	Department of Biology
POINT LOMA NAZARENE UNIVERSITY	**BIO3052: Research Methodology Lecture/Lab (3 units)**
	Fall 2021

Meeting days: Thursday	**Instructor: Dr. Heidi Woelbern**
Meeting times: 8:00-11:00	**Phone: 619-849-2925**
Meeting location: Library computer lab, LW 213	**Email: heidiwoelbern@pointloma.edu**
Final Exam: 12/16/21 7:30AM	**Office location: Rohr Science 164**
Additional info: Reader from University Readers (ordering info on CANVAS). You must order and bring a copy with you to class.	**Office Hours: LINK** (select an appointment slot which will set up a meeting reminder for both of us)

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.

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.

Attendance: Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member has the option of filing a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Academic Policies in the Undergraduate Academic Catalog. *Attendance at all exams is required, unless you have a doctor's note excusing you.*

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.

Academic Accommodations: While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic accommodations. At Point Loma Nazarene University, these students are requested to file documentation during the first two weeks of the semester with the Academic Support Center (ASC), located in the Bond Academic Center. This policy assists the University in its commitment to full compliance with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. Once the student files documentation, the ASC will contact the student's instructors and provide written recommendations for reasonable and appropriate accommodations to meet the individual learning needs of the student.

The PLNU Disability Resource Center (DRC) can be reached by phone at 619-849-2486 or by e-mail at DRC@pointloma.edu. See Disability Resource Center for additional information. For more details see the PLNU catalog Accommodations.

Students with learning disabilities who may need accommodations should also discuss their needs with the instructor during the **first two weeks** of class.

Academic Honesty: 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. Faculty should follow and students may appeal using the procedure in the university Catalog. See Academic Policies for definitions of kinds of academic dishonesty and for further policy information.

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. In particular, all homeworks, assignments, and laboratories are owned by Drs. Kim and Woelbern, and may not be shared with other individuals or groups outside of the students registered for the BIO3052, Fall, 2021 section. It is a violation of copyright law to otherwise distribute these materials in any form.

FERPA Policy: In compliance with federal law, neither PLNU student ID nor social security number should be used in publicly posted grades or returned sets of assignments without student written permission. Also in compliance with FERPA, you will be the only person given information about your progress in this class unless you

have designated others to receive it in the "Information Release" section of the student portal. See [Policy Statements](#) in the (undergrad/ graduate as appropriate) academic catalog.

Grading: **(approximate; I reserve the right to adjust percentages as appropriate for how the course proceeds)**

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: 10/21, 8:00 am - Mid-term exam
12/16, 7:30 am - Final exam

Final examination policy: Successful completion of this class requires taking the final examination on its scheduled day. The final examination schedule is posted on CANVAS. NO requests for early examinations or alternative days will be approved.

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. **USE ME OFTEN FOR HELP, BUT DON'T EXPECT ME TO DO IT FOR YOU.** Further details and expectations will be given separately.

Tentative Schedule:

Week	Date	Topic	Textbook Reference
1	9/2	1. Prior to class: 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	9/9	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). **General research proposal idea due by 9/8 (Canvas)**	Reader p. 1-14.
3	9/16	1. Prior to class: Intro to bioinformatics (CANVAS) 2. What's wrong with my child (part 1) 3. In class: Intro to bioinformatics 4. Work on proposal (background/significance and specific aims)	Intro to bioinformatics (CANVAS) Reader p. 15-31.
4	9/23	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	9/30	1. Prior to class: Genome sequencing and annotation, JASPAR and whole genome browsers and start BLAST (do dot plots) 2. In class: Blast and sequence alignment 3. Work on proposals (background/significance and specific aims)	Reader p. 32-54.
6	10/7	1. Prior to class: Major biological techniques associated with bioinformatics (part I) 2. Proposal work day (No Class) 3. **Draft of research proposal due on 10/9: Summary, intro, specific aims (Canvas)**	Reader p. 32-54.
7	10/14	1. Prior to class: Major biological techniques (part II) 2. In class: Analyzing data from figures of published articles 3. Work on proposals (feedback/methods)	Lecture slides + CANVAS

Week	Date	Topic	Textbook Reference
8	10/21	1. **Mid-term exam** 2. Work on proposals (Finding techniques to include in your proposals. Methods and description of how you will accomplish your aims)	Reader p. 73-78.
9	10/28	1. Prior to class: Hypothesis testing 2. In class: Work on proposals	Reader p. 73-89.
10	11/4	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 3. Peer-Reviews In-Class. **You must bring a draft of your full proposal, with printed copy in class for peer review.**	Reader p. 79-89.
11	11/11	1. Prior to class: Parametric statistics (Chi Square and ANOVAs) 2. In class: Help with parametric stats. **Research proposals due by midnight on 11/11 through Canvas (no exceptions).**	Reader p. 98-121.
12	11/18	1. Non parametric data 2. In class: Prepare for study sections	Reader p. 122-126.
13	12/2	1. Study section I meets	
14	12/9	1. Study section II meets	

Final Exam 12/16 at 7:30am