BIOL 4460/5460-Eukaryotic Genetics

Located in General Academic Building Room 112 every Monday, Wednesday and Friday between 11:00 and 11:50 AM

Instructor Contact

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Office Hours: Thursdays 11-12 PM

Communication Expectations: I encourage you ask questions in class, to peruse this document and post questions about course content/organization to your peers on Canvas or other appropriate platforms. Please feel free to reach me anytime by e-mail with personal questions and concerns and I will do my best to respond within a day, with the exception that I will likely not see e-mails on the weekend.

Course Description

In this active lecture format course designed for upper-division and graduate biology students, students will gain or solidify an understanding of basic genetics, gene expression, and genetic model systems and build on these concepts by exploring advanced topics at the fore-front of genetic research.

These include:

- Genetic engineering, such as with CRISPR/Cas9
- Quantitative Traits and networks and levels of genetic regulation (such as small RNA regulators and epigenetics) that contribute to the vast variability in gene function.
- Anomalous genetic systems that diverge from classical genetic principles, such as non-Medelian inheritance and genome elimination
- Basic, Applied and Popular Genetic applications such as multi-omics, gene-drive and “de-extinction”

Course Prerequisites or Other Restrictions

Completion of foundation requirements for the declared biological sciences major and C or higher in BIOL 3451/BIOL 3452 and BIOL 3510/BIOL 3520. If the major is outside of biological sciences, foundation requirements for the biology BA and C or higher in BIOL 3451/BIOL 3452 and BIOL 3510/BIOL 3520 must be completed. If these requirements are not met, department consent is required. Previous or concurrent enrollment in molecular biology or biochemistry recommended. Students who have taken Biol 4460 may not repeat the course at the graduate level as BIOL 5460.

Course Objectives

By the end of this course, students will:

1. Gain and/or solidify an understanding of basic genetics, gene expression, and genetic model systems
2. Build on these concepts by exploring advanced topics at the fore-front of genetic research.
3. Become familiar with the molecular technologies used at the forefront of genetics research
4. Gain experience in critical reading of the primary scientific literature, including in
    a. understanding the types of data presented, applying the process of science,
    b. hypothesis evaluation,

c. using quantitative reasoning, and
d. understanding the relationship between science and society.

5. And get to know some of the exciting genetic research being conducted here at UNT

Assessment-

Quizzes-Reading and content understanding will be assessed by short answer quiz questions, with a quiz every two weeks (8 total) throughout the semester. Each quiz is worth 35 points and will be over all material covered in lecture and readings. No make-up quizzes will be given, but each student's lowest-scoring quiz will not be counted toward the final grade.

In-Class Discussions-Experience in critical reading of the primary scientific literature, written and verbal communication will be assessed by both completion of a pre-class assignment and in-class, in participation in paper discussions and, for graduate students, in the quality of a leading the discussion on an in-class paper discussion.

Participation-The style of instruction used in this class requires regular attendance, so daily participation will constitute roughly 40% of the final grade with 5 Points for each class participation. Here are the details:

- Loss of participation points will not begin until a third missed class.
- Participation points are assigned based on daily class attendance, ability to answer questions about the reading when called upon, thoughtful responses to questions on in-class content.
- Class participation should reflect a preparedness for class, such as having read the assigned material, and an engaged attitude. In other words, whether or not you feel that you understand the content, your participation should reflect that you are engaging with the content.
- I will record participation points daily and post them by Friday at 5 pm.
- Guest Lectures: On days when a guest is lecturing participation points will be earned by attendance. The content of Guest Lectures will also be present in quiz questions.
- Graduate student presentations: All students will earn participation points by participating in the discussion led by the graduate student presenting. All students are responsible for reading the text assigned.

Materials

- Please bring your computer each day for in class activities, as we will use many open, free and online resources over the semester.
- Textbook in either digital or print format: Strachan, Tom, and Andrew Read Human Molecular Genetics. Garland Science, 2018. [VitalSource Bookshelf].
- Other required reading is assigned throughout; the reading will be distributed in class and/or available for download on Canvas

Teaching Philosophy

Students will gain the most out of the class by being engaged with the content, especially while in class. The investment each student places in their learning in this class will be directly related to both the intellectual gain and their grade. I will also do my best to take responsibility for this and have structured the class to promote your preparation to engage with the content during each class. This manifests in several ways. For one, my lectures over course content will not necessarily be an exhaustive detailing of what is in the chapter and will certainly include extra material that I believe will help solidify the learning of that content. It is, therefore, best if students come to the lecture having read the assigned reading. To encourage this, I will randomly choose students to respond to questions about the reading throughout class.

Secondly, my intent is not simply to convey information; we will practice learning, to use information appropriately, to be creative and to practice science. Therefore, the quiz questions and in class questions will not only be about the

content delivered in the reading and in the course, but will require you to integrate the information gained between classes to produce new ideas.

Instructor Responsibilities and Feedback

I assume responsibility for communicating the content of this subject effectively, providing clear instructions for projects and assignments, identifying additional resources as necessary for student success, providing grading rubrics, and for reviewing and updating course content

I will do my best to respond to all student e-mails by the end of the following day, except on weekends. I anticipate posting quiz grades within the week, but reserve that grades may be posted the following week. Assignment feedback will vary on the complexity of the assignment, but I will do my best to be timely.

Syllabus Change Policy

Changes to the syllabus, course information, due dates *etcetera* will be provided in class and on Canvas under the "Syllabus and Updates" module. Please ensure that notifications for course announcements are activated on your Canvas profile.

Course Technology & Skills

Minimum Technology Requirements

Provide a list of the minimum technology requirements for students, such as:

- An iClicker account
- Computer
- Connection to the internet on campus
- Microsoft Office Suite
- Canvas Technical Requirements (https://clear.unt.edu/supported-technologies/canvas/requirements)
- Student may anticipate a need to join the class via zoom, in which case students must have a reliable connection to the internet from home, access to a microphone and speakers.

Computer Skills & Digital Literacy

Provide a list of course-specific technical skills learners must have to succeed in the course, such as:

- Using Canvas
- Using email with attachments
- Downloading and installing software
- Internet Searches
- Using presentation and graphics programs

Technical Assistance

Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UNT IT Help Desk
Email: helpdesk@unt.edu
Live Chat:
https://it.unt.edu/helpdesk/chatsupport
Phone: 940-565-2324
In Person: Sage Hall, Room 330
Hours and Availability: Visit https://it.unt.edu/helpdesk for up-to-date hours and availability

The University is committed to providing a reliable online course system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will extend the time windows and provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and contact the UNT Student Help Desk: helpdesk@unt.edu or 940.565.2324

For additional support, visit Canvas Technical Help (https://community.canvaslms.com/docs/DOC-10554-4212710328)

Course Structure

This a 16-week face-to-face class that will consist of readings, lectures, guest lecturers, and student-led discussions of the primary literature. Many class periods will be interactive in nature; participation points will be assigned based on a combination of attendance and participation in discussions and activities, but will sometime only be assigned based on attendance.

Class Content, Reading and Quiz Schedule

Any changes to this schedule will be announced prior in class and over Canvas. Reading labelled “TBD” will be announced at least a week in advance. An updated version of this schedule will be posted each Friday on Canvas.

Unit	Topic		Date		Lectures	Due Before Lecture
0	**Syllabus and Course Structure**	**M**	18-Aug	**0**	Syllabus and Course Structure	
1	**The Moleculas that Make the Magic Happen**	**W**	20-Aug	**1**	DNA	**Submit:** Pre-class assessment, **Connect** iClicker account to "UNT Eukaryotic Genetics"
		F	22-Aug	**2**	Class Discussion on Crick Paper	**Read:** Crick Paper and discussion questions, **Submit:** Responses to at least three pre-discussion questions on canvas.
		M	25-Aug	**3**	Role of RNAs and proteins in Genetics	
		W	27-Aug	**4**	Chromosome, Chromatin structure	**Textbook 2.3 and 2.4 Pg 54-66**
		F	**29-Aug**		**Quiz 1**	
		M	1-Sep		Labor Day	
2	**The Language of the Eukaryotic Cell**	**W**	3-Sep	**1**	Introduction to sequencing and what it can tell us about how the code is being used.	
		F	5-Sep		Class Discussion on Pari et al 2024	**Parri et al 2024: Dire wolves were the last of an ancient New World canid lineage**
		M	8-Sep	**2**	Gene expression	"**Fundamental Features of Eukaryotic Genes**"- Recombinant DNA 3rd Edition-Chapter 5-Posted on Canvas
		W	10-Sep	**3**	Gene expression	
Off		**F**	12-Sep		**Quiz 2 Online**	
3	**Editing and Writing the language of the Cell**	**M**	15-Sep	**1**	DNA: perturbing the code	
		W	17-Sep	**2**	RNA interference: shoot the messenger	
		F	19-Sep	**3**	DNA: putting new code together	Dana Goodyear 2023, The New Yorker
		M	22-Sep		Guest Lecture: Shivani Dave, CRISPR-era technologies	
		W	24-Sep	**4**	Recombinant protein expression In heterologous systems	Read: Ford and Peat at the Pari Center "The Role of Language In Science" Submit: Responses to at least three pre-discussion questions on canvas.
		F	25-Sep		**Quiz 3**	
		M	28-Sep	**5**	Model organism for advanced genetic hypothesis testing	
		W	1-Oct	**6**	Guest Lecture: Dr. Jag	
		F	3-Oct		Discussion on Brainbow paper	**Read:** "Drosophila Brainbow:a recombinase-based fluorescence labeling technique to subdivide neural expression pattern" Hampel et al 2011 **Submit** responses to Pre-discussion Questions on Canvas
		M	6-Oct	7	Guest Lecture: Dr. Burrgren	
4		**W**	8-Oct		Overflow Lecture	
		F	10-Oct		Quiz 4	
		M	13-Oct		No class	
	Passing on the language	**W**	15-Oct	**1**	Chomosomes and Inheritence 1	Textbook sections 2.2 and 2.3 Pg 51-59 (not section on mitochondrial DNA)
		F	17-Oct	**2**	Chomosomes and Inheritence 2	
		M	20-Oct	**3**	Chomosomes and Inheritence 3	Textbook Chapter 5, Pgs 136-146
		W	22-Oct		Paper discussion: Chromatin dynamics in memory	
		F	**24-Oct**		**Quiz 5**	
5	**Non-mendelian interitance of DNA**	**M**	27-Oct	**1**	Quantitative traits and Heredity- Lecture 6a	Textbook chapter 5.4 pg 150-155
		W	29-Oct	**2**	Quantitative traits and Heredity-Lecture 6b	
		F	31-Oct	**3**	Paper Discussion: Heritibility	Jiang et al 2025 The Aging Brain
		M	3-Nov			
		W	5-Nov	**4**	Extrachromosomal Inheritance	
		F	**7-Nov**		**Quiz 6**	

Unit	Topic		Date		Lectures	Due Before Lecture
6	**Super-Mendelian interitance of DNA and Genetics on the multiorganism scale**	**M**	10-Nov	**1**	Natural and Synthetic Gene-drives	Supporting reading uploaded on Canvas LibreTexts 14.3: The 'Jumping Genes' of Maize
		W	12-Nov	**2**	Natural and Synthetic Gene-drives	
		F	14-Nov		Paper discussion-Mutagenic chain reaction	**Read:** Gantz and Bier et al 2015, **Submit:** responses to Pre-discussion Questions on Canvas.
		M	17-Nov	**3**	Guest Lecture: Evan Brothers, Holobiome Dynamics	
		W	19-Nov		Paper discussion: Immortal Jellyfish	**Read:** Pascual-Torner *et al* 2023 **Submit:** responses to Pre-discussion Questions on Canvas
		F	**21-Nov**		**Quiz 7**	
November 24-December 1:Thanksgiving Break						
		M	1-Dec		Space for Make-up/Extra credit paper discussions	
		W	3-Dec		Space for Make-up/Extra credit paper discussions	
		F	5-Dec		Reading Day: No Class	
		M	**8-Dec**		**Quiz 8 (Final) at 10:30-12:30**	

The due dates and points for each of these is listed in the table below. Assignments will be discussed in class and posted to canvas. Quizzes will be taken during class time using Respondus on Canvas. No make-up quizzes will be available, but one quiz grade will be dropped prior to final grade calculation.

Assignment	Due Date	Possible Points Undergrad/Grad	Undergraduate Percentage of Final grade	Graduate Percentage of Final grade
Daily participation points-up to 3 points daily for 35 classes, 3 days dropped	Daily **in class**	105/105	30%	24%
Paper discussion participation including pre-discussion questions-10 points each x 5	In class on specific days	50/50	12.5%	10%
Paper discussion-Graduate Students only	-	-/100	--	20%
Quizzes (8 total including the final quiz at 35 points each with lowest score dropped=210)	-	245/245		
Total Points Possible		400/500	100%	100%

Grading

Letter grade will be assigned base on points earned from assignments, in-class activities, presentations, and quizzes according to the following point ranges.

Grade	Points-undergraduate	Points-Graduate
A	360-400	450-500
B	320-359	400-449
C	280-319	350-399
D	240-279	300-349
E	0-278	0-299

Late Work and Make-up Work

No make-up quizzes will be available, but one quiz grade will be dropped prior to final grade calculation. All other assignments will be accepted late for half credit.

Helpdesk

The University is committed to providing a reliable online course system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will extend the time windows and provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and contact the UNT Student Help Desk: helpdesk@unt.edu or 940.565.2324

Office hours credit

Students who have earned less than 60% of the possible points by October 8th can gain an additional 10 points by attending by October 7th to discuss their strategy for passing the class.

Course Evaluation

Student Perceptions of Teaching (SPOT) is the student evaluation system for UNT and allows students the ability to confidentially provide constructive feedback to their instructor and department to improve the quality of student experiences in the course. These will be available to students starting November 18th through December 5th.

Course Policies

Face Coverings

Face coverings are not required in class, however in order to respect the values of individuals in the class room, it is necessary to demonstrate respect for all students' choice to wear or not wear a face covering.

Attendance

Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

Class participation

Students are expected to participate in class by engaging with class exercises and group work, be being prepared with the required reading, and engage with the content delivered during the lectures. This will be assessed in two ways

1. the student's grade in Quizzes, which will have questions over required reading and lecture content.
2. I will also assign participation points based on student participation in daily activities, including iClicker questions as detailed in the **Course Requirements and Assignment Policy** section of this document.

Late Work and Make-up Work

No make-up quizzes will be available, but one quiz grade will be dropped prior to final grade calculation. All other assignments will be accepted late for half credit.