



Biology/School of STEM

Genetics, BIO3045-1

Lecture (3 units) + Lab (1 unit)

Fall 2025

Lecture - MWF 12:15-1:10, Taylor 105

Lab Sator 108, M 2:45-5:45 (4)/T 7:45-10:45 (1), 11:00-2:00 (2), 2:30-5:30 (5)/W 2:45-5:45 (3)

Final Exam: Friday, 12/19 10:30 – 1:00pm

INFORMATION	SPECIFICS FOR THE COURSE
Instructor title and name:	Dr. Heidi Woelbern
Phone:	619-849-2925
Email:	heidiwoelbern@pointloma.edu
Office location:	Rohr Science 164
Office hours:	MON 8:30 – 9:30 am (Lineback – Evans Hall 101) TUES 9:00 – 10:30 am (Lineback – Evans Hall 101) WED 1:30 – 2:30 pm (Woelbern – Rohr Science 164) THURS 9:00 – 10:30 am (Woelbern – ZOOM) FRI 10:30 – 11:30 am (Woelbern – Rohr Science 164) FRI 2:30 – 3:30 pm (Lineback – Evans Hall 101)

PLNU Mission

To Teach ~ To Shape ~ To Send

Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Course Description

BIO 3045 (3): The study of the inheritance, organization, expression and variability of genes. Prerequisite(s): [BIO 2010](#). A grade of "C" or better in [BIO 2010](#) or instructor consent. Corequisite(s): [BIO 3045L](#)

BIO 3045L (1): An inquiry-based laboratory that is a co-requisite for [BIO 3045](#). Letter graded. Corequisite(s): [BIO 3045](#)

Program and Course Learning Outcomes

Genetics students will be able to

1. apply the basic principles of Genetics, including Gene Expression, Eukaryotic Genetics, Prokaryotic Genetics, Cancer Genetics, Population Genetics, and Molecular Evolution, to solving Genetics problems.
2. conduct laboratory investigations in genetics.

3. analyze data, formulate conclusions, and design a follow-up experiment for each lab investigation.
4. analyze and discuss different viewpoints concerning social issues that relate to genetics, including diverse viewpoints within the Christian community.

LAB TECHNIQUES LEARNED AND APPLIED IN BIO3045L

- Use of micropipettes
- Sterile technique for culturing bacteria and yeast
- Carry out dilution series for quantification of bacteria
- Design, execute, and interpret an experiment quantifying bacterial mutation
- Culture, breed, and perform microscopic analysis of *Drosophila*
- Perform PCR
- Perform agarose gel electrophoresis
- Work in teams to collaborate and engage in problem-solving activities
- Write five lab reports

COURSE SPIRITUAL OUTCOME

We would like to create an atmosphere in Genetics that embodies the verses:

You shall love your neighbor as yourself. (Matthew 22:39)

The stranger who dwells among you shall be to you as one born among you, and you shall love him as yourself; for you were strangers in the land of Egypt. (Leviticus 19:34)

To this end, we will be thinking about how we can help each other succeed in this class and beyond, both academically and spiritually, and how we can take responsibility for each other's achievement.

Required Texts and Recommended Study Resources

Students are responsible for having the required course textbooks prior to the first day of class.

All supplemental materials posted on this course site (including articles, book excerpts, or other documents) are provided for your personal academic use. These materials may be protected by copyright law and should not be duplicated or distributed without permission of the copyright owner.

1. Brooker, R. J. (2024). Genetics: Analysis & Principles. (8th edition). McGraw Hill.
2. iClicker 2

Course Credit Hour Information

In the interest of providing sufficient time to accomplish the stated Course Learning Outcomes, this class meets the PLNU credit hour policy for a 4-unit class (3 units lecture, 1 unit lab) delivered over 15 weeks. It is anticipated that students will spend a minimum of 37.5 participation hours per credit hour on their coursework. For this course, students will spend an estimated 200 total hours meeting the course learning outcomes.

Assessment and Grading

Grades will be based on the following:

A	B	C	D	F
A 92-100	B+ 88-89	C+ 78-79	D+ 68-69	F Less than 60
A- 90-91	B 82-87	C 72-77	D 62-67	
	B- 80-81	C- 70-71	D- 60-61	

This course will consist of a total of **1000 points**. Please note that your grade for BIO3045 and BIO345L will be calculated together, and the same grade will be given for both courses since they are intertwined. Note that the following dates and times may be changed, as determined by the instructors.

630 Points: Exams

Exam I – 100 pts, Friday, 9/12, during your lecture session

Exam II– 165 points, the week of 10/6 - 10/8, during your lab session

Exam III– 165 points, the week of 11/10 – 11/12, during your lab session

Final Exam – 200 points, 12/19, Friday (10:30 am – 1:00 pm)

Attendance at all exams is required.

NOTE: No cell phones, iPods/MP3 players, computers, or other electronic devices/smart technology may be used during an exam. For all exams, except the one on Friday, 9/12, you may use your lecture notes, your homework problems, and a calculator to take the exam.

170 Points: Problem Sets, Online Quizzes, Lab Quizzes, & Paper Analysis

Problem Sets (96 pts): For each unit of content we discuss in class, we will have at least one associated set of problems for you to work out. The Problem-Set (PS) assignments will be posted on Canvas and available to you once we begin the unit. Problem sets are due in class, and are typically due the following class session. (So, if we finish the chapter on Friday, your problem set will be due on Monday.) You may drop the 5 lowest grades from the problem sets.

Reading Assignment Quizzes (54 points): For 20 of our lecture class sessions, you will be required to read the material in advance and take a pre-class Canvas quiz. You may drop the 2 lowest grades from these assignments.

Lab quizzes (12 pts): You can expect a brief quiz associated with six of our lab sessions. The quiz will cover the current day's laboratory investigation, unless told otherwise. You may drop the 2 lowest grades from the lab quizzes.

Paper Analysis (8 pts): We will read and analyze a research paper.

160 Points: Lab Reports

The purpose of lab reports is to help you develop the skills of data analysis, interpretation, and communication. There will be 5 lab reports over the semester.

10/1 (Lab 1) – Group Lab Report

10/22 (Lab 2) – Group Lab Report

11/5 (Lab 3) – Individual Lab Report

11/17 (Lab 4) – Group Lab Report

12/10 (Lab 5) – Group Lab Report

40 Points: Class and Lab Participation (participation in group lab reports)

Attendance at the lecture sessions will be recorded via iClicker. You may miss four of them for any reason without losing class participation points.

Attendance at all lab sessions is required, unless excused by a doctor's note.

Extra Credit: Up to 20 points of extra credit will be available.

Late assignments: For work that is one day late, 10% will be deducted from the grade. For work that is two days late, 20% will be deducted from the grade. *Late work will not be accepted after graded homework has been returned to the class.*

FINAL EXAMINATION POLICY

Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on the [Class Schedules](#) site. If you find yourself scheduled for three (3) or more final examinations on the same day, you are authorized to contact each professor to arrange a different time for one of those exams. However, unless you have three (3) or more exams on the same day, no requests for alternative final examinations will be granted.

CONTENT WARNING

I acknowledge that each of you comes to PLNU with your own unique life experiences. This contributes to the way you perceive various types of information. In BIO3045/BIO3045L, all of the class content, including that which may be intellectually or emotionally challenging, has been intentionally curated to achieve the learning goals for this course. The decision to include such material is not taken lightly. These topics include discussions of the ***influence of genetics on behavior, fertility, gender, biotechnology, and evolution***. If you encounter a topic that is intellectually challenging for you, it can manifest in feelings of discomfort and upset. In response, I encourage you to come talk to me or your friends or family about it. Class topics are discussed for the sole purpose of expanding your intellectual engagement in the area of genetics, and I will support you throughout your learning in this course.

TRIGGER WARNING

I acknowledge that each of you comes to PLNU with your own unique life experiences. This contributes to the way you perceive several types of information. In BIO3045/BIO3045L, we will cover a variety of topics, some of which you may find triggering. These topics include discussions of the ***influence of genetics on behavior, fertility, and gender***. Each time this topic appears in a reading or unit, it is marked on the syllabus with a "(T)". The experience of being triggered versus intellectually challenged are different. The main difference is that an individual must have experienced trauma to experience being triggered, whereas an intellectual challenge has nothing to do with trauma. If you are a trauma survivor and encounter a topic in this class that is triggering for you, you may feel overwhelmed or panicked and find it difficult to concentrate. In response, I encourage you to take the necessary steps for your emotional safety. This may include leaving class while the topic is discussed or talking to a therapist at the Counseling Center. Should you choose to sit out on discussion of a certain topic, know that you are still responsible for the material; but we can discuss if there are other methods for accessing that material, and for assessing your learning on that material. Class topics are discussed for the sole purpose of expanding your intellectual engagement in the area of genetics, and I will support you throughout your learning in this course.

SPIRITUAL CARE

Please be aware PLNU strives to be a place where you grow as whole persons. To this end, we provide resources for our students to encounter God and grow in their Christian faith.

If you have questions, a desire to meet with the chaplain or have prayer requests you can contact your professor or the [Office of Spiritual Life and Formation](#).

STATE AUTHORIZATION

State authorization is a formal determination by a state that Point Loma Nazarene University is approved to conduct activities regulated by that state. In certain states outside California, Point Loma Nazarene University is not authorized to enroll online (distance education) students. If a student moves to another state after admission to the program and/or enrollment in an online course, continuation within the program and/or course will depend on whether Point Loma Nazarene University is authorized to offer distance education courses in that state. It is the student's responsibility to notify the institution of any change in his or her physical location. Refer to the map on [State Authorization](#) to view which states allow distance education outside California.

PLNU COPYRIGHT POLICY

Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.]

PLNU RECORDING NOTIFICATION

In order to enhance the learning experience, please be advised that this course may be recorded by the professor for educational purposes, and access to these recordings will be limited to enrolled students and authorized personnel. Note that all recordings are subject to copyright protection. Any unauthorized distribution or publication of these recordings without written approval from the University (refer to the Dean) is strictly prohibited.

PLNU ACADEMIC HONESTY POLICY

Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. For all student appeals, faculty and students should follow the procedures outlined in the University Catalog. See [Academic Policies](#) for definitions of kinds of academic dishonesty and for further policy information.

ARTIFICIAL (AI) POLICY

You **are allowed** to use Artificial Intelligence (AI) tools (e.g., ChatGPT, Gemini Pro 1.5, GrammarlyGo, Perplexity, etc) as a resource for this course, to assist you in **learning about** the content discussed in class and covered in the problems assigned. You are **not allowed** to use AI tools to **generate content** (text, video, audio, images) that will end up in any work submitted to be graded for this course (e.g., Problem-Sets, Lab Reports). If you have any doubts about using AI, please gain permission from the instructor.

PLNU Academic Accommodations Policy

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities in accordance with the Americans with Disabilities Act (ADA). Students with disabilities may request course-related accommodations by contacting the Educational Access Center (EAC), located in the Bond Academic Center (EAC@pointloma.edu or 619-849-2533). Once a student's eligibility for an accommodation has been determined, the EAC will work with the student to create an Accommodation Plan (AP) that outlines allowed accommodations.

Professors are able to view a student's approved accommodations through Accommodate.

PLNU highly recommends that students speak with their professors during the first two weeks of each semester/term about the implementation of their AP in that particular course. Accommodations are not retroactive so clarifying with the professor at the outset is one of the best ways to promote positive academic outcomes.

Students who need accommodations for a disability should contact the EAC as early as possible (i.e., ideally before the beginning of the semester) to assure appropriate accommodations can be provided. It is the student's responsibility to make the first contact with the EAC. Students cannot assume that because they had accommodations in the past, their eligibility at PLNU is automatic. All determinations at PLNU must go through the EAC process. This is to protect the privacy of students with disabilities who may not want to disclose this information and are not asking for any accommodations.

LANGUAGE AND BELONGING

Point Loma Nazarene University faculty are committed to helping create a safe and hospitable learning environment for all students. As Christian scholars we are keenly aware of the power of language and believe in treating others with dignity. As such, it is important that our language be equitable, inclusive, and prejudice free. Inclusive/Bias-free language

is the standard outlined by all major academic style guides, including MLA, APA, and Chicago, and it is the expected norm in university-level work. Good writing and speaking do not use unsubstantiated or irrelevant generalizations about personal qualities such as age, disability, economic class, ethnicity, marital status, parentage, political or religious beliefs, race, gender, sex, or sexual orientation. Inclusive language also avoids using stereotypes or terminology that demeans persons or groups based on age, disability, class, ethnicity, gender, race, language, or national origin. Respectful use of language is particularly important when referring to those outside of the religious and lifestyle commitments of those in the PLNU community. By working toward precision and clarity of language, we mark ourselves as serious and respectful scholars, and we model the Christ-like quality of hospitality.

If you (or someone you know) have experienced other forms of discrimination, you can find more information on reporting and resources at www.pointloma.edu/nondiscrimination.

SEXUAL MISCONDUCT AND DISCRIMINATION

In support of a safe learning environment, if you (or someone you know) have experienced any form of sexual discrimination or misconduct, including sexual assault, dating or domestic violence, or stalking, know that accommodations and resources are available through the Title IX Office at pointloma.edu/Title-IX. Please be aware that under Title IX of the Education Amendments of 1972, faculty and staff are required to disclose information about such misconduct to the Title IX Office.

If you wish to speak to a confidential employee who does not have this reporting responsibility, you can contact Counseling Services at counselingservices@pointloma.edu or find a list of campus pastors at pointloma.edu/title-ix. If you (or someone you know) have experienced other forms of discrimination or bias, you can find more information on reporting and resources at www.pointloma.edu/bias

PLNU ATTENDANCE AND PARTICIPATION POLICY

Regular and punctual attendance at all class sessions is considered essential to optimum academic achievement. If the student is absent for more than 10 percent of class sessions, the faculty member will issue a written warning of de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university withdrawal date or, after that date, receive an “F” grade.

Loma Writing Center

The Loma Writing Center exists to help all members of the PLNU community cultivate transferable writing skills to engage their academic, professional, personal, and spiritual communities. We work toward this goal by conducting one-on-one consultation sessions, supporting writing education across the PLNU community, and participating in ongoing writing center research.

Getting feedback from the Loma Writing Center while you’re in the process of working on an assignment is a great way to improve the quality of your writing and develop as a writer. You are encouraged to talk with a trained writing consultant about getting started on an assignment, organizing your ideas, finding and citing sources, revising, editing for grammar and polishing final drafts, and more. For information about how to make in-person or online appointments, see [Loma Writing Center webpage](#) or visit the Loma Writer Center on the first floor of the Ryan Library, room 221.

- [Appointment Calendar](#)
- [Website](#)
- Email: writingcenter@pointloma.edu

Lomabooks Instructions for Students:

*This course is part of our course material delivery program, **LomaBooks**. The bookstore will provide each student with a convenient package containing all required physical materials; all digitally delivered materials will be integrated into Canvas.*

You should have received an email from the bookstore confirming the list of materials that will be provided for each of your courses and asking you to select how you would like to receive any printed components (in-store pick up or home delivery). If you have not done so already, please confirm your fulfillment preference so the bookstore can prepare your materials.

*For more information about **LomaBooks**, please go: [HERE](#)*

Assignments At-A-Glance

Please see the next page for a tentative course schedule.

TENTATIVE SCHEDULE FOR GENETICS

Week	Date	Lecture Topic	Reading	Assignments DUE	Lab Topic
1	9/1	No Class (Labor Day)			No labs – Labor Day
	9/3	DNA Structure, Cell cycle review	Ch. 9: p. 223-224; 228-231 Ch. 10: p. 243-244		
	9/5	Transcription & RNA editing	*Ch. 12: p. 298-321		
2	9/8	Translation	Ch. 13: p. 331-337; 341-344; 346-352		Lab 1a – Mutagenesis
	9/10	Types of mutations	*Ch. 19: 493-496; 500-501	PS #1 - TnT	
	9/12	EXAM 1 – TnT (during class)			
3	9/15	DNA replication	*Ch. 11: 270-285; 289-291		Lab 1b – Mutagenesis
	9/17	How do mutations affect proteins?	*Ch. 4: 83-86	PS #2 - Replication	Lab 2a – Mutagenesis
	9/19	Mutations in biochemical pathways	*Ch. 13: 328-331		
4	9/22	How are mutations repaired?	*Ch. 19: 503-508; 514-516	PS #3 – Biochem path	Lab 3a – Drosophila
	9/24	Meiosis	*Ch. 2: 21-37	PS #4 - Mutations	
	9/26	Mendel: Principle of Segregation	Ch. 3: 47-55; 62	PS #5 – Meiosis	
5	9/29	Mendel: Principle of Ind. Assort	*Ch. 3: 55-63; 66-67		Lab 2b – Mutagenesis
	10/1	Mendel: Principle of Ind. Assort	Ch. 3: 55-63; 66-67	Lab Report #1	
	10/3	Mendel: Hypothesis Testing	Ch. 3: 70-72 (Chi sq)	PS #6 – Mendel 1	
6	10/6	Genes on Sex Chromosomes	*Ch. 2: 39-41; Ch. 3: 63-65; Ch. 5: 92-94		EXAM 2 during lab
	10/8	Chromosomal determination of gender (T)	Ch. 2: 39-41; Ch. 5: 114-119	PS #7 – Chi-sq	
	10/10	Extensions of Mendelian Genetics	Ch. 4: 81-92; 96-97		
7	10/13	Complementation	*Ch. 4: 99-100	PS #8 – X-linkage	Lab 2c - Mutagenesis
	10/15	Epistasis	*Ch. 4: 99-103		Lab 3b – Drosophila
	10/17	Linked Genes	Ch. 6: 136-142	PS #9 – Extending Mendel	
8	10/20	Mapping 2 linked genes	*Ch. 6: 138-142; 144-147		No labs – Fall Break
	10/22	Mapping 3 linked genes	*Ch. 6: 148-150	Lab report #2	
	10/24	No Class (Fall Break)			
9	10/27	Mapping 3 linked genes	Ch. 6: 148-150		Lab 4a – Yeast Genetics
	10/29	Data Analyses			
	10/31	Introduction to biotechnology	Ch. 21: 561-564	PS #10 – Gene mapping	
10	11/3	Genetically Modified Organisms (GMOs)	*Ch. 21: 567-571; 576-578		Lab 4b – Yeast Genetics
	11/5	Gene Therapy (T)	Ch. 17: 455-459; Ch. 20: 548-551; Ch. 21: 571-576	Lab Report #3	
	11/7	Chromosomal mutations	*Ch. 8: 183-191	PS #11 - Biotechnology	
11	11/10	Clinical examination of inversions	Ch. 8: 194-199		EXAM 3 during lab
	11/12	Changes in chromosomal #	*Ch. 8: 200-210		
	11/14	Cell cycle regulation	Ch. 25: 657-668	PS #12- Chromosomes	
12	11/17	Cancer genetics	*Ch. 25: 657-668	Lab Report #4	Lab 5a – Population Genetics
	11/19	Cancer treatments	Ch. 25: 670-674		
	11/21	Population genetics: Overview	*Ch. 27: 711-717	PS #13 - Cancer	
13	11/24	Genetics equilibrium	Ch. 27: 714-717	Population Calculations	No labs – Thanksgiving
	11/26	No Class (Thanksgiving Break)			
	11/28	No Class (Thanksgiving Break)			
14	12/1	Predicting alleles in populations	Ch. 27: 714-717		Lab 5b – Population Genetics
	12/3	Maternal inheritance (mtDNA)	Ch. 5: 124-130	PS #14 – Populations	
	12/5	Mitochondria & Human migration**	*»Supplement		
15	12/8	Phylogenetic Trees	Ch. 29: 782-788	PS #15 – mtDNA 2	Lab 6 – Phylogenetic Analyses
	12/10	Human genomic data	*Supplement	Lab Report #5	
	12/12	Molecular clocks	*Ch. 29: 789-798	PS #16 – Mol genetics	
		FINAL EXAM:	F 12/19 @ 10:30am		

** 8-point quiz on Canvas equivalent to a PS

Note 1: These dates and topics are subject to change, as necessarily determined by the instructors.

Note 2: The colors correspond to the primary content for exams: Exam 1, Exam 2, Exam 3, & Final Exam.

Note 3: * denotes there is a pre-class Canvas quiz on the Reading Assignment