

Principles of Genetics (BIOL 222) – Spring 2023

Instructor: Dr. Josie Reinhardt: geneseo.zoom.us/j/2611825805, x5413, reinhardt@geneseo.edu
Office hours: Monday 3-4; Tues 2:30-3:30; Thurs 12-1 in ISC349

Student TAs: Gianna Minnuto gmm16@geneseo.edu and Alexis Falvo aef12@geneseo.edu
Gianna and Alexis will hold Q&A sessions on Sunday and Thursday evenings in ISC131

Textbook: Genetics: Analysis and Principles (7th edition) by Robert J. Brooker.
Publisher: McGraw Hill, ISBN: 978-1259616020
Any format is fine, used is fine, no online content is needed.
Prior used editions (e.g. 6th) are available at very low expense! Please let me know and I can help you identify the correct pages for the required readings and problems.

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 populations of free-living organisms. Throughout, we will emphasize how scientific experimentation across these interconnected fields of study contributes to a larger understanding of genetics.

Course Goals / Learning Objectives

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

Class Format:

This course is organized into four three to four week modules, each including a homework assignment and culminating in a unit exam. The final assessment will be a cumulative exam. Daily activities include lecture, Tophat questions, demonstrations, and group homework and discussion time. I use Canvas heavily – so check often for updates. Additional materials such as review videos and lectures may be posted on Canvas. All homeworks are group homeworks, and group engagement also forms part of your grade. However, group work is a minority of your overall grade and group homework is still graded individually as well as in the group.

Course evaluation:

A total of 600 points are possible:
400 points for Midterm Exams (4 total, 100 pts per exam)
100 points for Homework & Tophat (clicker questions)
100 points for the Final Exam

Grading Scale:

The following scale will be used to calculate final grades. The hundredth place is rounded.

| | | | | |
|----------------------|----------------------|----------------------|---------------------|---------------|
| | B+ 87.0–89.9% | C+ 77.0–79.9% | | |
| A 93.0–100% | B 83.0–86.9% | C 73.0–76.9% | D 60.0–69.9% | E <60% |
| A- 90.0–92.9% | B- 80.0–82.9% | C- 70.0–72.9% | | |

Course policies

- o **Health and wellness:** If you have symptoms of potentially contagious disease please DO NOT COME TO CLASS. Be in communication with me and your homework groups as needed about making up material. If you begin feeling ill during class please leave promptly and let me know via email. SUNY Geneseo welcomes mask use for everyone and encourages mask wearing by anyone unvaccinated against COVID-19. If you don't have a mask, there are masks dispensers around the ISC. Be in touch if you are absent so I can open Tophat questions if necessary, but I will not be able to use zoom going forward to allow students to attend remotely so it's in your best interest to attend class when able. Please follow the most up-to-date guidelines for testing, vaccination, and monitoring posted on Geneseo's website: <https://www.geneseo.edu/covid>
- o **Exams:** Will be given on paper, during class time. You will need a calculator for each exam, and you may prepare and bring a small notecard with you for each exam. Please note that exams are timed to be taken during class time. Over-reliance on notes is likely to lead to inability to complete the exam on time. For some questions, you will be asked to show your work as a way to give partial credit. Exams are 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 and other allowed events as described in the student handbook (e.g. religious observances, varsity sports, etc). Please reach out if you have any issues as soon as possible.
- o **Accessibility and Disability:** SUNY Geneseo is dedicated to providing an equitable and inclusive educational experience for all students. The Office of Accessibility will coordinate reasonable accommodations for persons with documented physical, emotional, or cognitive disabilities, as well as medical conditions related to pregnancy or parenting. Students with letters of accommodation should submit a letter to each faculty member at the beginning of the semester and discuss specific arrangements. Please contact the Office of Accessibility Services for questions related to access and accommodations: Erwin Hall 22, (585) 245-5112 access@geneseo.edu, www.geneseo.edu/accessibility-office
- o I will use **TopHat** (www.tophat.com **join code 481700 for 10:30 section, xxxx for 11:30 section**) during class to give credit for in class work. Tophat is free to students. You can use your phone, tablet, or computer to access Tophats during class. Use the invitation link you should have received to access the course.
- o **Mental Health Policy:** I take mental health problems 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](#). If you feel more comfortable talking to peers, Geneseo students also lead a peer counseling group called Pathways. www.geneseo.edu/pathways
- o **Group Work Policy:** Students are encouraged to study and work together on practice problem sets, studying, and explicitly on their homework and in-class. Students are expected to contribute

effort and time to the homework assignments. Throughout the semester, surveys will be used to incentivize student participation in group work which is worth part of the homework grade.

- o **Academic Dishonesty & Plagiarism:** Presenting others' work as if it were your own, or providing such help to others constitutes academic dishonesty. The format of this inappropriate help does not matter. This is important not only due to fairness, but also so that instructors can provide feedback that is useful to improving your understanding and skills (feedback on work that is not your own is not useful to anyone!). Of course, in the case of group work the product will include input from all members. Any work that you are presenting as your own *must be original to you*. If you're struggling in class, please ask for help rather than resorting to academic dishonesty! I'm here to assist you if you have any concerns. SUNY Geneseo has instituted policies and procedures that must be followed in the event of an occurrence of Academic dishonesty which can be found here: https://www.geneseo.edu/dean_office/dishonesty). Immediate consequences include a report to the department chair and Dean of the College and a loss of points on impacted assignment(s).
- o **Extra Credit:** There are two opportunities for extra credit in this class. **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, other departments' seminar schedules can be found through those departments). **Second**, end of chapter textbook problems may be completed / turned in for 2 EC points towards the exam of any Module in which **all** assigned end of chapter problem sets are completed. These are due the next class period following each exam.
- o **Grading options:** Students should be aware that there are multiple grading options available to them. For example, an incomplete ("I") grade, Withdrawing from a class ("W"), and taking a Pass/Fail grading mode may be options. In addition, students may choose to repeat courses in which they have earned grades of D, E, F, U, or W (however, there are limits on the number of times you can repeat a course and have it count towards your major). Up to date policies on all of these options can be found on the [Academic Policies, Standards, and Information section of the Undergraduate bulletin](#). In addition, please reach out to me and your academic adviser as soon as possible if you are having difficulty in the course.

Course Schedule – Subject to change if needed – check Canvas and email for updates!

* Individual homework turn-in **Group homework turn-in

| Date | | Subject | Reading (7e) | Reading (6e) |
|--------|---|--|------------------------------|-----------------------------|
| 25-Jan | W | Introduction: What is a gene? | pp 1-16 | pp 1-15 |
| 27-Jan | F | DNA as the genetic material | 211-213, Canvas | 208-211, Canvas |
| 30-Jan | M | Structure of DNA and RNA | 213-226 | 211-224 |
| 1-Feb | W | Organization of DNA in cells * | 230-236, 245-251 | 229-234,237-245 |
| 3-Feb | F | Genome Structure and function | 236-238, 242-244, 565-570 | 234-237,573-577,5 80-581 |
| 6-Feb | M | DNA replication I * | 260-264, 274-275 | 252-256,266-267 |
| 8-Feb | W | DNA replication II ** | 264-273, 276-280 | 256-262,271-272 |
| 10-Feb | F | Polymerase chain reaction (PCR) and dideoxy sequencing | 516-523 | 519-522; 524-526 |
| 13-Feb | M | Mitosis & Meiosis* | 48-68 | 46-53,57-64 |
| 15-Feb | W | Module 1 Exam – through PCR / sequencing | | |
| 17-Feb | F | Chromosome Structure & Number | 178-196, 200-203 | 177-192 |
| 20-Feb | M | The Laws of Inheritance | 18-38 | 18-26 |

| | | | | |
|--------|---|---|--------------------------------------|-----------------------------|
| 22-Feb | W | Statistical analysis of Inheritance | 18-38 | 26-38 |
| 24-Feb | F | X-linked traits and chromosome theory * | 67-71 | 64-70, 86-88 |
| 27-Feb | M | Complex and quantitative traits I | 84-95, 120-125 | 76-95,116-121, |
| 1-Mar | W | Complex and quantitative traits II | 95-98, 709-711, 714-716 | 707-708, 712-714 |
| 3-Mar | F | Genetic linkage * | 131-139 | 127-135 |
| 6-Mar | M | Genetic mapping in Eukaryotes ** | 139-145 | 135-141 |
| 8-Mar | W | Mapping genes in bacteria * | | 155-165 |
| 10-Mar | F | Module 2 Exam – Meiosis through Genetic Mapping in Eukaryotes | | |
| | | March 13 to March 17 - SPRING BREAK | NO CLASS | |
| 20-Mar | M | Molecular cloning / recombinant DNA | 508-516 | 155-170 |
| 22-Mar | W | Viral Genetics * | 444-455 | 433-444 |
| 24-Mar | F | Central Dogma of Molecular Biology: DNA, RNA, Protein | 286-288, 315-318 | 278-280,306-310 |
| 27-Mar | M | Methods for measuring RNA, DNA, and protein | 526-528 | 529-531 |
| 29-Mar | W | Transcription – making RNA from DNA | 286-298 | 281-284,286-289 |
| 31-Mar | F | RNA processing in Eukaryotes * | 299-308 | 284-285,290-298 |
| 3-Apr | M | The Genetic Code ** | 318-327 | 311-319 |
| 5-Apr | W | Translation - making proteins from RNA | 328-339 | 322-329 |
| 7-Apr | F | Gene regulation in bacteria – overview * | 345-358 | 336-347 |
| 10-Apr | M | Module 3 Exam – Bacterial mapping through translation | | |
| 12-Apr | W | Gene regulation in bacteria - the Lac Operon | 345-358 | 336-347, |
| 14-Apr | F | Gene regulation in eukaryotes - overview * | 370-384 | 361-375 |
| 17-Apr | M | Gene regulation in eukaryotes - epigenetics and chromatin | 385-387, 396-399, 414-418 | 106-116.376-378,4 01-402 |
| 19-Apr | W | Post-transcriptional regulation | 362-365, 388-389, 428-431, 437 | 295-297,380-381,4 17-420 |
| 21-Apr | F | Mutation * | 472-490 | 461-470 |
| 24-Apr | M | DNA Repair ** | 490-496 | 470-485 |
| 26-Apr | W | GREAT DAY - NO CLASS | | |
| 28-Apr | F | CRISPR | 434-436, 524-526 | 423-426,526-529 |
| 1-May | M | Exam 4 | | |
| 3-May | W | Human Genetics: Mapping genes and traits in humans | 559-562, 602-613 | 611-622 |
| 5-May | F | Human genetics: heritability, genes, and the environment | 719-727 | |
| 8-May | M | Human genetics: ancestry and forensics * | 699-701 | 697-699,746-754 |
| 10-May | W | Human genetics: genetics of cancer ** | 629-642 | 624-634,405-407 |
| 12-May | F | 12:00 PM - Final exam for section 03 | (11:30 section) | |
| 15-May | M | 8:00 AM - Final exam for section 02 | (10:30 section) | |