Biology Department/School of STEM

BIO3052: Research Methodology

3 Units
Spring 2025

Thursday, 8:00 am – 11:00 am
Ryan Library 213
Final Exam: (Thursday, 5/08/2025, 7:30 am – 10:00 am)

"The mind of the discerning acquires knowledge, and the ear of the wise seeks it."

-Proverbs 18:15

INFORMATION	SPECIFICS FOR THE COURSE
Instructor title and name:	Dr. Walter Cho
Phone:	(619) 849-2398
Email:	wcho@pointloma.edu
Office location and hours:	Rohr Science 134; Tues. 9:30 am – 11:30 am & by appointment (Zoom by request) Sign up HERE

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

This course builds upon the basis of the scientific method that students are exposed to as freshmen. It focuses on teaching students how to develop biological questions, search databases to obtain background information, design scientific experiments, and analyze data. The course will focus more specifically on how research data is obtained (A below), how experimental knowledge and data are

dispersed amongst the scientific community (A and B), and how these data are used as a base for correlating new data and upon which new experimentation is based (A and B).

A. Research design:
- Practice methods by which novel questions worthy of addressing are identified.
- Determine how scientific inquiry is used to address these questions from a research standpoint along with how to predict outcomes of experiments.
- Identify and use appropriate statistical analyses to analyze data, arrive at valid conclusions, and appropriately design follow-up or repeat experimentation.

B. Bioinformatics:
- Introduce the various databases available to researchers.
- Introduce the idea of implementing bioinformatics into question identification and experimental design.
- Introduce the idea of implementing bioinformatics for the analysis of real data and correlation of conclusions into previous scientific knowledge.

Program and Course Learning Outcomes

Students will be able to
1) Analyze primary literature and, based on the data and conclusions presented, determine appropriate questions for subsequent experimentation.
2) Critically analyze data and judge conclusions using appropriate statistics and scientific logic.
3) Explain how bioinformatics and wet-lab are integrated in modern scientific research.
4) Query various bioinformatics databases available online and interpret the information obtained from these databases.
5) Create, write, and defend a biologically-related research proposal based on existing primary literature found through PubMed or other related scientific publication databases and feasible, existing scientific experimental techniques.

Required Texts and Recommended Study Resources

This course includes a BIO3052 reader which is available as a PDF through Canvas.

Excel: If you don't have Excel, you can download a free version through PLNU. Information is available here: https://help.pointloma.edu/TDClient/1808/Portal/KB/ArticleDet?ID=103058

Assessment and Grading

In-class assignments	17%	(85 points total)
Research grant proposal (final)	30%	(150 points total)

Grant review and study section		8%	(40 points total)	
Class participation and attitude		5%	(25 points total)	
Tests (1 midterm and final exam)		40%	(200 points total)	
Total		**100%**		

Grade Scale Based on Percentages

A	B	C	D	F
A 93-100	B+ 87-89	C+ 77-79	D+ 67-69	F Less than 59
A- 90-92	B 83-86	C 73-76	D 63-66	
	B- 80-82	C- 70-72	D- 60-62	

Exams: 2/27, Mid-term exam

5/08, Final exam

Research Grant Proposal: For this project, you will be working in pairs. The main assignment will be for you to write a relatively short (6-8 page), basic grant proposal. This can be on any biologically relevant topic that you are interested in. We do not expect this to be at the level of submission and funding, but this is a substantial portion of your grade and should be treated as such. Your proposal should demonstrate the ability to 1) research a topic, 2) integrate, analyze, and understand several recent primary literature articles on the topic, 3) generate a reasonable research project for your focus, and 4) design a few experimental suggestions to address the research focus. This will be a difficult assignment, but it is a very important exercise. All of science rests on one's ability to integrate previous knowledge and expand on that knowledge in order to continue to propagate our scientific understanding. Beyond that, the ability to adequately describe your ideas for funding is key to any job, particularly in the sciences, whether you are interested in pursuing a career in research, medicine, teaching, or any other science-related field. The best ideas in the world will never come to fruition if they aren't funded. The hardest part of the assignment will be to assemble the information and get your ideas together, so we strongly suggest once again that you don't procrastinate on this assignment. To help make sure you don't procrastinate, you will notice a few interim deadlines throughout the schedule.

This project will thus incorporate most of the principles taught in this course while allowing everyone to practice these principles on a topic of your choice / interest. We will work on the main principles of this extensively together throughout the semester, but you are expected to do most of your work on this project outside of class. I STRONGLY suggest not waiting until the end to do this. You will not be happy with yourself or your grade if you procrastinate. If you work reasonably, but diligently throughout, my hope is that you will find this to be interesting and rewarding. Please see me, or any of your other professors, for help throughout. I plan to help you get started (if needed) and then hope that you will work on your own and come to me often with specific questions for direction. Further details and expectations will be given separately.

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 [Traditional Undergraduate Records: Final Exam 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 <u>one</u> 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.

Incompletes and Late Assignments

All assignments are to be submitted/turned in by the beginning of the class session when they are due—including assignments posted in Canvas. *There is a 10% deduction per day it is late. Late work beyond one week, will receive a 0.* Incompletes will only be assigned in extremely unusual circumstances.

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 <u>State Authorization</u> to view which states allow online (distance education) outside of 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 Intelligence (AI) Policy

You are allowed to use Artificial Intelligence (AI) tools (e.g., ChatGPT, Gemini Pro 1.5, GrammarlyGo, Perplexity, etc) to generate ideas, but 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. 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 619-849-2486). 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. The EAC makes accommodations available to professors at the student's request.

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 special 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 a bias incident regarding language, you can find more information on reporting and resources at www.pointloma.edu/bias.

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.

Participation and Cooperation: Class participation counts for 5% of your grade. Much of this course will be interactive. You will be expected to work with online databases on the library computers as we go. In addition, you are expected to actively participate in class discussions. We will be using a semi-discussion style format, and we expect you to volunteer to answer questions and also to ask questions whenever you are confused. You should read ahead so that you can participate effectively and for your own learning benefit.

Use of Computers: This course requires significant use of computers and as such, is located in the computer lab. We realize that this brings with it many temptations to use the computers for things other than classwork, particularly when we are lecturing. Use of phones or computers for Instagram, YouTube, or any similar uses that have nothing to do with class is strictly forbidden. *You may think that you are great at multi-tasking, but substantial research shows that using these other websites significantly reduces students' ability to learn, remember, and apply content being taught at the same time*. Please save these activities for another time and make the most of your learning experience. Being caught using these other sites will result in a warning the first time, followed by grade reductions after that.

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: https://plnu.mywconline.com/
- Website: https://www.pointloma.edu/centers-institutes/loma-writing-center
- Email: writingcenter@pointloma.edu

Important Dates

Last day to add the class	01/17/2025
Last day to drop the class	01/24/2025
Last day to withdraw from the class	03/28/2025
Tentative exam dates	
Exam 1	02/19/2025
Exam 2	04/02/2025
BIO3052-1 Final	05/08/2025, Thursday, 7:30 am – 10:00 am
Holidays	01/20/2025, 03/10-14/2025, 04/17-21/2025

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

BIO3052 SP25 Course Schedule

Week	Week of (Mon)	Topic	Reading (Chapters in Garrison)	Notes
1	Thu, Jan 16, 2025	1. Introduction; grant proposal assignment (CANVAS) 2. In class: Biology literature searches 3. Expectation setting 4. Work on proposals (finding articles and narrowing topic)	Reader p. 1-14	
2	Thu, Jan 23, 2025	1. Prior to class: Scientific methods and research methods overview 2. In class: Reading articles efficiently 3. Work on proposals (Start thinking about your aims)	Reader p. 1-14	**General research proposal idea due by 1/23 (Canvas)**
3	Thu, Jan 30, 2025	1. Prior to class: Intro to bioinformatics 2. In class: Intro to bioinformatics 3. Work on proposal (background/significance and specific aims)	Intro to bioinformatics (CANVAS) Reader p. 15-31	
4	Thu, Feb 6, 2025	1. Prior to class: What's wrong with my child (continued) 2. In class: Chimera 3. Work on proposals (background/significance and specific aims)	Reader p. 15-31	
5	Thu, Feb 13, 2025	1. Prior to class: Genome sequencing and annotation 2. In class: JASPAR and Blast 3. Work on proposals (background/significance and specific aims)	Reader p. 32-54	**2/14/2025: No class (PLNU Presidential Inauguration)**
6	Thu, Feb 20, 2025	1. Prior to class: Major biological techniques associated with bioinformatics 2. In class: Analyzing data from figures of published articles 3. Draft of research proposal due on 2/22: Summary, intro, specific aims (Canvas)	Reader p. 32-54	**Draft of research proposal due on 2/22: Summary, intro, specific aims (Canvas)**
7	Thu, Feb 27, 2025	Mid-term exam		**Mid-term exam**
8	Thu, Mar 6, 2025	1. Prior to class: Hypothesis testing 2. In class: Work on proposals (Finding techniques to include in your proposals. Methods and description of how you will accomplish your aims)	Reader p. 73-89	
9	Thu, Mar 13, 2025	**Spring Break – No class**		**Spring Break – No class**
10	Thu, Mar 20, 2025	1. Prior to class: Testing for parametric data (Para vs. non-para; t- and z-tests) 2. In class: Complete the testing for parametric data homework	Reader p. 79-89	
11	Thu, Mar 27, 2025	1. Prior to class: Parametric statistics (Chi Square and ANOVAs) 2. In class: Help with parametric stats.	Reader p. 98-121	**Submit a draft of your full proposal for peer review.**
12	Thu, Apr 3, 2025	Asynchronous Peer-Reviews		**Research proposals due by 9:00am on 4/12 through Canvas (no exceptions).**
13	Thu, Apr 10, 2025	1. Non parametric data 2. In class: Prepare for study sections	Reader p. 122-126	
14	Thu, Apr 17, 2025	**EASTER BREAK - No lecture**		**Easter Recess – No Class on 4/17/25**
15	Thu, Apr 24, 2025	1. Study section I meets 8:30AM-11:00AM		**Easter Recess – No Class on 4/21/25**
16	Thu, May 1, 2025	1. Study section II meets 8:30AM-11:00AM		
17	Thu, May 8, 2025	**Finals Week**	**FINAL: BIO3052-1: 5/08/25, 7:30 am – 10:00 am**	**FINAL EXAM**