POINT 1902 LOMA
NAZARENE UNIVERSITY

Department of Biology

School of STEM

BIO2020: Microbiology of Infectious Diseases with Lab

Lecture section 2, Lab sections 2 and 3

Lecture (3 units) + Lab (1 unit)

Spring 2026

Meeting location: Taylor 312 (lecture), Sator 105 (lab)

Meeting days/times: MWF: 12:15 – 1:10 pm (lecture)

T: 9 am – 12 pm (lab section 2)

T: 1:30 – 4:30 pm (lab section 3)

Final Exam: F: 10:30 am – 1:00 pm

Instructor title and name:	Dr. David Cummings, Professor of Biology
Email:	davidcummings@pointloma.edu
Office location and hours:	Mondays 2:00 – 4:00 pm Tuesdays 12:00 – 1:30 pm OR by appointment Rohr Science 176

COURSE DESCRIPTION

A study of microbial physiology, the diseases associated with infections by certain pathogenic microbes, and the vertebrate response to microbial infections. Topics will include bacteria, viruses, algae, fungi, and protozoa. Does not apply toward the Biology major. Lecture and lab. Offered every year.

Prerequisite(s): CHE1003 (or CHE1052); BIO1040 (may be taken concurrently).

COURSE LEARNING OUTCOMES

The unifying theme of this course is pathogenesis, the detrimental interactions between microorganisms and their human hosts. Our main objectives will be to understand what pathogenic microorganisms are, how they cause disease, and how we may be able to control them.

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

- evaluate microbial structure, metabolism, and genetics to explain growth, adaptation, and survival in diverse environments.
- analyze and compare prokaryotic, eukaryotic, and viral systems, assessing how their biological features influence pathogenicity and clinical outcomes.
- assess mechanisms of infection, transmission, and virulence, integrating host–pathogen interactions across different microbial groups.
- evaluate antimicrobial strategies and resistance mechanisms, applying evidence-based reasoning to therapeutic decision-making.
- synthesize microbiological concepts through clinical case studies to support conclusions related to diagnosis, treatment, prevention, and immune responses.
- perform and interpret fundamental microbiology laboratory techniques to analyze microbial characteristics.

REQUIRED BOOKS AND MOBILE APP

(1) *Microbiology with Diseases by Taxonomy,* 6th ed. E-Text (not including Mastering) is required.
(2) *Follow Your Gut*. Rob Knight, Simon & Schuster, 2015. Hard copy. ISBN 978-1476784748
(3) *Sanford Guide to Antimicrobial Therapy* app (not the booklet).

ASSESSMENT AND GRADING

A total of 800 points are possible in Microbiology of Infectious Diseases: 645 points in lecture and another 155 points in lab. Both lecture and lab grades will be combined into a single course grade that will be applied to both lecture and lab in your final transcript. Your final grade will be non-negotiable (unless an error was made in grading one or more assignments).

Exams (504 points) – There will be four exams, including the final, in this course, each worth 126 points. Exam questions will be focused on material from lecture (as opposed to lab). Exams 2 and 3 will be cumulative, with approximately 20% of the points coming from questions associated with the previous chapters (*i.e.*, those on which you have already been tested). The final exam will cover approximately 50% new content and 50% cumulative material covering the entire semester. If you have a legitimate conflict with an exam date/time, you must inform the instructor prior to the week of the exam to arrange for a makeup exam. Students are responsible for all in-class lecture material, video lecture content, and everything assigned on the reading guides, whether it is covered in class or not.

Homework (100 points) – Weekly homework will be assigned to help you learn the content and concepts of the course (10 points each). Due dates can be found in the course schedule posted here and on Canvas.

Chemistry review quiz (10 points) – Chemistry is an important pre-requisite course for BIO2020. To ensure that you remember basic chemistry terminology and principles, you will be given a quiz early in the semester. The instructor will inform you in advance of the topics you can expect on the quiz.

Case studies (30 points) – Learning infectious disease principles in context can be a powerful way to ensure retention of the material. At three strategic points in the semester, students will be assigned a case study describing a real infection. All of class time on the due date will be dedicated to discussion, and two or three questions from the case studies will be found on the exams.

Laboratory experience (155 points) – The BIO2020 lab is designed to expose the student to some of the essential tools of the microbiologist in a safe, controlled environment. More details can be found below.

Point breakdown

Exams (4)	504 points (63%)
Homework assignments (10)	100 points (12.5%)
Chemistry review quiz (1)	10 points (1.25%)
Case studies (3)	30 points (3.75%)
Laboratory activities	155 points (19.375%)
Honesty signature (1)	1 point (0.125%)
TOTAL	800 possible points

Grade Scale Based on Percentages

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

LECTURE TOPICS AND SCHEDULE

Date	Topic	Reading	Videos	Other
M 1/12	Introduction to Microbiology			
W 1/14	Eukaryotic cells	Ch3: External structures of Eukaryotic cells, Eukaryotic cell walls and cytoplasmic membranes, Cytoplasm of eukaryotes	Episode 6	
F 1/16	Gram types (+/-) Bacterial morphology and arrangement	Ch3: Bacterial cell walls Ch11: General characteristics of prokaryotic organisms	Episode 17 Episodes 11-12	Chemistry quiz (Ch2) (12:15 pm) Honesty signature (12:15 pm)
W 1/21	Bacterial cells	Ch3: Prokaryotic and eukaryotic cells: an overview, External structures of bacterial cells, Bacterial cytoplasmic membranes, Cytoplasm of bacteria	Episodes 10, 13-16	Build-A-Bacterium activity in class
F 1/23	Enzymes and energy	Ch5: Basic chemical reactions underlying metabolism		HW1 (11:59 pm)
M 1/26	Glycolysis, PDH, Krebs	Ch5: Carbohydrate catabolism (not ETC)	Episodes 18-20 (not ETC)	
W 1/28	Electron transport chain	Ch5: Carbohydrate catabolism (ETC)	Episode 20 (ETC)	
F 1/30	Anaerobic respiration and fermentation	Ch5: Carbohydrate catabolism (fermentation)	Episodes 21-22	HW2 (11:59 pm)
M 2/2	Microbial nutrition	Ch6: Growth requirements	Episodes 23-25	
W 2/4	Microbial growth	Ch6: Phases of microbial population growth	Episode 26	
F 2/6	UTI case study	Case study documents on Canvas		HW3 (11:59 pm) Definitions (12:15 pm) Group worksheet (11:59 pm)
M 2/9	**EXAM 1 (126 points)**			
W 2/11	Review exam 1 DNA replication	Ch7: The structure and replication of genomes	Episode 31	
F 2/13	Gene expression: transcription and translation	Ch7: Gene function	Episodes 32-33	HW4 (11:59 pm)
M 2/16	Horizontal gene transfer: transformation, transduction	Ch7: Horizontal gene transfer among prokaryotes (transformation, transduction)	Episode 34 (transformation, transduction)	

W 2/18	Horizontal gene transfer: conjugation Mobile genetic elements: insertion sequences, transposons, integrons	Ch7: Horizontal gene transfer among prokaryotes (conjugation), Transposons and transposition	Episode 34 (conjugation)	In-class worksheet: conjugation in the lab
F 2/20	Bacterial pathogens	Ch19: Staphylococcus, Streptococcus, Clostridia Ch20: The Enterobacteriaceae: an overview, Coliform opportunistic Enterobacteriaceae, Noncoliform opportunistic Enterobacteriaceae, Truly pathogenic Enterobacteriaceae	Episodes 27-30 Episodes 69-70	HW5 (11:59 pm) In-class worksheets: Gram-positive pathogens, Enterobacteria
M 2/23	Antibiotics	Ch10: Mechanisms of antimicrobial action	Episodes 35-37	
W 2/25	Antibiotic resistance	Ch10: Resistance to antimicrobial drugs	Episodes 38-40	
F 2/27	Considerations when prescribing antibiotics	Ch10: Clinical considerations in prescribing antimicrobial drugs		HW6 (11:59 pm)
M 3/2	RTI case study	Case study documents on Canvas		Definitions (12:15 pm) Group worksheet (11:59 pm)
W 3/4	**EXAM 2 (126 points, 20% cumulative, Sanford Guide)**			
F 3/6	Exam 2 review			
M 3/16	Virus structure	Ch13: Characteristics of viruses	Episodes 41-44	
W 3/18	Virus life cycles	Ch13: Viral replication	Episodes 45-46	
F 3/20	Phages vs human viruses			HW7 (11:59 pm) In-class worksheet
M 3/23	Influenza SARS-CoV-2 /COVID19	Ch25: Influenza, Diseases of coronaviruses	Episodes 50-52, 71-72	In-class worksheet
W 3/25	Eukaryotes: algae and fungi	Ch12: Algae Ch22: Pathogenic fungi	 Episode 7	
F 3/27	Eukaryotes: protozoa and helminths	Ch23: Protozoan parasites of humans, Helminthic parasites of humans	Episodes 8-9	HW8 (11:59 pm)

M 3/30	Infection process and principles	Ch14: Symbiotic relationships between microbes and their hosts, Reservoirs of infectious diseases of humans, The invasion and establishment of microbes in hosts	Episode 53	
W 4/1	Virulence factors	Ch14: The nature of infectious diseases, The movement of pathogens out of hosts	Episodes 54-56	
W 4/8	Virulence factors			Clinical vignettes
F 4/10	Transmission	Ch14: Modes of infectious disease transmission	Episode 57	HW9 (11:59 pm)
M 4/13	Transmission	Ch14: Classification of infectious diseases, Epidemiology of infectious diseases		Clinical vignettes
W 4/15	**EXAM 3 (126 points, 20% cumulative, Sanford Guide)**			
F 4/17	Review exam 3 Immune system overview	Ch15: An overview of the body's defenses	Immune system animation	
M 4/20	Innate immunity – first line	Ch15: The body's first line of defense	Episodes 58-59	
W 4/22	Innate immunity – second line	Ch15: The body's second line of defense	Episodes 60-62	
F 4/24	Adaptive immunity – T cells	Ch16: Overview of adaptive immunity, Elements of adaptive immunity, Cell-mediated immune response	Episode 63-66	
M 4/27	Adaptive immunity – B cells	Ch16: Antibody immune response	Episode 67	
W 4/29	Adaptive immunity - vaccines	Ch16: Types of acquired immunity Ch17: Vaccine types	Episode 68	
F 5/1	Final exam review			HW10 (11:59 pm)

LAB LEARNING OUTCOMES

The goal of the Microbiology Lab is to expose students to the hands-on work of a clinical microbiologist in a safe learning environment.

Specific lab learning outcomes: By the end of the semester, students will be able to

- Manipulate bacteria using aseptic technique;
- Perform streak plates, spread plates, and viable plate counts;
- Apply physical and chemical means of microbial control;
- Use a compound light microscope to view bacteria;
- Carry out antimicrobial susceptibility testing;
- Diagnose an oral infection and recommend appropriate antibiotic therapy.

ASSESSMENT AND GRADING

A total of 800 points are possible in Microbiology of Infectious Diseases: 645 points in lecture and another 155 points in lab. Both lecture and lab grades will be combined into a single course grade that will be applied to both lecture and lab in your final transcript.

Lab reports (80 points). After each of the labs is complete, you will turn in a lab report with your partner. Each pair must turn in their own lab report – identical answers between teams will be given a grade of zero. There are six 10-point lab reports. In lieu of a lab practical, the final lab activity, which each student will do on his/her own, is three weeks long and worth 20 points.

Weekly quizzes (35 points). A 5-question, 5-point quiz will be given at the beginning of each regular lab period; quizzes missed because of tardiness cannot be made up. The focus will be on the assigned preparation for the week (see schedule below). The lowest quiz grade will be dropped.

***Follow Your Gut* (40 points).** One 20-point quiz will be given covering this short book by Rob Knight. This is an open-book quiz, but there will be a time limit of 1 hour, so thorough preparation is essential. The goal is not to *memorize* what you read, but to *understand* it. The additional 20 points will come from an infographic you and your partner will create on the gut microbiome. Additional instructions will be provided in lab.

LAB ASSIGNMENTS AND GRADES

Labs 1-6 (10 pts ea)	60 pts
Lab 7	20 pts
Quizzes 1-8 (5 pts ea, drop lowest)	35 pts
Follow Your Gut quiz	20 pts
Follow Your Gut infographic	20 pts
TOTAL	**155 pts**

LAB SCHEDULE

Date	Lab topic	Comments
Jan 12-16	**FIRST WEEK OF CLASS**	**NO MICROBIOLOGY LABS**
Jan 19-23	Lab 1: Contamination and aseptic technique	Quiz 1
Jan 26-30	Lab 2: Isolation of individual species	Quiz 2 Lab report 1 due by midnight
Feb 2-6	**EXAM WEEK**	**NO MICROBIOLOGY LABS**
Feb 9-13	Lab 3: Physical controls on microbial growth	Quiz 3 Lab report 2 due by midnight
Feb 16-20	Lab 4: Chemical controls on microbial growth	Quiz 4 Lab report 3 due by midnight
Feb 23-27	Lab 5: The compound light microscope	Quiz 5 Lab reports 4 & 5 due by midnight
March 2-6	**EXAM WEEK**	**NO MICROBIOLOGY LABS**
March 9-14	**SPRING BREAK**	**NO MICROBIOLOGY LABS**
March 16-20	Lab 6: Staining bacteria	Quiz 6 Lab report 6 due by midnight
March 23-27	Lab 7: Diagnostic testing	Quiz 7
March 30 - April 3	**EASTER BREAK**	**NO MICROBIOLOGY LABS**
April 6-10	Lab 7: Diagnostic testing	Quiz 8
April 13-17	**EXAM WEEK**	**NO MICROBIOLOGY LABS**
April 20-24	Lab 7: Diagnostic testing	*Follow Your Gut* quiz Intro to infographic Lab report 7 due by midnight
April 27 -May 1	Gut week: GITI case study and gut microbiome infographic	Infographic due before the start of lab Definitions due before lab, worksheet due by midnight

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 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 four-unit class 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 150 total hours meeting the course learning outcomes. The time estimations are provided in the Canvas modules.

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.

Incompletes and Late Assignments

All assignments are to be submitted/turned in by the indicated due date and time, including assignments posted in Canvas. Exceptions will only be granted 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 prayer requests, you can contact your professor or the Office of Student 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 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. 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.

Artificial Intelligence (AI) Policy
Use of Artificial Intelligence (AI) tools (*e.g.*, ChatGPT, iA Writer, Marmot, Botowski) is not permitted, and use of these tools will be treated as plagiarism.

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 drop date or, after that date, receive an "F" grade.

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.