

## BI620 Molecular Genetics, Fall 2021

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Office hours: email me for an appointment!

### Course description

This course aims to teach you how to use genetic techniques to analyze gene function. We will illustrate the use of model organisms including yeast, *Caenorhabditis elegans* (worms), *Drosophila melanogaster* (flies), *Danio rerio* (zebrafish), and mice. We will cover both forward genetics (function-driven gene discovery) and reverse genetics (gene-driven functional analysis).

### Learning outcomes

By the end of this course, students will be able to:

1. design and interpret experiments that distinguish how DNA sequence variations affect proteins and thereby phenotypes
2. design forward genetic screens in yeast, worm, fly, mouse, and zebrafish
3. identify the DNA sequence changes responsible for the phenotypes of mutants identified in screens
4. design reverse-engineered gene disruptions
5. use epistasis analysis, suppressors, and enhancers to define genetic pathways

**Textbook.** *Genetic Analysis, 3rd edition* by Philip Meneely. The readings are listed at the end of this syllabus. The textbook is available for purchase at the UO DuckStore. Copies of the textbook will also be available in the science library.

### In-Class time

**MW 12:00-1:20pm Science Library B042**

**F 12:00-12:50pm Science Library B042**

**Attendance on all three days is mandatory**

### Preparing for in-class time (Science Library B042)

**Mondays and Wednesdays 12:00-1:20pm:** We will spend much of our in-class time working through questions based on the reading that was assigned for that day. For a productive class session, it is HELPFUL to complete the reading beforehand! Many of the Monday/Wednesday readings are from the required textbook (*Genetic Analysis, 3rd edition* by Philip Meneely). Additional readings will be posted on the course site within Canvas (<https://canvas.uoregon.edu/>).

**Fridays 12:00-12:50pm:** We will spend most Fridays discussing papers that use techniques or approaches discussed earlier in the week. This will be a true discussion - I will not be giving a presentation. Instead, you should expect to answer and ask questions about the assigned paper. You MUST complete the reading beforehand! These readings will be posted on the course site within Canvas (<https://canvas.uoregon.edu/>).

### Practice problems

You will learn best by working through problems. In addition to in-class time, you should spend time on your own working through the problems posted on Canvas. These will not be graded - answer keys will also be posted separately

**Canvas Site:** The UO Canvas Site will be used to distribute all information for the class, including exams and lectures. Please familiarize yourself with the site, download and print the lecture notes and readings, and consult it frequently for announcements and updates. Please make sure that your Canvas settings allow Canvas to email you when new announcements are posted.

**Course Communication:** Announcements will be made via the Canvas website. For questions regarding the course and lecture material (outside of office hours), please utilize the "Discussion Boards" on the Canvas site to post questions.

## Final grades

Your final course grade will be calculated by:

- Midterm: 25%**
- Student presentation: 25%**
- Attendance: 5%**
- Participation: 10%**
- Final exam: 35%**

### Participation (10%)

Participation will be determined based on three factors: engagement during problem solving activities (Monday and Wednesday classes), questions/answers/engagement during journal article discussions (Fridays), and questions asked during the student presentations.

### Student presentation (25%)

You will each give a 15 minute oral presentation on a research paper you select that makes extensive use of the genetic approaches we will have learned about in the lectures. (note: a review article is not a research paper)

### Midterm (25%)

The midterm will be a take-home exam. You will have 48 hours to complete the exam and it will be turned in on the Canvas site. Exams may not be turned in late. The emphasis of the midterm will be on testing your understanding of the concepts, not your ability to memorize facts. Questions will primarily be based off problem solving activities we do in class and applying the concepts from the lectures. You may use your notes and textbook to answer the questions. You may work in groups on the exams, in fact it is encouraged. You may NOT turn in identical responses and must prepare your own individually worded, typed/written responses to the exam questions.

### Final Exam (35%)

The final will be take-home exam. You will have 4 days to complete the final exam and it will be turned in on the Canvas site. The final exam may not be turned in late. The final exam will be composed of two parts: 1) testing your understanding of the concepts based on problem solving activities from class (not your ability to memorize facts; 2) reading and answering questions on a research paper that primarily utilizes genetic techniques. You may use your notes and textbook to answer the questions. You may work in groups on the exams, in fact it is encouraged. You may NOT turn in identical responses and must prepare your own individually worded, typed/written responses to the exam questions.

### Academic Honesty:

Academic dishonesty includes various forms of "cheating" and will not be tolerated. Academic dishonesty includes but is not limited to:

1. Copying another person's answers to exam and quiz questions.
2. Utilizing materials otherwise not allowed on exam (e.g. textbooks, more than the allocated pages of notes, internet access, etc.).
3. Having someone else take your exams.
4. Altering an exam for a regrade.
5. Copying problem set answers from others.
6. Obtaining/distributing previous exams if those exams are not made available by the instructor to everyone in the class.
7. Submitting clicker questions for other students.
8. Misrepresenting circumstances leading to missed classes, exams, or quizzes.

All such activities will be reported to the Dean of Students office and will result in a failing grade in the class if academic dishonesty is confirmed. For further definitions of cheating and its penalties, consult the University of Oregon Student Conduct Code <https://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code>.

### Learning Environment:

The University of Oregon and I are working to create inclusive learning environments. Please notify me if there are aspects of the instruction or design of this course that result in barriers to your participation. You may also wish to contact the UO Accessible Education Center in 164 Oregon Hall at 346-1155 or [uoaec@uoregon.edu](mailto:uoaec@uoregon.edu)

## Academic Disruption

In the event of a campus emergency that disrupts academic activities, course requirements, deadlines, and grading percentages are subject to change. Information about changes in this course will be communicated as soon as possible by email, and on Canvas. If we are not able to meet face-to-face, students should immediately log onto Canvas and read any announcements and/or access alternative assignments. Students are also expected to continue coursework as outlined in this syllabus or other instructions on Canvas.

In the event that the instructor of this course has to quarantine, then this course may be taught online during that time.

## COVID Containment Plan for Classes

As the University of Oregon returns to in-person instruction, the key to keeping our community healthy and safe involves prevention, containment, and support. Here is information critical to how the UO is responding to COVID-19.

- *Prevention:* To prevent or reduce the spread of COVID-19 in classrooms and on campus, all students and employees:
  - Must to comply with [vaccination policy](#)
  - Must [wear face coverings](#) in all indoor spaces on UO campus
  - Complete weekly [testing](#) if not fully vaccinated or exempted
  - [Wash hands](#) frequently and practice social distancing when possible
  - Complete daily [self-checks](#)
  - Stay home/do not come to campus if feeling [symptomatic](#)
  - Complete the UO [COVID-19 case and contact reporting form](#) if you test positive or have been in close contact with a confirmed or presumptive case.
- *Containment:* If a student in class tests positive for COVID-19, all relevant classes will be notified via an email by the Corona Corps Care Team with instructions for students and staff based on their vaccination status. Specifically:
  - *Vaccinated/Asymptomatic students:* Quarantine not required, but daily self-monitoring before coming on campus advised; sign up for testing 3-5 days after notification through [MAP](#)
  - *Unvaccinated or partially vaccinated students:* 14-day quarantine advised – do not come to class – and sign up for testing 3-5 days after notification through [MAP](#), if asymptomatic, or through University Health Services (541-346-2770) or your primary care provider, if symptomatic.
  - *Symptomatic students:* stay home (do not come to class/campus), complete the online [case and contact form](#), and contact University Health Services (541-346-2770) or your primary care provide to arrange for immediate COVID-19 testing.

Students identified as close contacts of a positive case will be contacted by the Corona Corps Care Team (541-346-2292).

- *Support:* The following resources are available to you as a student.
  - [University Health Services](#) or call (541) 346-2770
  - [University Counseling Center](#) or call (541) 346-3277 or (541) 346-3227 (after hrs.)
  - [MAP Covid-19 Testing](#)
  - [Corona Corps](#) or call (541) 346-2292
  - [Academic Advising](#) or call (541) 346-3211
  - [Dean of Students](#) or call (541)-346-3216

## Good Classroom Citizenship

- Wear your mask and make sure it fits you well
- Stay home if you're sick
- Get to know your neighbors in class, and let them know if you test positive
- Get tested regularly
- Watch for signs and symptoms with the daily symptom self-check
- Wash your hands frequently or use hand sanitizer
- Complete the UO COVID-19 [case and contact reporting form](#) if you test positive or are a close contact of someone who tests positive.

### Reporting:

The instructor of this class is a Student-Directed Employee. As such, if you disclose to me, I will respond to you with respect and kindness. I will listen to you, and will be sensitive to your needs and desires. I will not judge you. I will support you. As part of that support, I will direct students who disclose sexual harassment or sexual violence to resources that can help. I will only report the information shared to the university administration when you as the student requests that the information be reported (unless someone is in imminent risk of serious harm or is a minor). Please note the difference between 'privacy' and 'confidentiality.' As a Student-Directed Employee I can offer privacy because I am not required to report certain information to the university. However, I cannot be bound by confidentiality in the same way that a counselor or attorney is. Confidential resources such as these means that information shared is protected by federal and state laws. Any information that I as a student-directed employee receive may still be accessed by university or court proceedings. This means, for example, that I could still be called as a witness or required to turn over any related documents or notes that I keep.

Please note also that I am required to report all other forms of prohibited discrimination or harassment to the university administration. Specific details about confidentiality of information and reporting obligations of employees can be found at [titleix.uoregon.edu](http://titleix.uoregon.edu).

### Class Courtesy

Please arrive in class on time. Late arrivals distract the instructor and the other students. Please turn off cell phones during the class meeting times. Do not leave class early unless you have cleared it with the instructor in advance. Ask questions if you did not hear or understand something.

Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the quarter (or before) so that I may address you properly.

Open inquiry, freedom of expression, and respect for difference are fundamental to a comprehensive and dynamic education. We are committed to upholding these ideals by encouraging the exploration, engagement, and expression of divergent perspectives and diverse identities. Classroom courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Our classroom is a learning environment, and as such should be a safe, inclusive and respectful place. Being respectful also includes using preferred pronouns for your classmates. Disrespecting fellow students as well as combative approaches, tones and/or actions are not acceptable. Please make me aware if there are classroom dynamics that impede your (or someone else's) full engagement.

### Course outline: BI620 Fall 2021

Date	Topic	Before class, read:
<b>Week 1: What is modern genetics?</b>		
M 9/27	Introductions What is modern genetics?	
W 9/29	Mendelian Genetics Problem Solving Activities	Meneely Chapter 1 (if you need a brush-up)
F 10/1	No class	
<b>Week 2: Mutations – sources and functional consequences</b>		
M 10/4	Sources of Mutations and Mutant Classification	Readings: Griffiths 452-456, 461-463; Meneely, section 4.6, and p132-133
W 10/6	Forward Genetics Screen Intro	Meneely, sections 4.1-4.3, 4.5, and Chapter 9
F 10/8	Discussion: Lou Gehrig's disease	Wong <i>et al. Neuron</i> (1995)
<b>Week 3: Forward Genetic Screens: Yeast and Worms</b>		
M 10/11	Designing Screens: Yeast	Forsburg review (2001); Giaever & Nislow review (2014)

W 10/13	Designing Screens: Worms	Jorgensen & Mango review (2002)
F 10/15	Discussion: a yeast screen to identify genes that regulate aging	Kaeberlein <i>et al. Nature</i> (2005)
<b>Week 4: Forward Genetic Screens: Flies, Mice, Zebrafish</b>		
M 10/18	Designing Screens: Flies and Mice	St Johnston review (2002); Kile and Hilton review (2005)
W 10/20	Designing Screens: Zebrafish	Patton and Zon review (2001)
F 10/22	Discussion: Drosophila screen paper	Lake <i>et al., eLife</i> (2015)
<b>Week 5: Identifying the Causative Mutation</b>		
M 10/25	Identifying the Causative Mutation Part I	Meneely, section 4.4 and chapter 5
W 10/27	Identifying the Causative Mutation Part 2	Meneely, section 4.4 and chapter 5
F 10/29	Discussion: mapping a selfish genetic element in worms	Ben-David <i>et al., Science</i> (2017)
<b>Week 6: Reverse Genetics (and CRISPR) and Midterm week!</b>		
M 11/1	Reverse Genetics and CRISPR	Meneely, Chapter 6, sections 8.1, 8.4, 8.5; Hsu <i>et al.</i> (2014)
W 11/3	Review for Midterm	your questions & problem set questions Midterm posted at 5pm
F 11/5	<b>MIDTERM EXAM DUE!</b>	MUST submit on Canvas by 5:00pm!
<b>Week 7: Epistasis Analysis</b>		
M 11/8	Epistasis Analysis	Meneely, Chapter 11
W 11/10	Problem Solving Activities	
F 11/12	<b>STUDENT PRESENTATIONS</b>	
<b>Week 8: Suppressors and Enhancers</b>		
M 11/15	Suppressors	Meneely, sections 10.1-10.3
W 11/17	Enhancers	Meneely, sections 10.4; O'Neil <i>et al.</i> (2017)
F 11/19	<b>STUDENT PRESENTATIONS</b>	
<b>Week 9: Student Presentations</b>		
M 11/22	<b>STUDENT PRESENTATIONS</b>	
W 11/24	<b>STUDENT PRESENTATIONS</b>	
F 11/26	THANKSGIVING HOLIDAY	No class
<b>Week 10: Final Exam Week!</b>		
M 11/29	Review for Final Exam	Your questions and problem set questions Final Exam posted at 5pm
W 12/1	No Class	
F 12/3	<b>FINAL EXAM DUE!</b>	MUST submit on Canvas by 5:00pm!