

**Midwestern State University**  
**Spring Semester 2023**  
**Genetics – BIOL-3334**

**Lecture:** Monday, Tuesday, and Friday from 10:00 to 10:50 am (BO 209)

**Lab:** Monday from 2:00 to 4:50 pm (BO 205)

Tuesday from 2:00 to 4:50 pm (BO 205)

**Instructor of Record:** Dr. Antonio R. Castilla (he/his/él) and Dr. Michael Shipley (he/his/él)

**Teaching Assistant:** Mr. Andrew Vann (he/his/él)

**Email** (best way to contact me): [antonio.castilla@msutexas.edu](mailto:antonio.castilla@msutexas.edu) – expect an answer within 24hrs during the week and 48hrs on the weekends. Best way to get a timely answer: (1) Write the course name ('BIOL3334') in the subject line, (2) use professional language, consider this professional correspondence, and (3) sign with your complete name. Do not expect a quick reply after 5pm, in the middle of the night or during weekends.

**Office hours:** Monday, Tuesday, Wednesday, Thursday, and Friday from 12:00 pm to 1:00 pm; or by appointment (email me to schedule a time).

### **Course content and goals**

Genetics is the study of heredity, how inherited variation is encoded, replicated, and expressed, and how it evolves. In this course, we will learn to integrate fundamental principles and concepts in Genetics into an overall picture of what a gene is, how it functions, how it may be altered and how it is inherited. The overarching goal of this course is to train you to become a geneticist. You will develop skills to evaluate the primary literature critically, implement the scientific method through experimental work, solve real-world problems through quantitative practices, and communicate your findings to broad audiences. A substantial portion of the class will be activity-focused, and you will learn not only from your instructors but also from your classmates and your own experience. To succeed, you will need to be prepared for each class, which consists of reviewing your assigned readings and videos, and completing assignments on time. **I expect you to allocate at least 9 hours of work per week outside of the lectures and labs.**

Suggestions to be successful:

- Take notes, take notes of your notes, summarize, and connect the material in new ways. Reviewing is not enough!
- Prepare for the class: read your notes, read the book chapters and the discussion papers, watch videos and participate in class activities.
- Start your assignments early: don't leave things for the last minute.
- Ask questions! Ask all the questions. Ask me, ask your peers, ask me again.

By the end of the semester, you will be able to

- a) Use the principles of chromosome transmission to predict patterns of inheritance.

- b) Evaluate scientific data using the rules of probability.
- c) Understand how the DNA structure enables it to function as the inheritance material.
- d) Explain the relationship between genotype and phenotype.
- e) Understand the molecular basis of mutation and its role in genetic variation.
- f) Explain how the genetic code enables protein synthesis to be directed by genetic information.
- g) Understand how genomes are replicated, repaired, organized, and packaged.
- h) Describe modes of gene regulation in prokaryotes and eukaryotes.

### **Textbook, readings, materials and resources**

- **Required textbook:** Pierce, Benjamin A. 2020. Genetics: A Conceptual Approach, 7th. Ed. W.H. Freeman and Company, New York. ISBN-13: 978-1319216801. Although most of the course content is based on the seventh edition of this textbook, it is totally ok to use previous editions. Graded activities will focus on broader concepts beyond specific differences between editions.
- **Readings and lab protocols:** will be posted on D2L.
- **Additional resources:** I encourage you to look at additional sources and share them with everyone. If you are struggling with the lecture, discussions, or labs, looking at a different perspective may help.

### **Class structure**

This course will be in-person and consist of three portions: Individual Work (Lecture and Reading assignments), Teamwork (Assigned Problems and Seminar), and Experimental Work (Labs). The instructor will set the pace of the course, including making deadlines for completing assignments. **Late submissions will not be accepted after the answers have been provided. If the answers have not been provided yet, a late submission will incur penalty points for lateness. Late assignments will have a penalty of 20% of the total points for each day late.**

All portions are designed to complement your knowledge and practice your skills in genetics, so topics will come up multiple times from different perspectives. You will have access to all materials via D2L. You must participate in all portions to succeed in this course. Here, I describe each portion and detail the activities, readings, and special considerations.

### **Individual Work**

#### Lecture

- **Prepare:** Read the textbook chapters and watch the lecture videos provided. **\*All cell phones should be turned off before entering the classroom to prevent disturbing the class.** No texting in class once lecture begins.
- **Participate:** Class attendance is crucial for maximum performance. We will practice the material and work through some of the study guides together. In addition, announcements

and questions about the material come up in these sessions, keeping us all on the same page. Importantly, we will have **in-class activities like think-pair-share and checking concepts to help you increase your grades (up to 100 points)**; see grading policies). Therefore, I strongly encourage you to attend and participate actively!

- Study for exams: These tests will allow you to evaluate your comprehension of the course content and challenge your abilities. To succeed in these tests, it is not enough to study the night before. Instead, you should be up to date with the material and practice regularly.

### Scientific literature

- Prepare: Read the scientific article assigned. Think critically about the subject, don't stay on the surface.
- Participate: Answer the questions in the reading report, upload your replies to D2L. You can reach up to 10 points per reading report. **Address the questions directly and avoid vague answers.** Use a direct and concise writing style, avoiding slang and plagiarism. **Do not limit yourself to the assigned article, be curious and look for additional information on the internet.** And do not forget to reference any resource used!

### **Teamwork**

#### Assigned problems

- Prepare: The assigned problems constitute a critical element in your training as a scientist. You will apply the concepts addressed during the lectures to solve real-world problems. By doing this, you will train your scientific reasoning and quantitative skills. Furthermore, **problems will be an essential element in exams, so this is a fantastic activity to get a critical number of points for your final grade.** Read the textbook chapters and ask any questions you have during the class time or office hours.
- Participate: I will post the series of assigned problems in D2L, and you will work in teams of four colleagues. Working in teams is crucial in science and most current professional environments. Please make sure everyone on your team has a role and understands what is happening at every step of the process. **It is not acceptable to obtain points without participating in teamwork. You lose the points if you do not contribute to your group (see grading policy).**
- Explore: I strongly encourage you to take a step further and practice with additional textbook problems! You will have problems in the exams, so getting as much practice as possible can make the difference.

#### Seminars

- Prepare: Communication is another crucial component of science. Our findings will not have significant societal implications if we do not disseminate properly. We will train this aspect by working on an oral presentation in a similar format to that used in a scientific meeting.
- Participate: I expect all group members to contribute equally, from the design of the seminar to the presentation in the classroom. To foster this fair task sharing, each team member will perform a similar portion of the presentation (~3 min). **If you do not attend the day your group presents, you lose the points of this activity unless it is a verified medical or similarly valid absence.**

## Experimental work

### Lab

- Prepare: Review assigned handouts before the lab session. These handouts will be available in D2L the week before the lab is conducted.
- Participate: Join your instructors and peers each week for a short lecture on the lab contents and work together to conduct lab activities.
- Study for the final exam: This test will allow you to evaluate your comprehension of the fundamental concepts underlying these practical exercises. To succeed in these tests, you must attend to the labs, keep an updated record of the activities, and review the lecture material on the topics addressed in the labs.
- Prepare your lab report and oral communication: As mentioned earlier, an essential part of your training as a scientist is learning to communicate your findings. You will work in groups of four classmates on two different activities: a **lab report** focused on the Molecular DNA, PCR and Gel Electrophoresis labs and a **round table** where you will present and discuss the results of the labs focused on *Drosophila melanogaster*.

## Grading policies

Final grades will be based on the points earned out of 1206 points (including 125 extra points). It is important to remember that although I assign the grades, you earn the points. Points will be earned based on the following criteria (Table 1):

Class Portion	Number	Points/Unit	Total
<b>Individual work</b>			
Exams	4	100	400
Scientific literature	5	10	50
Percentage and Total		<b>40.9%</b>	<b>450</b>
<b>Teamwork</b>			
Assigned problems	5	40	200
Seminar	1	100	100
Percentage and Total		<b>27.2%</b>	<b>300</b>
Class portion	Number	Points/Unit	Total
<b>Lab</b>			
Attendance	11	1	11
Lab exercises	12	20	240
Lab exam	1	50	50
Final report	1	25	25
Round Table Drosophila	1	25	25
Percentage and Total		<b>31.9%</b>	<b>351</b>
<b>Total (excluding bonus)</b>			<b>1101</b>
Class portion (voluntary)	Number	Points/Unit	Total
Active learning lecture			100
Questions seminar			25
<b>Total (including bonus)</b>			<b>1226</b>

The final grade will be based upon the following system:

A = 90% and above (991 points and above)

B = 80-89% (881-990 points)

C = 70-79% (771-880 points)

D = 60-69% (661-770 points)

F = Below 60% (below 660 points)

I reserve the right to move the curve downward (e.g., such that a 78% could be a B) and to use +/- grades.

Grading the items listed above will be based on the following criteria and policies:

### **Individual work**

Lecture: You are expected to participate in all activities and in general engage with the subject matter. It is natural that some people will talk more than others, but absolute silence is not an option. Don't be afraid to ask questions or provide input. This is good for you and for the rest of the class.

- Lecture participation: There will be activities to promoting active learning during the lecture time. These activities will include think-pair-share, checking concepts, connecting concepts, etc. You will obtain points by completing these tasks during the session. Furthermore, you will also receive points for asking questions or providing input. **You can obtain up to 100 extra points just participating (5 points for each individual contribution)!**
- Exams: Written exams will be a mix of short answers, fill-in-the-blanks, definitions, multiple-choice questions, short answers/essays and problems to be solved. While some questions will be over material explicitly covered in lectures and/or the textbooks, other questions may ask you to apply what you have learned to a new situation or take it further than we did in class. Reviewing your notes is only the beginning of your preparation, you must practice the material thoroughly. **Make-up exams will only be available if you have a verified medical or similarly valid excuse and must be taken in a timely fashion within one (1) week of the original exam date.** Once an exam has been handed out, students are not allowed to leave the classroom and return. Please make every effort to come to the classroom prepared for the test. Don't forget your calculator! **Cell phones must be silenced before the test is handed out. Do NOT pull out your cell phone at any time during the test!** All personal items must be stored under your desk so that the exam proctor may use the aisles during the exam. **Attempting to cheat on an exam by looking at someone's test is a serious offense and will result in a grade of zero for that exam.**

Scientific literature: We will have 5 sessions for the reading of scientific articles. I will upload the corresponding article related to the topics we will address in the lectures and a reading report with 4-5 questions aimed at proving your understanding and your ability to think critically. You must upload your responses the day before the deadline.

### **Teamwork activities**

The primary goal of these activities is to stimulate your scientific reasoning and problem-solving skills in a collaborative atmosphere resembling how scientists actually work.

Assigned problems: you will work in teams of four colleagues on five series of problems. Each series will have 3-5 problems, and you must solve at least 2-3 of them. You will have about one week to work on the assigned series and upload your response to D2L. **In the document with your answers, you must include a contribution statement indicating the group members contributing to the answers. If you don't work with your group, you do not obtain any points for that assignment.** One week after the submission, I will post the solutions for all the problems in D2L.

Seminar: working in **groups of four classmates**, you will choose a topic in Genetics of your interest and prepare a seminar. You will do a 15-min oral presentation in the classroom by the end of the semester. Each group member must present for approximately 3 minutes, altogether 12 minutes. The 3 remaining minutes are for questions from the audience. **Be ready to ask questions to your classmates because you can obtain up to 25 extra points (5 points per question)!** I strongly encourage you to propose a topic for your seminar. There is nothing better than working on something that you feel passionate! But if you do not have a specific topic in mind, here you can find a tentative list: cancer genetics, direct-to-consumer genetic testing, editing the Genome with CRISPR-Cas 9, epigenetics, forensic genomics, gene chips, gene therapy, genetic rare diseases, genetics of COVID-19, genetics of monkeypox, immunogenetics, molecular mechanisms of DNA damage response, stem cell research, targeted mutagenesis, the promising scope of RNA vaccines.

## **Experimental work**

Lab activities are designed to develop skills in the techniques used in genetics, experimental design, data analysis and reporting. You are expected to participate actively in individual and group activities and make progress towards practical genetics. During the lab session, you will start with a brief introduction by your instructor indicating each week's activities, and then you will work in groups to complete the material.

- Lab attendance: I strongly encourage attending the lab sessions for the support of your instructors and peers in completing these tasks. By simply attending, you will obtain up to 11 points.
- Lab exercises: Lab handouts will be available in D2L. Please, print the handout before coming to the lab session. These handouts include exercises and questions that you should reply during the session and others that will require some homework. **Please turn your completed lab exercises at the beginning of the following lab session. Late assignments will have a penalty of 20% of the total points for each day late.**
- Lab report: The overarching goal is to familiarize you with how scientists report their results. **You will work in groups of four colleagues**, resembling the collaborative atmosphere that scientists use when preparing their scientific manuscripts. The **report** will comprise four sections commonly used in scientific articles (i.e., introduction,

methods, results, and discussion). It will be based on the labs focused on using Genetic Markers, PCR and Gel Electrophoresis. In addition, you will present and discuss the results obtained in the labs using *D. melanogaster* through an **oral presentation**. You can use PowerPoint or any other similar software to create your presentation. The main goal of this activity is to have a round table experience that facilitates the participation of the entire class in the discussion.

- Lab exam: it will be a mix of short answers, fill-in-the-blanks, definitions, multiple-choice questions, short answers/essays, and problems to be solved.

#### Additional considerations

*All apparent grading errors*, disputes, and so forth must be submitted in a formal email to Dr. Castilla within one week of the date when the grade is posted. If you are disputing the scoring of an answer, you must include a written explanation of why you believe that your answer is correct.

#### **Topical outline**

Topic	Textbook
Introduction to Genetics	Chapter 1
Chromosomes and Cellular reproduction	Chapter 2
Basic Principles of Heredity	Chapter 3
Sex-determination	Chapter 4
<b>EXAM 1</b>	
Extensions and Modifications of Basic Principles	Chapter 5
Pedigree Analysis and Applications	Chapter 6
Linkage, Recombination and Eukaryotic Gene Mapping	Chapter 7
Chromosome Variation	Chapter 8
<b>EXAM 2</b>	
DNA: The Chemical Nature of the Gene	Chapter 10
DNA Replication and Recombination	Chapter 12
Transcription	Chapter 13
<b>EXAM 3</b>	



Topic	Textbook
RNA Molecules and RNA Processing	Chapter 14
The Genetic Code and Translation	Chapter 15
Control of Gene Expression	Chapters 16-17

## EXAM 4

### Flexibility Clause

Circumstances may arise during the semester that may prevent the professor from fulfilling parts of this syllabus; therefore, it should be viewed as a guide and subject to change. Students will be notified of any changes.

### Communication

- We will communicate with you about the course through the main email address as listed by MSU Texas. Ensure that you receive these emails in a timely fashion, either by checking your account regularly, or by forwarding your messages to an account that you check regularly. To ensure timely response, add BIOL 3334 to the subject line. Make sure to write emails in an organized, clear way. Use full sentences and avoid slang. Begin with a formal greeting and finish with your complete name.
- We will be using D2L regularly in this course. It is important that you check the website often during the week. I will post announcements, readings, assignments, and other materials there. Although the class schedule may change, these changes will always be updated in D2L. You should be able to log into D2L. If you have trouble, please contact the Distance Education Department at Midwestern State University: [Distance Education](#)

### Inclusivity Statement

I encourage every student in this class to speak freely and participate. Each of us must show respect for each other because our class represents a diversity of beliefs, backgrounds, and experiences. I believe that this is what will enrich all our experiences together. I recognize that our individual differences can deepen our understanding of one another and the world around us, rather than divide us. In this class, people of all ethnicities, genders and gender identities, religions, ages, sexual orientations, disabilities, socioeconomic backgrounds, regions, and nationalities are strongly encouraged to share their rich array of perspectives and experiences. If you feel your differences may in some way isolate you from our classroom community or if you have a specific need, please talk with me so that we can work together to help you become an

active and engaged member of our class and community (adapted from CSU Chico and Winona State University).

## University Policies

**MSU Texas policies, procedures and resources:** [Security Policy and Procedures](#)

**Academic Honor Policy:** You are responsible for knowing the policy regarding academic honesty. Students are expected to maintain high standards of academic integrity at all times. No forms of academic dishonesty (cheating, plagiarism, etc.) will be tolerated. I will take any violation of the University's Academic Honesty Policy very seriously. I trust you to be honest. Do not violate that trust. For further information: [Student Conduct](#)

**Students with disabilities:** If you need accommodations, please contact the disability support services as soon as possible. Some accommodations may take some time to arrange. Feel free to contact me if I can be of any help.

Debra Higginbotham

Clark Student Center, 168

disabilityservices@msutexas.edu

(940) 397-4140

(940) 397-4180

**Add/Drop policy:** March 27th, 2023, is this semester's deadline to Add or Drop classes without serious and compelling reasons. It is your responsibility for following up on these procedures. For more information: [Add/Drop Policy](#)

**Emergency and crises:** In case of emergencies and crises, I will work with you to make arrangements and accommodations. Excusable absences under this category include illness, death in the family, dependent children serious illness, and other documented crises, call to active military duty or jury duty, religious holidays and official University activities. Absences for religious holidays require you to notify me at least 14 days in advance. Please don't agonize about your class if you are in a crisis, just let me know. **Note that documentation will be necessary in all instances.** This allows us to make arrangements associated with evaluation and grading. For more information: [Crisis Counseling](#)

**Tutoring at MSU Texas:** Midwestern State University provides Tutoring and Academic Support Programs. For more information: [MSU Tutoring](#)

**Emergency procedures:** Review the evacuation plan and emergency procedures for our classrooms. During an emergency, follow instructions and information provided at [Emergency Procedures](#)

**Campus carry:** Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes as prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit [Campus Carry](#).

**Active Shooter:** The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit [Safety / Emergency Procedures](#). Students are encouraged to watch the video entitled "Run. Hide. Fight." which may be electronically accessed via the University police department's webpage: "Run. Hide. Fight."