

**Biology 3015: Microbiology (3 units)**  
**Point Loma Nazarene University**  
**Department of Biology**  
**Fall 2019**

*Blessed are those who have not seen and yet have believed. John 20:29*

<u>Instructor:</u>	Dr. Dave Cummings (x2642, davidcummings@pointloma.edu)
<u>Lab assistant:</u>	Jenna Moses (jennamoses1120@pointloma.edu)
<u>Lecture time/place:</u>	M/W/F, 11:00-11:55 am, Ryan Learning Center room 102
<u>Lab time/place:</u>	TH 1:30-4:30, Sator Hall lab 105
<u>Book options:</u>	(1) Hardcopy text: Brock <i>Biology of Microorganisms</i> , 15th ed. (Madigan, 2018; ISBN: 978-0-134-26192-8) OR (2) E-Text with Study Tools: See separate registration instructions
<u>Office hours:</u>	Mon and Wed 2-4 pm or by appointment (Rohr Science room 176)

**Catalog course description:** An in-depth exploration of the world of microscopic organisms, including their diversity, physiology, biochemistry and ecology. Emphasis is on prokaryotes, but also some discussion of microscopic eukaryotes and viruses. Lecture and lab. Offered every year.

Prerequisite(s): BIO 210 and BIO 345.

**Learning objectives:** The primary objective of this course is to familiarize the Biology student with the world of microorganisms with an emphasis on the domain *Bacteria*. We will begin with fundamental concepts of microbiology followed by focused discussions of medical microbiology, immunology, and the human microbiome.

**Specific course learning outcomes (CLOs):** By the end of this course, students will be able to

1. describe the physical structure, function, and physiology of *Bacteria*, eukaryotic pathogens, and viruses;
2. explain the ways in which *Bacteria* cause disease and resist antibiotics;
3. interpret clinical data to diagnose an infection;
4. analyze and interpret modern research into the human microbiome;
5. apply the basic laboratory skills necessary to study living microorganisms to an original research project.

**Assessment and grading:** A total of 575 points are possible: 450 in lecture and another 125 in lab.

**Exams (350 points)** – There will be three exams, including the final, in this course. Each exam will consist of various question types (multiple choice, fill-in-the-blank, short answer) to assess your retention of basic facts and concepts as well as your ability to apply them. The first two exams are worth 100 points each, and exam 3 will be worth 150 points and will cover 50% old and 50% new content. Students are responsible for all of the material covered in class. If you have a legitimate conflict with an exam date/time, you must let the instructor know prior to the week of the exam to make arrangements for a makeup exam. Exam dates are firm - please make your plans accordingly. Missed exams cannot be made up without prior instructor approval. If you have more than two final exams scheduled on the same day as our final you may be eligible to re-schedule, but you must inform the instructor no later than November 30.

**Homework (100 points)** – Weekly homework will be assigned worth 10 points each with the lowest score being dropped. These will be due each Wednesday except on exam days or holidays. You are welcome to work on these together, but you must each turn in your own assignment, *written in your own words*. Any two homework assignments that are identical will receive a grade of zero. Never turn in answers that you do not personally understand.

**Laboratory experience (125 points)** – An essential part of any microbiology curriculum is hands-on experience working with microorganisms. The BIO3015 lab is designed to expose the science student to some of the essential tools of the microbiologist in a safe, controlled environment. Furthermore, BIO3015 students will gain *bona fide* research experience, working on a unique project of their own throughout the semester. See details below.

**Point distribution**

3 Exams	350 points
Homework	100 points
Laboratory activities	125 points
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TOTAL	575 possible points

**Grading scale**

<u>Percentage range</u>	<u>Letter grade earned</u>
92-100%	A
90-91%	A-
88-89%	B+
82-87%	B
80-81%	B-
78-79%	C+
72-77%	C
70-71%	C-
68-69%	D+
62-67%	D
60-61%	D-
≤ 59%	F

\*NOTE: Final percentages will be rounded to the nearest whole number and the letter grade assigned will be non-negotiable.

Approximate lecture schedule:

<b>Date</b>	<b>Topic</b>	<b>Chapter</b>	<b>Homework</b>
W 9/4	Introduction to microbiology		
F 9/6	Pathogen structure and function <ul style="list-style-type: none"> <li>• Viruses</li> <li>• Fungi, protozoa, helminths</li> <li>• Bacteria</li> </ul>	2.1, 2.3-2.11, 2.14-2.16, 8.1-8.3, 8.5-8.8	
M 9/9			
W 9/11			HW1
M 9/16			
W 9/18	Bacterial metabolism <ul style="list-style-type: none"> <li>• Aerobic respiration</li> <li>• Anaerobic respiration</li> <li>• Fermentation</li> </ul>	3.2-3.12	HW2
F 9/20			
M 9/23			
W 9/25			HW3
M 9/30	Bacterial growth <ul style="list-style-type: none"> <li>• Batch growth</li> <li>• Continuous culture</li> <li>• Biofilms</li> </ul>	5.1-5.4, 5.9-5.17, 7.9, 20.4	
W 10/2			HW4
F 10/4			
M 10/7			
<b>W 10/9</b>	<b>Exam 1</b>		
M 10/14	Mobile genetic elements <ul style="list-style-type: none"> <li>• Plasmids</li> <li>• Insertion sequences</li> <li>• Transposons</li> <li>• Integrons</li> </ul>	4.2, 9.6, 11.6-11.8, 11.11	
W 10/16			HW5
F 10/18			
M 10/21			
W 10/23	Antibiotics and resistance <ul style="list-style-type: none"> <li>• Mechanisms of action</li> <li>• Mechanisms of resistance</li> </ul>	7.10, 28.4, 28.10, 28.12	HW6
M 10/28			
W 10/30			HW7
F 11/1			
M 11/4	Virulence factors <ul style="list-style-type: none"> <li>• Structures</li> <li>• Proteins</li> </ul>	25.1-25.3, 25.5-25.8	
W 11/6			HW8
M 11/11			
W 11/13			
<b>F 11/15</b>	<b>Exam 2</b>		
M 11/18	The immune response <ul style="list-style-type: none"> <li>• Innate immunity</li> <li>• Adaptive immunity</li> </ul>	26.1-26.3, 26.5-26.8, 26.10, 27.1-27.3, 27.5, 27.7-27.8,	
W 11/20			HW9
M 11/25			
M 12/2			
W 12/4	The human microbiome <ul style="list-style-type: none"> <li>• Normal microbiota</li> <li>• Dysbiosis and disease</li> </ul>	24.1-24.11	HW10
F 12/6			
M 12/9			
W 12/11			HW11
F 12/13	Optional review session		
<b>W 12/18</b>	<b>Final Exam (50% cumulative)</b> <b>(10:30 am - 1 pm)</b>		

## **BIO3015 Lab**

The specific course learning outcome (CLO) of the lab is to be able to apply the basic laboratory skills necessary to study living microorganisms to an original research project. Specific objectives include:

1. good aseptic technique;
2. skills and knowledge to culture bacteria in various media;
3. critical thinking skills necessary to carry out research in microbiology;
4. maintaining a good lab notebook.

Overview and grades: The BIO3015 lab is organized more like a research lab than a teaching lab. Students will learn fundamental microbiology lab techniques in the context of a bona fide research project. There will be assigned reading, and attendance and participation each week are required, but there will be no weekly quizzes, worksheets, or lab reports to turn in. Instead, students will spend the semester learning about their project, carrying out the research, and learning principles of microbiology in the process. At the end of the semester, each team will prepare and present a poster describing their project and results at a mini-conference. Students will keep a detailed lab notebook which they will need to use as a resource each week in lab. Lab is worth 125 points.

**Lab notebook (25 pts)** – Each student is required to keep a lab notebook throughout the semester, which will be graded at the end of the semester. See guidelines and rubric on Canvas.

**Poster presentation (50 pts)** – Each team will present the findings of their research project in poster format at a mini-conference to be held at the end of the semester. Various judges will score you out of 50 pts and you will receive the average of the scores. See rubric on Canvas.

**Lab participation and attitude (50 pts)** – Your consistent participation in lab is essential to the group's success and will be graded. Your peers and the instructor will grade you based on your attitude and intellectual and technical contribution, and your final score will be an average of them all. See rubric on Canvas.

Lab attendance: Unexcused lab absences will cost you 10 points from your lab grade as will multiple late arrivals or early departures. Your lab mates need you! More than three unexcused absences and you will receive no credit (NC) for the lab and an incomplete (I) for the course.

Lab grade distribution (125 pts total):

1. Thorough and complete lab notebook (25 pts) [see rubric]
2. Average score of your poster presentation (50 pts) [see rubric]
3. Average evaluation of your participation on the team (50 pts) [see rubric]

Assigned teams:

1 – Avila, Glendrange, Leiter, Fuentabella  
2 – Besser, Scheer, Hale, Baas  
3 – Mazza, Martinez, Jones, Bolock

4 – Bruno, Pritchett, Gutierrez, Herring  
5 – Falkenberg, Flores, Cornelius, Holley  
6 – Burroughs, Harrelson, Phillips, Owen

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## **Additional information**

### **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.

**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.

If you have a diagnosed disability, please contact PLNU's Disability Resource Center (DRC) to demonstrate need and to register for accommodation by phone at 619-849-2486 or by e-mail at [DRC@pointloma.edu](mailto:DRC@pointloma.edu). See [Disability Resource Center](#) for additional information. 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. As explained in the university catalog, 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. Violations of university academic honesty include cheating, plagiarism, falsification, aiding the academic dishonesty of others, or malicious misuse of university resources. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for a) that particular assignment or examination, and/or b) the course following the procedure in the university catalog. Students may appeal also using the procedure in the university catalog. See Academic Policies for further information.

**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. This class will meet the federal requirements by distributing graded work individually and posting grades securely in Canvas. 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 academic catalog.

**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. No requests for early examinations or alternative days will be approved.

**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 attendance and participation policy:** 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 can file 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** of all lectures and lab sessions is required; role will be taken during the first 5 minutes of class; late arrival counts as a half absence (as does early departure). Because lab sessions are 3 hours, missing a lab counts as 2 absences. A total of three *unexcused* absences will be permissible. More than three absences will result in forfeiture of two percentage points per absence from your final grade unless documentation of a valid excuse is provided (see below). **Three weeks of absences (9 lectures or 3 labs) for any reason, excused or unexcused, will result in de-enrollment from the course, according to University policy.** Missed in-class assignments, including iClicker quizzes, cannot be made up without prior instructor approval or documentation of a legitimate excuse.

**Excused absences** are those that result from situations beyond the control of the student. These include (but are not limited to) personal illness, serious family illness or death, delayed flights, and sanctioned University events (athletics, debate team, etc.). Excused absences require some formal documentation such as a doctor's note, email from a coach, etc. Documentation must be provided directly to the instructor. Work done on a day for which you have an excused absence can be made up in a reasonable amount of time at the instructor's discretion.

**Unexcused absences** are those that are preventable by the student or are recreational in nature. These include (but are not limited to) oversleeping, forgetting to come to class, attending family functions (weddings, family trips, etc.), and personal leave days. Work performed on days for which you have an unexcused absence cannot be made up and points are forfeited. You are allowed no more than 3 unexcused absences before you begin to lose points from your final course grade.

**\*\*Please do not come to class if you are currently sick or have had a fever within the last 24 hours.**

**Respect** for one another and for the instructor is essential for an effective classroom environment. You are expected to show respect to your classmates and instructors by:

- listening when others are speaking,
- refraining from discussing non-related issues during class,
- not belittling the opinions of others, even when you disagree.,
- refraining from texting, etc. during class.

**Cell phones** must be silenced before class begins. Texting is distracting to the instructor and other students. Please wait until after class or lab finishes to text.

**Laptop computers** are not allowed during class unless you have a documented learning disability that requires it.