisted reproduction. 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 modern genetic science.

**3. Course Texts and Readings**

There are three required texts for the course:


*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. Lecture, Reading, and Laboratory Schedule

Readings from Ricki Lewis, *Human Genetics*, are listed by chapter number and pages; readings from Gilbert et al., *Bioethics*, are listed by chapter number. 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.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic &amp; Reading</th>
<th>Laboratory Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 T Sept 5</td>
<td><strong>Introduction – Genetics and Society</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 1, pp. 1 – 17</em></td>
<td></td>
</tr>
<tr>
<td>Sept 5/6</td>
<td></td>
<td><strong>No laboratory</strong></td>
</tr>
<tr>
<td>2 Th Sept 7</td>
<td><strong>Structure and Function of Cells</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 2, pp. 21 – 33</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Lab 1: Microscopy of Cells</strong></td>
</tr>
<tr>
<td>3 Th Sept 14</td>
<td><strong>Introduction to DNA</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 9, pp. 171 – 182</em></td>
<td></td>
</tr>
<tr>
<td>4 T Sept 19</td>
<td><strong>Cell Cycle and Mitosis</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 2, pp. 33 – 38</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 18, pp. 355 – 361</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Lab 5: Isolation of DNA</strong></td>
</tr>
<tr>
<td>5 Th Sept 21</td>
<td><strong>Meiosis and Cytogenetics</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 3, pp. 47 – 56</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 13, pp. 241 – 257</em></td>
<td></td>
</tr>
<tr>
<td>6 T Sept 26</td>
<td><strong>Mendelian Inheritance</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 4, pp. 75 – 91</em></td>
<td></td>
</tr>
<tr>
<td>Sept 26/27</td>
<td></td>
<td><strong>Lab 2: Mitosis</strong></td>
</tr>
<tr>
<td>7 Th Sept 28</td>
<td><strong>Sex-Linked Traits 1</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 6, pp. 113 – 126</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Gilbert Ch. 5</em></td>
<td></td>
</tr>
<tr>
<td>8 T Oct 3</td>
<td><strong>Sex-Linked Traits 2</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 6, pp. 126 – 132</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Gilbert Ch. 6</em></td>
<td></td>
</tr>
<tr>
<td>Oct 3/4</td>
<td></td>
<td><strong>Lab 3: FlyLab</strong></td>
</tr>
<tr>
<td>9 Th Oct 5</td>
<td><strong>Multifactorial Traits</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 7, pp. 135 – 151</em></td>
<td></td>
</tr>
<tr>
<td>10 T Oct 10</td>
<td><strong>Genetics of Behavior</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 8, pp. 155 – 167</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Gilbert, Ch. 14</em></td>
<td></td>
</tr>
<tr>
<td>Oct 10/11</td>
<td></td>
<td><strong>Review for Midterm 1</strong></td>
</tr>
<tr>
<td>Th Oct 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 T Oct 17</td>
<td><strong>Gene Expression 1</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 10, pp. 185 – 194</em></td>
<td></td>
</tr>
<tr>
<td>Oct 17/18</td>
<td></td>
<td><strong>Presentation proposals</strong></td>
</tr>
<tr>
<td>12 Th Oct 19</td>
<td><strong>Gene Expression 2</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 10, pp. 195 – 201</em></td>
<td></td>
</tr>
<tr>
<td>13 T Oct 24</td>
<td><strong>Gene Mutation &amp; Variation</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 12, pp. 217 – 231</em></td>
<td></td>
</tr>
<tr>
<td>Oct 24/25</td>
<td></td>
<td><strong>Lab 5: Human Genetic Traits</strong></td>
</tr>
<tr>
<td>14 Th Oct 26</td>
<td><strong>Recombinant DNA Technology</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Lewis Ch. 19, pp. 377 – 384</em></td>
<td></td>
</tr>
</tbody>
</table>
### Instructor Information:

- **Genetic Testing & Gene Therapy**
  - Lewis Ch. 20, pp. 397 – 414
- **Population Genetics**
  - Lewis Ch. 14, pp. 267 – 272
- **Forensic DNA Fingerprinting**
  - Lewis Ch. 14, pp. 272 – 279
- **Midterm Exam 2**
- **Review for Midterm 2**

### Course Schedule:

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Readings/Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Oct 31</td>
<td>Genetic Testing &amp; Gene Therapy</td>
<td>Lewis Ch. 20, pp. 397 – 414</td>
</tr>
<tr>
<td>Th Oct 31</td>
<td>Lab 6: Sickle Cell Anemia</td>
<td></td>
</tr>
<tr>
<td>Th Nov 2</td>
<td>Population Genetics</td>
<td>Lewis Ch. 14, pp. 267 – 272</td>
</tr>
<tr>
<td>T Nov 7</td>
<td>Forensic DNA Fingerprinting</td>
<td>Lewis Ch. 14, pp. 272 – 279</td>
</tr>
<tr>
<td>Nov 7/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Nov 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Th Nov 9</td>
<td>Midterm Exam 2</td>
<td></td>
</tr>
<tr>
<td>T Nov 14</td>
<td>Human Development</td>
<td>Gilbert Ch. 1 &amp; 2</td>
</tr>
<tr>
<td>Nov 15/16</td>
<td>Lab 7: DNA Fingerprinting</td>
<td></td>
</tr>
<tr>
<td>Th Nov 16</td>
<td>No class</td>
<td></td>
</tr>
<tr>
<td>T Nov 21</td>
<td>Science and Ethics of Cloning</td>
<td>Gilbert Ch. 7 &amp; 8</td>
</tr>
<tr>
<td>Nov 21/22</td>
<td>No labs - Thanksgiving</td>
<td></td>
</tr>
<tr>
<td>Th Nov 23</td>
<td>No class - Thanksgiving</td>
<td></td>
</tr>
<tr>
<td>T Nov 28</td>
<td>Stem Cells 1</td>
<td>Gilbert Ch. 10</td>
</tr>
<tr>
<td>Nov 28/29</td>
<td>Lab 7: DNA Fingerprinting</td>
<td>Student Presentations 1</td>
</tr>
<tr>
<td>Th Nov 30</td>
<td>Stem Cells 2</td>
<td></td>
</tr>
<tr>
<td>T Dec 5</td>
<td>Assisted Reproduction</td>
<td>Gilbert Ch. 4</td>
</tr>
<tr>
<td>Dec 5/6</td>
<td>Student Presentations 2</td>
<td></td>
</tr>
<tr>
<td>T Dec 7</td>
<td>Our Genetic Future?</td>
<td>Reading TBA</td>
</tr>
<tr>
<td>Dec 12/13</td>
<td>Course Overview</td>
<td>Review for Final Exam</td>
</tr>
<tr>
<td>T Dec 19</td>
<td>FINAL EXAM (2:00 – 3:50 p.m.)</td>
<td></td>
</tr>
</tbody>
</table>

### Grade Allocation:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm Exam 1</td>
<td>15 %</td>
</tr>
<tr>
<td>Midterm Exam 2</td>
<td>15 %</td>
</tr>
<tr>
<td>Final Exam (cumulative)</td>
<td>25 %</td>
</tr>
<tr>
<td>Laboratory</td>
<td>25 %</td>
</tr>
<tr>
<td>Homework</td>
<td>10 %</td>
</tr>
<tr>
<td>Presentation</td>
<td>10 %</td>
</tr>
</tbody>
</table>

### Additional Information:

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.
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 2007 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 two will be graded. Homeworks are worth 10 points, with up to 4 points for each graded questions and 2 points awarded for completing all the questions.

All homework must be submitted on time for full credit and any late assignments will have points deducted. 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

10% 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 for the course will be held in Silver 201. There will be no laboratory session during the first week of classes and the sessions will begin on Tuesday, September 12 or Wednesday, September 13. The laboratories will be taught by three graduate student instructors.

Natalie Dennison
nnd211@nyu.edu

Varun Doddapaneni
vd285@nyu.edu

Saadia Shallalah
ss4074@nyu.edu
<table>
<thead>
<tr>
<th>Lab Section</th>
<th>Day and Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 011</td>
<td>Tuesday, 5:00 p.m.– 6:40 p.m.</td>
</tr>
<tr>
<td>Section 012</td>
<td>Wednesday, 9:00 a.m. – 10:40 a.m.</td>
</tr>
<tr>
<td>Section 013</td>
<td>Wednesday, 11:00 a.m. – 12:40 a.m.</td>
</tr>
<tr>
<td>Section 014</td>
<td>Wednesday, 1:00 p.m.– 2:40 p.m.</td>
</tr>
<tr>
<td>Section 015</td>
<td>Wednesday, 3:00 p.m. – 4:40 pm</td>
</tr>
<tr>
<td>Section 016</td>
<td>Wednesday, 5:00 p.m.– 6:40 p.m.</td>
</tr>
</tbody>
</table>

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 the second week of classes, 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 a 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.