POINT 1902 LOMA
NAZARENE UNIVERSITY

Bio 3012 Applied Plant Biology

Dr. Dianne Anderson **Spring 2022**

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 becomes an expression of faith. Being of Wesleyan heritage, we aspire to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

Course description and format

This course is designed to promote learning about the myriad of ways in which humans produce and use plants. The course lecture and lab activities are designed to provide multiple opportunities you to learn and to apply ideas and to learn how scientific inquiry is applied to problems in applied plant biology. Outside of class, you will have assigned readings to prepare for lab and discussion activities on Fridays. You are expected to do all assigned reading before class, and to come prepared to discuss the content for the day. Biology 2012 is a pre- or co-requisite for this course, so you will be expected to know basic concepts related to plant diversity as well as basic plant structure and function. The course is an upper division biology elective for biology and environmental science majors. (2 units)

BIO 3012 Applied Plant Biology (2 units) catalog description

A study of plant structure, function, and phytochemistry through an examination of economically and culturally important plants, including plants used for medicine, food, fuel, fiber, and building materials. Topics include environmental plant physiology, biotechnology, plant propagation, medicinal botany, and sustainable land use. Lecture, lab and fieldwork.

"Innovation in life science will be the major driver of meeting four major societal challenges: challenges of climate, challenges of food, challenges of energy, and challenges of health."
Phillip A. Sharp, Massachusetts Institute of Technology,
Co-chair, National Research Council Committee, A New Biology for the 21st Century

Course learning outcomes:

1. Distinguish between 1) possible benefits to the plant and 2) possible uses by humans for a variety of botanical structures and molecules.
2. Describe the roles of biotechnology, traditional plant breeding, innovative farming methods, and sustainable land use in meeting the needs of a growing world population.
4. Critique primary literature by identifying the research question, and analyzing the methods and results to determine if the conclusions are valid.
5. Develop questions related to overall course themes, then access and summarize appropriate resources to answer those questions, and report findings to the class.
6. Design an experiment, collect and analyze the data, then write up the experiment.
7. Describe how plants can be used for food, unique molecules including medicines, fuel, fiber, and wood.

Instructor office hours and contact information

dianneanderson@pointloma.edu Office: Rohr Science 146 Phone: 619-849-2705

Office hours: Tuesdays 1:00-3:00 and Thursdays 3:00-4:30

Class session schedule

Class will be held on Friday afternoons from 2:45-4:45 PM in Rohr Science 40 and the adjoining greenhouse.

Required resources for the course:

The Fate of Food: What We'll Eat in a Bigger, Hotter, Smarter World (2019)
by Amanda Little ISBN: 978-0804189033

Links to a variety of additional sources will be posted on Canvas.

Grading

Grades will be given on the basis of total points earned. Points are distributed as follows:

Syllabus verification		5 pts
Lecture/lab exams (2 @ 80 points each)		160 pts.
Lab summaries (10 pts. X 8 weeks)		80 pts.
Weekly reading assignments (5 pts. X 12 weeks)		60 pts.
Misc. homework and activities	approximately	45 pts.
Projects (4 @ 25 points each)		100 pts.
Research Presentation		100 pts.
	approximately	550 pts. total

Project information:

- Project #1 – Design, carry out, and analyze a **plant nutrition project** based on either a comparison of fertilizer types or concentrations.
- Project #2 - Design, carry out, and analyze a **medicinal botany project** based analyzing the antibacterial properties of various plants/spices.
- Project #3 - Complete a class-related **service project** (2-3 hours) to benefit someone else and submit a brief written summary as well as before and after pictures (1-2 pages)
- Project #4 – Complete a **landscape design project** as a horticultural therapy space to benefit a particular population (such as dementia patients, inmates, patients/families at a children's hospital)

Research Presentation:

Prepare and present a **summary of current research** (at least three research articles) on a topic related to applied plant biology, then propose a line of research to extend the work.

Exams:

You are expected to take the exams on the days scheduled unless you have an excuse cleared by me no later than the Friday preceding the exam. If something unexpected happens, we will make appropriate arrangements at that time. Makeup exams may not be the same as the original and will generally be more difficult in nature. Un-excused misses will result in a zero grade.

Final exam policy: All students are required to take the final exam for the course on the day and at the time on the PLNU final exam schedule.

Grade calculation

A 92-100%	A- 90-91%	B+ 88-89%	B 82-87%	B- 80-81%	C+ 78-79%
C 72-77%	C- 70-71%	D+ 68-69%	D 62-67%	D- 60-61%	F 59% or lower

Attendance, participation, and cooperation

Class attendance is mandatory. Poor attendance tends to correlate with low grades. Please communicate regarding any planned absences. Since the class only meets once a week, at 2 absences, I must contact the Vice-Provost for Academic Administration, and you will be dropped from the course unless there is an exception granted by the administration.

Note these important dates:
March 12, 2022 is the last day to add BIO 3012.
May 7, 2022 is the last day to drop BIO 3012.

In an effect to create the best learning environment possible, all students should work in groups when asked to do so. I will often assign groups, and I may shuffle the groups several times during the semester. You may be surprised how much you can learn from one another, especially from people who you may not have chosen to work with on your own.

Cell phones must be muted/on vibrate during class. Only in cases of emergency should you leave class to take a phone call, unless the lab is on a break. Please, NO texting during class as it distracts both you and people around you. **It is important that you bring both your required book and computer with you to each class if at all possible, as you will be using both in almost every class session.**

Coronavirus-Related Safety Requirements

1. A face mask must be worn properly in the laboratory at ALL times. This will be strictly enforced! If you forget your mask, you will be sent home to retrieve it. Your face mask should completely cover both your nose and mouth at all times. Do NOT let your mask sag below your nose or mouth and become a chin strap.
2. Absolutely NO consumption of food (including gum) or beverages within the lab, since this would require removing your mask. You MUST leave the lab classroom and go outside to take a drink from a closed container.
3. Tables will be sanitized at the end of each lab.
4. It is strongly suggested that you wash your hands multiple times each day.

GENERAL PLNU POLICIES

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 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. 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 ACADEMIC ACCOMMODATIONS POLICY

PLNU is committed to providing equal opportunity for participation in all its programs, services, and activities. 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 issue an academic accommodation plan ("AP") to all faculty who teach courses in which the student is enrolled each semester.

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 and/or if they do not wish to utilize some or all of the elements of their AP in that course. 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.

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 drop date or, after that date, receive the appropriate grade for their work and participation.

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 students have questions, a desire to meet with the chaplain or have prayer requests you can contact the Office of Spiritual Development.

BIO 3012 Class schedule – Spring 2022 (subject to change)

Additional reading assignments, assignment details, and due dates available on Canvas

Week	Date	In-class Topics and activities	Projects due
1	Jan. 14	**Intro to BIO 3012** **Plant nutrition Part I: Root structure & function** Expectations for assignments: rubrics & APA formatting Lab: Root examination and Plant nutrition experiment Demo: repotting houseplants	
2	Jan. 21	**Plant nutrition Part II: Soils** Lab: Soil composition (mineral components and nutrients) Lab: Radish germination observations, set up plant nutrition experiment & composting boxes	
3	Jan. 28	**Plant Production Part I: Organic vs. conventional vs. sustainable practice farming** Irrigation systems on campus Lab: Impact of abiotic factors on photosynthesis	
4	Feb. 4	**Plant Production Part II: Alternative methods of farming** Lab: Comparison of deep-water culture, aeroponics and growing in soil.	
5	Feb. 11	**Plant pathology** Lab: Plant pathology	**Farmer's Market assignment due**
6	Feb. 18	**Plant varieties and Plant propagation** GM database activity Lab: Tomato grafting & Apple tasting	
7	Feb. 25	Collect and dry plants for medicinal botany labs **Exam #1**	
8	Mar. 4	**Phytoremediation & horticultural therapy using landscape design** Lab: Design a garden for a specific population Harvest and analyze plant nutrition experiment	**Service project due**
	Mar. 11	**Spring Break – no class**	
9	Mar. 18	**Plants as a source of unique molecules – Part I** Lab: Medicinal Botany Part I	**Plant nutrition project due**
10	Mar. 25	**Plants as a source of unique molecules – Part II** Lab: Medicinal botany results	**Landscape Design project due**
11	Apr. 1	**Plants as a source of food** Lab: Growing microgreens and extending shelf life	**Medicinal botany project due**
12	Apr. 8	**Plants as a source of wood** Lab: Wood structure and uses	
	Apr. 15	**Easter Break – no class**	
13	Apr. 22	**Plants as a source of fiber and fuel** Lab: Fiber structure and uses	
14	Apr. 29	Research presentations Field trip to Andersen Nursery	**Research project due**
15	May 2	**Exam #2 – MONDAY, MAY 2 1:30-4:00**	