BI 320, MOLECULAR GENETICS
Fall 2022

Annie Zemper PhD, Instructor
She/her
Email: anniez@uoregon.edu
Office hours: Wednesdays, 10am, on Zoom (see Canvas "Zoom Meetings")
Link: https://uoregon.zoom.us/j/93054347130
(no meeting ID or passcode)

GE: Rachel Hopton
She/her
Email: rhopton@uoregon.edu
Office Hours (by appointment only), on Zoom.
Link: https://uoregon.zoom.us/j/92090666763

GE: Avika Sharma
She/her
Email: avikas@uoregon.edu
Office Hours (by appointment only), on Zoom.
Link: https://uoregon.zoom.us/j/2443738235

BI 320 is an advanced undergraduate course covering gene expression and gene regulation in both prokaryotic and eukaryotic organisms. The course has been designed with the assumption that students enter with a mastery of the material presented in BI 282H/BI 214 and with a basic understanding of protein biochemistry. We will explore how genetic analysis can be used to understand cellular processes, how different sets of genes are selectively activated in different cell types within multicellular organisms, and the genetic mechanisms that enable organisms to respond to changes in their environment. The course will focus on the experimental approaches that have been used with several model organisms whose properties make them especially well-suited for genetic studies. We will discuss how studies with these model organisms established fundamental principles, and how these principles and approaches apply to more complex creatures.

Lectures: The main content lectures will be presented on Tuesdays and Thursdays in-person.
Discussions: Friday class sessions will either: cover standard techniques used in Molecular Genetics or provide a review of the material covered on an upcoming exam. Discussion attendance and participation is required.

Course Communication: Announcements will be made via the Canvas website. Office hours will be held via Zoom on the Canvas website. For questions regarding the course and lecture material (outside of office hours), please utilize the "Discussion" part of Canvas to post questions. We will try to answer your questions as soon as possible.

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.

Assigned Reading:
Everyone approaches reading assignments differently; if you are comfortable with the material presented in lecture, then you might want to do the reading after lecture to deepen your understanding; however, if you struggle to keep up in lecture, then you might find it more useful to do the reading before lecture.
Textbook. *Molecular Biology: Principles and Practices,* 2nd edition (Cox, Doudna, and O'Donnell) readings are listed at the end of this syllabus.

Grading Policy:
The final course grade will be calculated by the distributions below. Please make note of the due dates.

Assignment	% of final grade	Due date
Problem Sets (4)	16% (160)	see schedule
Self-reflection on Science and Your Life (short paper)	2% (20)	10/28
Quizzes (7, but drop lowest score)	24% (240)	see schedule
Midterm 1	10% (100)	**10/18**
Midterm 2	10% (100)	**11/14**
Final Exam	20% (200)	**12/8**
Exam notes	2% (20)	after midterms and final
Participation: (Weekly reflections are 5 points and there are 9 of them. Drop lowest score = 40 points total. Discussion attendance and participation are 15 points and there are 9 of them. Drop lowest score = 120 points total)	16% (160)	see schedule

Extra Credit Assignments

Meme/Tik Tok on Midterm 1 Material	up to 5 pts on Midterm 1
Meme/Tik Tok on Midterm 2 Material	up to 5 pts on Midterm 2

YOU ARE EXPECTED TO KEEP ALL OF YOUR GRADED WORK UNTIL FINAL GRADES ARE POSTED, TO USE AS DOCUMENTATION SHOULD DISAGREEMENTS ARISE.

Problem Sets (16%): Problem set due dates are indicated on the Syllabus. Answers must be typed (with the exception of illustration, which can be hand drawn), and should be concise. Problem sets must be turned in via the Canvas website on the indicated due date. You may use your notes and your book, and you may consult with others, but the answers must be your own and in your own wording. *I will not provide detailed written feedback on grades so please check the answer key for details about the answers.*

Self-reflection on Science and Your Life (short paper, ~500 words, typed; 2% of course grade). See Canvas assignment for details. Due on Canvas on 10/28.

Quizzes (24%): Quizzes will be taken on the Canvas website and will be multiple choice or short answer. They will cover lecture material presented since the previous quiz. There will be 7 quizzes in total, but your lowest quiz score will be dropped. You will have 45 minutes to complete the quizzes on Canvas before MIDNIGHT on the indicated day. You may use your notes and textbook to answer the questions, but you may not consult with anyone. The quizzes open at 7am and close at midnight. If you need an accommodation, contact the accessible education center (AEC) and your time to take the quizzes will be altered accordingly.

Midterms and Final (50%): Exams will be administered on Canvas. You may not consult with anyone while taking the exam, nor may you utilize any resources (including internet resources). The emphasis will be on testing your understanding of the concepts, not your ability to memorize facts. If you feel that you have been graded unfairly, you must submit your reasoning to the instructor in writing, within one week of the day the exam is returned to you. Attach a screen shot of the question and the answer you have given. If you need an accommodation, contact the accessible education center (AEC) and your time to take the exams will be altered accordingly.

Midterm 1 (10%): 10/18. Posted to Canvas at 7am and closes at midnight. This exam will cover material from the beginning of the course through Lecture 6, including Discussion material. You will have the entire 1.5 hour scheduled class time to take your exam on Canvas. You are not allowed to consult with anyone else while taking this exam.

Midterm 2 (10%): 11/14. Posted to Canvas at 7am and closes at midnight. This exam will cover material from Lecture 7 through Lecture 12 and Discussion material. You will have the entire 1.5 hour scheduledclass time to take your exam on Canvas. You are not allowed to consult with anyone else while taking this exam.

Final Exam (20%): 12/8. Posted to Canvas at 7am and closes at midnight. This exam will cover material from the entire course. You will have 2 hours to take your exam on Canvas. Exam is comprehensive. You are not allowed to consult with anyone else while taking this exam

Exam Notes (2%): A copy of your notes must be turned in immediately following your exam via the Canvas website. A picture or scan of your notes will suffice. If the resolution of the image of the notes is not sufficient, then we will contact you. These are intended as study aids, so please prepare a fresh sheet of notes (do not simply turn in a photo of a single page of notes from the previous lectures)

For each Midterm, please prepare:

- One page of notes, handwritten on both sides.

For the Final Exam, please prepare:

- Two pages of handwritten notes, handwritten on both sides.

Weekly Reflection and Discussion Participation (16%): This component of the grade will take into account your reflections based on the given prompts, each week, as well as your attendance in Discussion sections. Each reflection is 5 points, and each Discussion is 15 points. Lowest Reflection and Discussion scores are dropped

Extra Credit Assignments (extra credit on midterms): Create a meme or Tik Tok based on the course material coveredin the exam. Please see the assignment description on the Canvas website. For examples of science memes:

https://www.buzzfeednews.com/article/alexkasprak/best-science-memes

Submit your Memes or Tiki Tok via the Canvas website by 5pm on the Friday following the exam. Only a single meme or TikTok per exam may be submitted. Extra credit will be given up to 5 pts per midterm.

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. Obtaining/distributing/copying previous problem sets if are not made available by the instructor toeveryone in the class.
8. Misrepresenting circumstances leading to missed classes, exams, or quizzes.
9. Working together online (either in the same room or in different rooms) to collaborate on any material that does not permit collaboration.

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

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 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.

Class Courtesy
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.

COVID Containment Plan
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:*

1. *Must to be comply with vaccination policy*
2. *Mask wearing is not required but encouraged: The UO supports the personal choice to wear a mask as an effective strategy for individuals seeking to protect themselves from COVID-19. We encourage anyone who wishes to wear a mask to do so. Masks are welcome though optional in most indoor spaces on UO campuses.*

KN95 masks are available here:
- EMU - O Desk
- Lillis - Atrium reception desk
- Global Scholars Hall - Service center
- Knight Library - Check out and reserve desk
- Price Science Commons - Service desk

3. *Wash hands frequently and practice social distancing when possible*
4. *Stay home/do not come to campus if feeling symptomatic*
5. *Visit this website for vaccine information, symptom management and reporting information: https://coronavirus.uoregon.edu*

Good Classroom Citizenship:
- *Stay home if you're sick*
- *Get to know your neighbors in class, and let them know if you test positive*
- *Watch for signs and symptoms with the daily symptom self-check*
- ***Wash your hands*** *frequently or use hand sanitizer*

Major Learning Objectives:
In this class you will:
-Become familiar with prokaryotic and eukaryotic gene architecture and how it relates to regulation ofgene expression. Understand the similarities and differences between the gene architecture of prokaryotes and eukaryotes along with the consequences on expression regulation.
-Understand the differences between coordinate regulation of gene expression in prokaryotes andeukaryotes
-Understand the applications and limitations of common genetic techniques and be able to interpret datafrom these techniques.

-Be able to: 1) use your understanding of genetics to propose hypotheses for the mechanisms for generegulation and maintenance of genome integrity, 2) use your understanding of common genetic techniques to propose a means of testing these hypotheses.
-Understand how chromatin organization and modification in eukaryotes influences gene expression.
-Become familiar with basic RNA processing in eukaryotes and how this processing can be differentially regulated

Date	Topic (Concepts)	Reading Cox 2nd ed.	Notes:
Week 1	**Lecture 1** Foundations of molecular genetics, studying genes **Lecture 2** Studying genes **Self-reflection on Science and Your Life paper posted**	• 43-54, 212-217, 220-223, 226-232, 239-244, 246-248 (CRISPR)	
9/28	**Week 1 Reflection posted**		
9/30	**Discussion 1** -Techniques: PCR, gel mobility shift assays, Restriction enzymes	• 136-142, 199, 212-216, 221-226, 241-242, 700-701	
Week 2	**Lecture 3** Genome organization in eukaryotes vs. prokaryotes, DNA mutations **Lecture 4** Modifications to the genome: transpositions, hybrid recombination	• 260-269, 414-423 486-487, 496-500, , 510-511	
10/2	**Week 1 Reflection**		Due Midnight
10/3	**Quiz 1 (on Canvas)**		Opens at 7am. Due Midnight.
10/5	**Week 2 Reflection posted**		
10/7	**Discussion 2** -Techniques: Northern, Southern and Western blots	• 136-142, 199, 212-216, 221-226, 241-242, 700-701	
10/8	**Problem Set 1 Posted**		
Week 3	**Lecture 5** Chromosomes, nucleosomes, chromatin **Lecture 6** Nucleosomes, chromatin	•502-507 •298-304, 332-353	
109	**Week 2 Reflection due**		Due Midnight
10/10	**Quiz 2 (on Canvas)**		Opens at 7am. Due Midnight.
10/12	**Week 3 Reflection posted**		
10/14	**Discussion 3** **Exam Review**		
10/15	**Problem Set 1 Due (Canvas file upload)**		Due Midnight
Week 4	**Lecture 7** Transcription basics and in bacteria	•520-536	
10/16	**Week 3 Reflection due**		Due Midnight
10/18	**MIDTERM 1 (COVERS LECTURES 1-6 and Discussions)**		Opens at 7am. Due Midnight.
10/19	**Week 4 Reflection posted**		
10/21	**Discussion 4** -Techniques: DNA sequencing, High throughputsequencing	226-232	
10/22	**Problem Set 2 Posted**		

Week 5	**Lecture 8:** Transcription in eukaryotes **Lecture 9:** RNA processing I	•537-545 •554-564	
10/23	**Week 4 Reflection due**		Due Midnight
10/24	**Quiz 3 (on Canvas)**		Opens at 7am. Due Midnight.
10/26	**Week 5 Reflection posted**		
10/28	**Discussion 5** Covid testing: PCR and antigen tests mRNA vaccines **Self-reflection on Science and Your Life paper due**		
10/29	**Problem Set 2 Due (Canvas file upload)**		Due Midnight
Week 6	**Lecture 10 :** RNA processing II **Lecture 11:** The genetic code	• 564-579 • 590-604	
10/30	**Week 5 reflection due**		Due Midnight
10/31	**Quiz 4 (on Canvas)**		Opens at 7am. Due Midnight.
11/2	**Week 6 reflection posted**		
11/4	**Discussion 6** ChIP, ChIP-sequencing, HiC		
11/5	**Problem Set 3 Posted**		
Week 7	**Lecture 12:** Protein Synthesis I	• 618-630	
11/6	**Week 6 reflection due**		Due Midnight
11/7	**Quiz 5 (on Canvas)**		Opens at 7am. Due Midnight.
11/9	**Week 7 reflection posted**		
11/10	**(DURING REGULAR CLASS TIME) Discussion 7** **Exam Review**		
11/12	**Problem Set 3 Due (Canvas file upload)**		Due Midnight
W eek 8	**Lecture 13** Protein Synthesis II **Lecture 14** Transcriptional regulation in eukaryotes I	• 630-647 • 727-750	
11/13	**Week 7 reflection due**		Due Midnight
11/14	**MIDTERM 2 (COVERS LECTURES 7-11 and Discussions)**		Opens at 7am. Due Midnight.
11/16	**Week 8 reflection posted**		
11/18	**Discussion 8** TBA		
11/19	**Problem Set 4 Posted**		
Week 9	**Lecture 15** Transcriptional regulation in eukaryotes II	• 727-750	
11/20	**Week 8 reflection due**		Due Midnight
11/21	**Quiz 6 (on Canvas)**		Opens at 7am. Due Midnight.
11/23	**Week 9 reflection posted**		
11/26	**Problem Set 4 Due (Canvas file upload)**		Due Midnight
Week 10	**Lecture 17** Post-transcriptional regulation in eukaryotes I **Lecture 18** Post-transcriptional regulation in eukaryotes **II**	759-780, 650-652	
11/27	**Week 9 reflection due**		Due Midnight
12/2	**Discussion 9** **Exam Review**		
12/2	**Quiz 7 (on Canvas)**		Opens at 7am. Due Midnight.
12/8	**FINAL EXAM (comprehensive)**	•	Opens at 7am. Due Midnight.

*__Early exams will not be given under any circumstances__.

Sept to Dec Schedule

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
25	26	27 Lecture 1 *Science and Your Life paper posted*	28 WEEKLY REFLECTION POSTED	29 Lecture 2	30 Discussion 1	1 (OCTOBER!)
2 WEEKLY REFLECTION DUE	3 Quiz 1	4 Lecture 3	5 WEEKLY REFLECTION POSTED	6 Lecture 4	7 Discussion 2	8 Problem Set 1 posted
9 WEEKLY REFLECTION DUE	10 Quiz 2	11 Lecture 5	12 WEEKLY REFLECTION POSTED	13 Lecture 6	14 Discussion 3 (exam review)	15 Problem Set 1 Due
16 WEEKLY REFLECTION DUE	**17**	**18** **MidTerm 1**	19 WEEKLY REFLECTION POSTED	20 Lecture 7	21 Discussion 4	22 Problem Set 2 posted
23 WEEKLY REFLECTION DUE	24 Quiz 3	25 Lecture 8	26 WEEKLY REFLECTION POSTED	27 Lecture 9	28 Discussion 5 *Science and Your Life paper due*	29 Problem Set 2 due
30 WEEKLY REFLECTION DUE	31 Quiz 4	1 (NOVEMBER!) Lecture 10	2 WEEKLY REFLECTION POSTED	3 Lecture 11	4 Discussion 6	5 Problem Set 3 posted
6 WEEKLY REFLECTION DUE	7 Quiz 5	8 Lecture 12	9 WEEKLY REFLECTION POSTED	10 Discussion 7 Exam Review (GEs run class)	11 NO CLASS	12 Problem Set 3 due
13 WEEKLY REFLECTION DUE	**14** **MidTerm 2**	15 Lecture 13	16 WEEKLY REFLECTION POSTED	17 Lecture 14	18 Discussion 8	19 Problem Set 4 posted
20 WEEKLY REFLECTION DUE	21 Quiz 6	22 Lecture 15	23 WEEKLY REFLECTION POSTED	24 NO CLASS	25 NO CLASS	26 Problem Set 4 due
27 WEEKLY REFLECTION DUE	28	29 Lecture 16	30	1 (DECEMBER!) Lecture 17	2 Discussion 9 (exam review) Quiz 7	3
4	**5**	6	8 **FINAL 8am**	9	10	11