



Lahore University of Management Sciences

BIO314 – Microbiology and Virology Spring 2024

Instructor	Shaper Mirza
Room No.	9-318A
Office Hours	Monday and Wednesday 2-3 pm
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Secretary/TA	Nida Javaid
TA Office Hours	No
Course URL (if any)	

Course Teaching Methodology (Please mention following details in plain text)

- Teaching Methodology: synchronous or asynchronous or a blend of both - Blend of both. A one-hour lecture will be given to all students followed by 15 min group discussion in groups of 5 students. Each group will be lead by a TA. Instructor will visit each group
- Lecture details: Percentage of recorded and live interaction lectures- 40% recorded and 60% inclass. This is subject to change depending on how students respond to live online vs recorded lectures.

Course Basics

Credit Hours	3			
Lecture(s)	2Lec(s) Per Week		75 min	
Recitation/Lab (per week)	0		0	
Tutorial (per week)	2 tutorials Per Week		15-20 min	

Course Distribution

Core	Core
Elective	-
Open for Student Category	Junior and Senior Year Students
Close for Student Category	

COURSE DESCRIPTION

Lecture Series: The goal of this course is to provide a strong foundation for advanced microbiology course by familiarizing students with knowledge of bacteriology and virology. Microbiology is an exciting discipline with far-reaching impacts in human health and disease. This course will focus on the study of microbes in particular bacteria and viruses and their interrelationship with human disease. Understanding these relationships is essential in order to develop interventions to prevent infections in a community. The first quarter of the course will cover the basic principals of bacteriology including bacterial structure, growth, metabolism, genetics and general concepts of bacterial disease mechanisms. In the second quarter we will draw on the basic principals learned in the first quarter of the semester to understand bacteriology as it relates to human health and human disease. More precisely, the course will cover mechanism of disease and drug resistance and State-of-the-art technologies developed to understand pathogenesis. The next half of the course focus will be on viruses, another important pathogen that causes significant burden of disease every year. Globally viral infections kill approximately 2 million individuals every year. The higher burden of infections and fatalities caused by viruses are the result of their intrinsic diversity, which makes it difficult to treat and prevent viral infections. This part of the course will follow the same design as the part on bacteriology. However, in the next half the course will be focused on basic understanding of viral structures, assembly, replication, types of viruses, viral pathogenesis and finally vaccines.

COURSE PREREQUISITE(S)



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•	BIO 216
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COURSE OBJECTIVES

• • •	Major objectives of the course are Develop a series of lectures to increase awareness and appreciation for microorganisms and their relationship to human health and disease
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Learning Outcomes

• • •	Lectures: Students will be able to achieve the following from lectures <ul style="list-style-type: none">• Understand pathophysiology of viruses and bacteria important to human health• Be able to describe structure of bacterial and viral cells, the form, arrangement, and replication of genetic material• Distinguish between mechanism of pathogenesis caused by viruses and bacteria.• Appreciate the barriers that are used by the host to resist bacterial pathogen, the mechanism whereby innate and adaptive immunity provide protection against infectious agents and the role of vaccines in protection of host from infection
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Grading break up: Component Details and weightages

Assignment(s): Total weightage = 10%. Two assignments, which will include a project on one of the most important question of pathogenesis and critical review of a paper

Home Work: -None

Quiz(s): Total weightage = 20%. A total of 4 quizzes will be administered two before Midterms and two before Final exam

Class Participation: Total weightage = 5%. This will include active participation in class, attendance and participation in tutorials

Attendance:-None

Midterm Examination: 25% will include material from lectures

Project: -None

Final Examination: 30%will include material from lectures

(please add plain text)

Examination Detail

Midterm Exam	Yes/No: Yes Combine Separate: Combine Duration: 3 hours Preferred Date:- Exam Specifications: MCQs, short answers and problems
Final Exam	Yes/No:- yes Combine Separate:- Combine Duration:- 3 hours Exam Specifications:- MCQ, short answers and problems

COURSE OVERVIEW



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Week/ Lecture/ Module	Topics	Recommended Readings	Objectives/ Application
Week 1	Principals of Scientific integrity Fundamentals of Virology <ul style="list-style-type: none"> • Viral history/physiology/classification • Molecular biology • Structure • Attachment and entry cycle • 	Reading material provided inclass Jane Flint –Chapter -5 pg 24-153	Introduction to fundamental concepts in virology. Study of viral structure, viral classification and viral life cycle. This information is critical for viral culture and viral identification
Week 2	Viral genome replication <ul style="list-style-type: none"> • Synthesis of RNA from RNA template • Synthesis of RNA from DNA template • Reverse transcription and integration • Processing of viral pre-mRNA • Replication of DNA • Production of small RNA that interfere host gene expression QUIZ-1	Reading material Jane Flint-6-9 Pg157-266	Understand the diversity in mechanism of genome replication. As viruses can have either DNA or RNA and in nucleic acids viruses can either have a positive or a negative strand, this lecture will provide background into how viruses synthesize their nucleic acids.
Week 3	Viral assembly <ul style="list-style-type: none"> • Assembly of icosahedral viruses • Assembly of helical viruses 	Principals of virology S.J Flint, Facaniello III Edition	Finally this series of lecture will be concluded by viral assembly and release
Week 4	Viral Infections <ul style="list-style-type: none"> • Infections by RNA viruses • Infections by DNA viruses • Recurrent viral infections QUIZ-2		Some infections of human importance caused by negative strand viruses will be discussed. Infections of public health relevance caused by positive strand virus will be discussed This has great application in understanding mechanism of viral pathogenesis
MIDTERM			
Week 5	Bacterial physiology Evolution and anatomy <ul style="list-style-type: none"> • History • Pathogenesis 	Prescott Harley Kleins Chapter 1	Introduction to Microbiology, what is Microbiology Why it matters. Understand the complex association of bacteria with environment. Difference between bacteria good for health and harmful for



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			health
Week 6	Bacterial Metabolism <ul style="list-style-type: none"> • Microbial Nutrition • Microbial Growth • Control of Microorganisms by physical and Chemical agents 	Prescott Harley-Chapter 2-3	To understand how bacteria acquire nutrients How bacteria metabolize nutrients Appreciate the diversity in metabolic processes between different bacteria
Week 7	Bacterial Genetics <ul style="list-style-type: none"> • DNA replication • Conjugation • Transformation • Transduction • Protein secretion systems 	Chapter 2 Molecular Genetics of Bacteria Snyder and Champness 3 rd Edition	To understand how proteins and other virulence factors are expressed in bacteria.
Week 8	Food and Applied Microbiology <ul style="list-style-type: none"> • Food Microbiology • Environmental Microbiology 	Material will be provided in class Prescott- Chapter 40-41	Interaction of microbes with host and its impact on environment. How microbes and microbial products are utilized in industry to make products for human consumption, such as curd, yoghurt, cheese, yeast etc.
Week 9	Epidemiology and infectious disease	Material provided in class Prescott- Chapter 36	To understand how to measure spread of infections in population
Week 10	Antimicrobial resistance	Material provided in class	Mechanism and types of antimicrobial resistance
Week 11	Vaccines and		
Week 12	Immunology of infectious diseases <ul style="list-style-type: none"> • Bacterial infections 	Material provided in class	TO understand host response to infections and identify pathways and molecules responsible for infection prevention and control in human body
Week 13	Immunology of Infectious Diseases <ul style="list-style-type: none"> • Viral infections 	Material provided in class	TO understand host response to infections and identify pathways and molecules responsible for infection prevention and control in human body
Week 14			



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