BI 320, MOLECULAR GENETICS (CRN 31848)
Spring 2022

David Garcia, PhD, Instructor   dmgarcia@uoregon.edu Office hours: 2-3pm Mon, Zoom
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BI 320 is an advanced undergraduate course covering gene expression and gene regulation in both prokaryotic and eukaryotic organisms. A prerequisite for your success is mastery of the material presented in BI 282H/BI 214 and a basic understanding of protein and nucleic acid biochemistry. We will explore how the genome and the transcriptome is organized and physically structured, and how different sets of genes are selectively activated in different circumstances. Particular emphasis will be placed on the experimental approaches that established fundamental principles in molecular genetics found throughout nature.

Major Learning Objectives:
In this class you will:

- Become familiar with prokaryotic and eukaryotic gene architecture and how it relates to regulation of gene expression. There will be an emphasis on eukaryotic systems.

- Understand the applications and limitations of common molecular genetics techniques and be able to interpret data from application of these techniques.

- Apply the above concepts to propose a means of testing hypotheses regarding gene expression regulation.

Lectures:
> **Tuesdays and Thursdays**
> **Live Lectures**
> **10:00–11:20am in Chapman 220**
> Content presented in lectures is mandatory and will be tested. A Zoom option will *not* be offered by default, unless we become required to later into the term.

Discussion Sections:
> **Fridays**
> **Mandatory Live Discussion Sections in Klamath 5**
> **1:00–1:50pm (31849, Sara/William); 2–2:50pm (31850, Sara); 3:00–3:50pm (31851, William)**
> The discussion sections will include brief review of core material from lectures of the week, as well as active learning for problem solving. Sessions close to exams will provide a review of pertinent material. Attendance is mandatory and will constitute 2% of your grade. If you have to miss a discussion section, then please inform the instructor immediately so that we can provide a make-up assignment needed for participation.

Exams:
> **EXAM 1: during class time on Thursday 4/14**
> **EXAM 2: during class time on Thursday 5/5**
> **FINAL: 8:00–10am on Friday 6/10**

Course Communication:
The UO Canvas Site will be used to distribute all announcements and information for the class. 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.*** Office hours will be held via Zoom on the Canvas website. For questions regarding the course and lecture material, please use "Discussions" in Canvas. We will try to answer your questions as soon as possible.

Assigned Reading:
The more consistent you are with the reading, the easier learning the material will become. Use the first two weeks to find an approach that works well for you, whether you choose to read the textbook before lecture, after, or both. Problem sets and other practice problems will draw from all material in the textbook readings.

> **Textbook.** *Molecular Biology: Principles and Practices,* 2nd edition (Cox, Doudna, and O'Donnell) Readings are listed below. Copies of the textbook will be available in the Science Library. Scanned pages of the textbook readings will also be uploaded to Canvas.

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, quiz, or problem set questions.
2. Utilizing materials otherwise not allowed on exam.
3. Having someone else take your exams, quizzes, or problem sets.
4. Altering your answers for a regrade.
5. Obtaining/distributing previous exams/quizzes/problem sets if those materials are not made available by the instructor to everyone in the class.
6. Posting course material (exams/quizzes/problem sets/any submitted work) on outside public or private websites (e.g. Course Hero, Chegg, etc.)
7. Misrepresenting circumstances leading to missed attendance, exams, quizzes, or problem sets.

Note that *we take this extremely seriously* and should we determine that cheating has occurred, consequences can be severe, such as receiving a **zero** for an entire exam/assignment. These cannot be made up.

Furthermore, these activities can be reported to the Dean of Students office, which would result in a failing grade and other serious consequences for your academic standing. 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.

Honor Code:
I will ask you to certify that your problem sets, quizzes, and exams are your own work.

Student Health:
I ask that you consider the health of your classmates and instructors in the actions that you take. If you are feeling unwell, please use your best judgement. I will make every effort to make sure each student has a good learning experience, regardless of these circumstances. Thank you.

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)	10%	see schedule
Importance of Diversity in Science (short paper)	3%	**4/4**
Quizzes (5, lowest grade will be dropped)	20%	see schedule
Exam 1	20%	**4/14**
Exam 2	20%	**5/5**
Final Exam	25%	**6/10**
Participation	2%	
Extra Credit Assignments		
Exam 1 material Haiku	TBD	
Exam 2 material Haiku	TBD	

KEEP ALL OF YOUR GRADED WORK UNTIL FINAL GRADES ARE POSTED.
Be aware that under certain circumstances, and for byzantine reasons, your current grade reported on Canvas may not perfectly match reality, although in most cases it is expected to be close.

Problem Sets (10%): Problem set due dates are indicated on the Syllabus. <u>Answers must be typed (with the exception of illustration, which can be hand drawn), and should be concise.</u> Problem sets must be turned in via the Canvas website by 5pm on the indicated due date. GEs will not provide detailed written feedback on grades so please check the answer key for details about the answers.

Importance of Diversity in Science (short paper, 350-500 words, typed; 3% of course grade): A self-reflection on how your background influences your scientific interests and opportunities. Also mention a barrier that you see toward the goal of increasing the diversity of the people practicing science in the United States, and a way this could be addressed. Citations welcome. For full credit, give a demonstrative effort. **Due 5pm on 4/4**.

Quizzes (20%): Quizzes will be taken **at the beginning of class (10:00am) on Canvas** on indicated days and be timed. They will cover lecture material presented up through the previous lecture. There will be five quizzes in total and the lowest quiz score will be dropped. You may use *your own* notes and textbook to answer the questions but you cannot consult with other students as you take it.

Exams (65%): Exams will be administered in person and will be open book and open notes. You may not consult with anyone while taking the exam, nor may you utilize any other resources (including from the internet). The emphasis will be on testing your understanding of the concepts. If you feel that you have been graded unfairly after viewing the answer key, you must submit your reasoning to the instructor <u>in writing,</u> <u>within one week</u> of the day the exam is returned to you. Attach the original exam to your request. We reserve the right to change this rule if we determine this option is being abused.
EARLY EXAMS WILL NOT BE GIVEN UNDER <u>ANY</u> CIRCUMSTANCES.

> **Exam 1 (20%):** This exam will cover material from the beginning of the course through Lecture 5. You will have the entire scheduled class time to take your exam. You are not allowed to consult with anyone else while taking this exam. If you take your exams through the accessible education center (AEC), then you must sign up with the AEC at least a week in advance.

> **Exam 2 (20%):** This exam will cover material from Lectures 6 through 10 but also incorporate methods taught in lectures 1 and 2 as well. You will have the entire scheduled class time to take your exam. You are not allowed to consult with anyone else while taking this exam. If you take your exams through the accessible education center (AEC), then you must sign up with the AEC at least a week in advance.

> **Final Exam (25%):** <u>8:00–10:00am on Friday, June 10th</u>. This exam will cover material from Lectures 11 through 18 but also incorporate methods taught in lectures 2–4 as well. You will have 2 hours to take your exam. You are not allowed to consult with anyone else while taking this exam. If you take your exams through the accessible education center (AEC), then you must sign up with the AEC at least a week in advance.

> *Materials permitted during exams:* writing instrument for writing answers on paper; physical notepaper for making your own notes during exam (not typed); your lecture/reading notes (pre-handwritten or pre-printed or pre-typed, but they must be yours); textbook (either physical copy, e-copy, or pdfs of scanned readings provided on Canvas); calculator (physical or electronic); either a laptop or tablet PC, (but not both) only for viewing assigned readings or pre-written notes. Thus the only apps that you may use on a device are those required to access what is listed above (e.g. Adobe Reader, Preview, etc.) or a calculator app—absolutely **no** other apps will be allowed.

> *Materials NOT permitted during exams:* anything else, *including cell phones*—turn your cell phone off and leave it in your bag below your desk, no cell phone access during exams.

Participation (2%): This component of the grade will take into account participation and attendance in discussion sections. If you have to miss a discussion section, then please inform the instructor immediately <u>and in advance of the section</u> (not afterward) so that we can assign a make-up assignment.

Exam (1 and 2) extra-credit haikus:
Compose a haiku about a molecule or concept learned in preparation for the exam. *Be creative and whimsical*, but please follow rules for number of lines and syllables in order to receive full credit.

Some examples here:
https://www.scq.ubc.ca/cell-biology-via-seventeen-syllables-lessons-through-haikus/

Submit your haikus via the Canvas website **by 5pm on the Friday following exams 1 and 2**. Only a single haiku per exam may be submitted. Note that duplicate haikus from two or more students may receive no credit and place additional scrutiny on your other work, therefore do not depend on "poem generators" or take existing ones you find on the internet. Have fun with it!

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 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.

Date	Event	Reading Cox, Doudna, O'Donnell 2nd ed.	Assessment or work due
Week 1			
Tu 3/29	**Lecture 1** Foundations of molecular genetics	43-54	
Th 3/31	**Lecture 2** Studying genes	212-217, 220-223, 226-232	
Fri 4/1	**Discussion section**		

Sat 4/2	*Last drop day w/o "W"*		
Week 2			
Mon 4/4			**Diversity paper due @ 5pm**
Tu 4/5	**Lecture 3** Studying genes continued	239-243, 246-248 (CRISPR)	**Quiz 1**
Th 4/7	**Lecture 4** Genome organization in eukaryotes vs. prokaryotes, DNA mutations	246-248 (CRISPR), 260-269, 414-420	
Fri 4/8	**Discussion section**		**Problem Set 1 due @ 5pm**
Week 3			
Tu 4/12	**Lecture 5** Chromosomes, chromatin, nucleosomes	298-305, 332-342	**Quiz 2**
Th 4/14	**EXAM 1**		**EXAM 1**
Fri 4/15	*No Discussion section today*		**Extra Credit 1 due @ 5pm**
Week 4			
Tu 4/19	**Lecture 6** Chromatin, nucleosomes	343-353	
Th 4/21	**Lecture 7** Transcription in bacteria	520-536	
Fri 4/22	**Discussion section**		
Week 5			
Tu 4/26	**Lecture 8** Transcription in eukaryotes	537-545	
Th 4/28	**Lecture 9** Transcriptional regulation in eukaryotes I	727-736	**Quiz 3**
Fri 4/29	**Discussion section**		**Problem Set 2 due @ 5pm**
Week 6			
Tu 5/3	**Lecture 10** Transcriptional regulation in eukaryotes II	736-743	
Th 5/5	**EXAM 2**		**EXAM 2**
Fri 5/6	*No Discussion section today*		**Extra Credit 2 due @ 5pm**
Week 7			
Tu 5/10	**Lecture 11** RNA processing I	554-562	
Th 5/12	**Lecture 12** RNA processing II	562-569, 577-579, 580-582 (16.5)	
Fri 5/13	**Discussion section**		
Sun 5/15	*Last day to withdraw from classes*		
Week 8			
Tu 5/17	**Lecture 13** The genetic code	590-600	
Th 5/19	**Lecture 14** Protein synthesis I	618-630	**Quiz 4**
Fri 5/20	**Discussion section**		**Problem Set 3 due @ 5pm**
Week 9			
Tu 5/24	**Lecture 15** Protein synthesis II	630-638, 648	
Th 5/26	**Lecture 16** Protein synthesis III	639-649	
Fri 5/27	**Discussion section**		
Week 10			
Tu 5/31	**Lecture 17** Translational control in the cytoplasm	650-652, 765-768	**Quiz 5**
Th 6/2	**Lecture 18** Translational control continued and RNA interference	771-779, 791-793	

Fri 6/3	Discussion section		Problem Set 4 due @ 5pm
Finals Week			
Fri 6/10	8:00–10am FINAL EXAM		