Principles of Genetics (BIOL 222) – Spring 2020 – Newton 209, MWF 9:30

Instructor: Dr. Josie Reinhardt: ISC 349, (585)245-5413, reinhardt@geneseo.edu
Office Hours: Monday 12-1; Wednesday 3-4; Friday 1-2

Tutors: Sundays, Tuesdays, and Thursdays from 530-7
Lindsey Dressler lgd3@geneseo.edu
Lauren Ellis lne1@geneseo.edu
Tyler Dion tjdl3@geneseo.edu


Principles of Genetics provides a comprehensive introduction to the fields of genetics and molecular biology. In this course, we will investigate genetic phenomena at many levels of biological complexity, from single molecules to evolving populations of organisms. Throughout, we will emphasize how scientific experimentation across these interconnected fields of study contributes to our evolving understanding of the basis of heritable variation.

Course Goals / Learning Objectives

- Understand the biochemical basis and function of the genome and its products
- Understand principles of heredity, including analysis of simple and complex traits
- Describe, analyze, and interpret key experiments that contributed to our present understanding of genetics
- Describe and understand the purpose of current experimental approaches in genetics, and technical and societal limits of their use
- Understand the interplay between genetic mutations & the environment in producing variation including differences within and between species and human disease
- Acquire skills and knowledge necessary for advanced study in biology, including genetics/genomics, molecular and cellular biology, and evolutionary biology.

Course policies

- Bring a simple calculator to all exams (no cell-phones or computers are allowed).
- I will use Top Hat (www.tophat.com join code 176054) to assess your comprehension in class. You will work on Top Hats with your Canvas Groups but answer individually. Bring an internet-enabled device to lectures (laptop or cell-phone or tablet). If you don’t have such a device, you need to let me know during the first week of class! To account for routine absences/bad days I will drop several Top Hat Questions so please don’t email me about missing individual questions.
- We often do activities in class that require you to bring your laptop. Please check Canvas to know when you’ll need to bring it!
- Midterm exams are to be taken on the day they are scheduled in the syllabus, so please check your schedule carefully and let me know if you have anything that would conflict within the first week of class. Make-up exams are allowed for unanticipated, significant emergencies.
- Students with Disabilities: SUNY Geneseo will make reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities. Accommodations will be made for medical conditions related to pregnancy or parenting. Students should contact Dean Buggie-Hunt in the Office of Disability Services (tbuggieh@geneseo.edu or 585-245-5112) and myself to discuss needed accommodations as early as possible in the semester.
Mental Health Policy: I take mental health problems exactly as seriously as I would issues with your physical health. Diminished mental health, including significant stress, mood changes, excessive worry, or problems with eating and/or sleeping can interfere with optimal academic performance. If the source of your symptoms is directly related to this class, please speak with me. However, problems with relationships, family worries, loss, or a personal struggle or crisis can also contribute to decreased academic performance. SUNY Geneseo provides mental health services to support the academic success of students. Counseling Services, a part of the Lauderdale Center for Student Health & Counseling, offers free, confidential psychological services to help you manage personal challenges that may threaten your well-being. Call 585-245-5716 to make an appointment and also see this page for emergency resources.

Group Work Policy: Students are randomly assigned to groups for work in-class (including Tophat) and are asked to participate in all group work in class. Outside of class, students are encouraged to study and work together on practice problem sets, Sapling problems and graded homework. However, presenting others’ work as your own constitutes academic dishonesty. Students turn in their own copy of homework, written in their own words with their work shown. Collaboration is not dishonesty, but pretending someone else’s work was done by you (e.g. copying) is… not to mention this is self-defeating as feedback on work you didn’t do is not going to be helpful to your learning and preparation. To ensure fair and timely feedback for student work, late homework will receive a 10% deduction for each day past the due date. On the day that assignments are returned graded, homework can no longer receive points (however, if you have an emergency please reach out!)

Extra Credit: There are two opportunities in this class for extra points. First, you may attend a seminar presenting original research on a social or natural science, math, or health-related topic and turn in (on Canvas) a ½ page summary of the talk for 2 pts extra credit (Biology seminars are 2:30 – 3:30 Fridays in Newton 201, other departments’ seminar schedules can be found through those departments). I give 2 points of extra credit towards your homework grade for each homework assignment turned in. Second, all assigned sapling or end of chapter problems may be completed / turned in for 3 EC points towards each exam. These are due the next class period following each exam (or on study day for Module 4).

Basic Proficiency in Biology/Biochemistry: Students wishing to continue in the Biology major beyond their first two courses must obtain at least a C+ average (2.3 GPA) in their first two required biology lecture courses taken at Geneseo – this is known as “Basic Proficiency in Biology”. Many upper level courses in Biology also require Basic Proficiency as a prerequisite. Ultimately, a C- or better in all courses required for the major is needed to graduate with a degree in Biology.

Course evaluation:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>How many?</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams</td>
<td>5</td>
<td>600</td>
</tr>
<tr>
<td>Final Exam</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td>Homework Assignments</td>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td>In-class Participation, including Tophat</td>
<td>Daily</td>
<td>100</td>
</tr>
</tbody>
</table>

Grading Scale:
Grades are based on the percentage of points you earned (no “curving”)
The following scale will be used to calculate final grades, rounding the hundredths place.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93.0-100%</td>
</tr>
<tr>
<td>A-</td>
<td>90.0-92.9%</td>
</tr>
<tr>
<td>B</td>
<td>83.0-86.9%</td>
</tr>
<tr>
<td>B-</td>
<td>80.0-82.9%</td>
</tr>
<tr>
<td>C</td>
<td>73.0-76.9%</td>
</tr>
<tr>
<td>C-</td>
<td>70.0-72.9%</td>
</tr>
<tr>
<td>D</td>
<td>60.0-69.9%</td>
</tr>
<tr>
<td>E</td>
<td>&lt;60%</td>
</tr>
</tbody>
</table>

B+ 87.0-89.9% | C+ 77.0-79.9%
# Course Schedule

Unless otherwise noted, readings are from Brooker Genetics Analysis and Principles, 6th Edition. Additional readings are found on Canvas as indicated below. **Check Canvas weekly for updates!**

<table>
<thead>
<tr>
<th>Date</th>
<th>DoW</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>22-Jan</td>
<td>W</td>
<td>What is a gene? (Ch 1)</td>
<td>p. 1-15</td>
</tr>
<tr>
<td>24-Jan</td>
<td>F</td>
<td>What is the Genetic Material? (Ch 9)</td>
<td>208-211, Canvas</td>
</tr>
<tr>
<td>27-Jan</td>
<td>M</td>
<td>What are DNA and RNA made of? (Ch 9)</td>
<td>211-220, 223-224</td>
</tr>
<tr>
<td>29-Jan</td>
<td>W</td>
<td>What form does DNA take within the cell? (Ch 10)</td>
<td>229-234; 237-245</td>
</tr>
<tr>
<td>31-Jan</td>
<td>F</td>
<td>Tool-torial: Genomics (Ch 10, Ch 23)</td>
<td>234-237; 574-577; 580-581</td>
</tr>
<tr>
<td>3-Feb</td>
<td>M</td>
<td>How do we know how DNA is copied? (Ch 11)</td>
<td>252-256, 266-267</td>
</tr>
<tr>
<td>5-Feb</td>
<td>W</td>
<td>What is needed to replicate DNA? (Ch 11)</td>
<td>256-262, 271-272</td>
</tr>
<tr>
<td>7-Feb</td>
<td>F</td>
<td>EXAM 1</td>
<td>Jan 22 - Feb 5</td>
</tr>
<tr>
<td>10-Feb</td>
<td>M</td>
<td>Tool-torial: PCR &amp; DNA sequencing (Ch 21)</td>
<td>519-522</td>
</tr>
<tr>
<td>12-Feb</td>
<td>W</td>
<td>How do we pass our DNA to the next generation? (Ch 3)</td>
<td>47-53, 57-64, 156</td>
</tr>
<tr>
<td>14-Feb</td>
<td>F</td>
<td>What do chromosomes do in our cells? (Ch 8)</td>
<td>177-192</td>
</tr>
<tr>
<td>17-Feb</td>
<td>M</td>
<td>What are the laws of genetic inheritance? (Ch 2)</td>
<td>18-26</td>
</tr>
<tr>
<td>19-Feb</td>
<td>W</td>
<td>How do we analyze inheritance of a trait? (Ch 2)</td>
<td>26-38, HW2</td>
</tr>
<tr>
<td>21-Feb</td>
<td>F</td>
<td>How do we know chromosomes carry genes? (Ch 3, 4)</td>
<td>64-70, 86-88</td>
</tr>
<tr>
<td>24-Feb</td>
<td>M</td>
<td>EXAM 2</td>
<td>Feb 10 - Feb 21</td>
</tr>
<tr>
<td>26-Feb</td>
<td>W</td>
<td>How do we analyze more complicated modes of inheritance? (Ch 4 &amp; 5)</td>
<td>76-91; 116-121</td>
</tr>
<tr>
<td>28-Feb</td>
<td>F</td>
<td>What happens when more than one gene impacts a trait? (Ch 4)</td>
<td>89-95; 707-708; 712-714</td>
</tr>
<tr>
<td>2-Mar</td>
<td>M</td>
<td>What happens to inheritance when genes are on the same chromosome? (Ch 6)</td>
<td>127-135</td>
</tr>
<tr>
<td>4-Mar</td>
<td>W</td>
<td>How can we determine where a gene is in the genome? (Ch 6)</td>
<td>135-141</td>
</tr>
<tr>
<td>6-Mar</td>
<td>F</td>
<td>Tool-Torial: mapping a human disease (Ch 25)</td>
<td>611-622</td>
</tr>
<tr>
<td>9-Mar</td>
<td>M</td>
<td>How do we “map” genes in Bacteria (Ch 7)</td>
<td>155-165, HW3</td>
</tr>
<tr>
<td>11-Mar</td>
<td>W</td>
<td>Tool-torial IV - Cloning</td>
<td>511-516, 542-543</td>
</tr>
<tr>
<td>13-Mar</td>
<td>F</td>
<td>EXAM 3</td>
<td>Feb 26 - Mar 11</td>
</tr>
</tbody>
</table>

**14-Mar through 22-Mar: SPRING BREAK!!!!!**

<table>
<thead>
<tr>
<th>Date</th>
<th>DoW</th>
<th>Topic</th>
<th>Reading</th>
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</thead>
<tbody>
<tr>
<td>23-Mar</td>
<td>M</td>
<td>Tool-torial: Measuring DNA, RNA, and Proteins (Ch 21, 23)</td>
<td>529-531, 590-594</td>
</tr>
<tr>
<td>25-Mar</td>
<td>W</td>
<td>How is information encoded in DNA? (Ch 12, 13)</td>
<td>278-280, 306-310</td>
</tr>
<tr>
<td>27-Mar</td>
<td>F</td>
<td>How do cells make RNA from DNA? (Ch 12)</td>
<td>281-284, 286-289</td>
</tr>
<tr>
<td>30-Mar</td>
<td>M</td>
<td>How is the RNA message prepared for decoding? (Ch 12)</td>
<td>284-285, 290-298</td>
</tr>
<tr>
<td>1-Apr</td>
<td>W</td>
<td>How do we know the “Genetic Code”? (Ch 13)</td>
<td>312-319 HW4</td>
</tr>
<tr>
<td>3-Apr</td>
<td>F</td>
<td>How do cells make Proteins from RNA? (Ch 13)</td>
<td>322-329</td>
</tr>
<tr>
<td>6-Apr</td>
<td>M</td>
<td>EXAM 4</td>
<td>Mar 23 - Apr 3</td>
</tr>
<tr>
<td>8-Apr</td>
<td>W</td>
<td>How do cells respond to their environment? (Ch 14)</td>
<td>336-346</td>
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<tr>
<td>Date</td>
<td>Day</td>
<td>Topic</td>
<td>Reading Range</td>
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<tr>
<td>10-Apr</td>
<td>F</td>
<td>Tool-torial: Analyzing gene function via mutation (Ch 14)</td>
<td></td>
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<tr>
<td>13-Apr</td>
<td>M</td>
<td>How is expression regulated in humans? (Ch 15)</td>
<td>361-375</td>
</tr>
<tr>
<td>15-Apr</td>
<td>W</td>
<td>How does the structure of DNA impact transcription? (Ch 16)</td>
<td>106-116; 376-378, 401-402</td>
</tr>
<tr>
<td>17-Apr</td>
<td>F</td>
<td>How can gene expression be changed after transcription?</td>
<td>295-297; 380-381; 417-420 HW5</td>
</tr>
<tr>
<td>20-Apr</td>
<td>M</td>
<td>Where do new alleles come from? (Ch 19)</td>
<td>461-470</td>
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<tr>
<td>22-Apr</td>
<td>F</td>
<td>22 April: GREAT DAY – NO CLASS!</td>
<td></td>
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<tr>
<td>24-Apr</td>
<td>F</td>
<td>EXAM 5</td>
<td>Apr 8 - Apr 20</td>
</tr>
<tr>
<td>27-Apr</td>
<td>M</td>
<td>How do our cells prevent too much mutation? (Ch 19)</td>
<td>470-485</td>
</tr>
<tr>
<td>29-Apr</td>
<td>W</td>
<td>Tool-torial: CRISPR-Cas9 Gene Editing (Ch 21)</td>
<td>526-529</td>
</tr>
<tr>
<td>1-May</td>
<td>F</td>
<td>Why do genetic diseases persist in populations? (Ch 27)</td>
<td>681-685, 689-691</td>
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<tr>
<td>4-May</td>
<td>M</td>
<td>What can our DNA tell us about relatedness and ancestry? (Ch 29)</td>
<td>697-699; 746-754, Canvas</td>
</tr>
<tr>
<td>6-May</td>
<td>W</td>
<td>What type of genetic changes cause cancer?</td>
<td>625-634; 405-407 HW6</td>
</tr>
<tr>
<td>11-May</td>
<td>M</td>
<td>Final Exam – 8:00 in Newton 209</td>
<td>Cumulative</td>
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</table>