MODULE DESCRIPTION

Principles of microbiology

Prof.Dr.Mohammed Amer Fayyadh / Mohammed.Amer.Fayyadh@sa-uc.edu.iq

This course description provides a concise summary of the main course features and the learning outcomes expected of the student, demonstrating whether the student has made the most of the available learning opportunities. It must be linked to the program description.

1- Educational institution	Shatt AL-arab University- Faculty of Science
2- Scientific Department / Center	Department of pathological analyses science
3-Course Name/Code	principles of microbiology Path-111
4-Available attendance forms	Traditional attendance (in-person/in-the-hall)
5- Semester/year	1/2025
6- Number of study hours (total)	175
7- Date this description was prepared	1-8-2025

8-**Module Aims**

1. Illustrate the importance and diversity of microorganisms in the environment as well as their importance to humans.
2. understanding of classification schemes applied to micro-organisms, including those based on molecular criteria.
3. Through the study of a variety of microbes, students will gain an appreciation of the diversity of pathogens and pathogenic mechanisms in human infectious diseases.
4. Distinguish the principal features of bacterial cells, particularly those features which differ from eukaryotic cells, including genetic information and its transfer.
5. Outline the relationship between bacteria cell structure and function. And provide Knowledge of how to cultivate microorganisms.
6. Identify the main groups of fungi, and exemplify an understanding of their life histories, including their economic consequences, as well as their beneficial and detrimental effects on humans.
7. Learn methods of microbial control

9-Course outcomes, teaching, learning and assessment methods

A- Cognitive objectives

1. Describe the specialized molecular structures found in different microorganisms including prokaryotes (bacteria and archaea), viruses, and single-cell eukaryotes (algae, fungi, and protozoa), and correlate the structures to their function.
2. The student will be able to identify common infectious agents and the diseases that they cause.
3. The student will be able to evaluate methods used to identify infectious agents in the clinical microbiology lab.
4. The student will also be able to recall microbial physiology including metabolism, regulation and replication. diagnostic techniques.
5. Evaluate the factors that are involved with the epidemiology, pathogenesis, detection, diagnosis, and control of infectious diseases (including antibiotics, vaccines, and antibody therapies).
6. demonstrate knowledge and understanding of the mechanisms of microbial pathogenesis and the outcomes of infections, including chronic microbial infections.
7. demonstrate knowledge of the laboratory diagnosis of microbial diseases and practical skills, including isolation and characterization of specific microbes in clinical specimens.

b-Course skill objective

1- Safely handle and work with microorganisms using proper aseptic techniques.

2- Prepare and use basic microbiological media and culture methods.

2- Perform staining techniques (e.g., Gram stain, acid-fast stain) to identify microbial characteristics.

Learning Methods

1-In-person lectura and Textbook and Reference Reading: Core texts and recent scientific literature.

2-Hands-on Laboratory Work: Experiments involving culturing, staining, microscope use, etc.

3-Group Projects: Collaborative learning on topics such as infection control or microbial ecology.

4-Assignments: Topic-based tasks to reinforce classroom learning.

5-Self-study and Online Resources: Encouraging the use of e-learning platforms and journal databases.

Assessment Methods

Assessment Type	Purpose	Weight (Marks)
Quizzes / MCQs	Test understanding of key concepts and facts	10%
Midterm Examination	Assess knowledge of foundational topics	10%
Lab Practicals / Reports	Evaluate practical skills and ability to interpret results	10% 10%
Assignments / Projects	Encourage application and synthesis of concepts	10%
Final Examination	Comprehensive assessment of all course outcomes	50%
Totat		100%

C- Emotional and value goals

1. Appreciation for Microbial Diversity and Importance

-Appreciate the critical roles microbes play in health, the environment, industry, and biotechnology.

2. Responsibility and Ethical Conduct

a-Demonstrate ethical behavior in the handling of microbes, especially in clinical or research settings.

b-Understand the moral implications of microbiological work (e.g., antibiotic resistance, pathogen handling, vaccine development).

3. Respect for Life and Safety

a-Foster a commitment to biosafety and the well-being of oneself, peers, and the environment.

b-Value the importance of infection prevention and control in healthcare and community settings.

D - General and transferable skills (other skills related to employability and personal development
1- Critical Thinking and Problem Solving

2- Communication Skills

a-Write clear, well-organized scientific reports and lab documentation.

b-Present scientific information effectively in oral presentations or discussions.

3- Teamwork and Collaboration

4-Time Management and Organization

5-Information Literacy

Course structure (Weekly Syllabus)

Weeks	Hours	Required learning outcomes	Unit name/topic	Learning method
Week1	2	1- Describe the timeline and major milestones in the discovery of microorganisms. 2- **Identify** key scientists (e.g., Antonie van Leeuwenhoek, Louis Pasteur, Robert Koch) and **explain** their contributions to microbiology. 3 -**Explain** the development of the germ theory of disease and its impact on medicine and public health. 4- **Recognize** the evolution of microscopy and its role in observing microorganisms.	History of microorganism discovery	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates

Week2	2	1- **Define** what a pathogenic microorganism is. a- **Identify and classify** the major types of pathogenic microorganisms: • **Bacteria** • **Viruses** • **Fungi** • **Protozoa** • **Helminths (parasitic worms)** • **Prions** b- **Describe** the general characteristics of each type (e.g., cell structure, replication method, size, typical infections).	Types of Pathogenic microorganism	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week3	2	1- **Define** bacterial morphology and explain why bacterial shape is important in microbiology. 2- **Identify** and **describe** the major bacterial shapes 3- **Differentiate** between various bacterial shapes and arrangements under microscopic observation. 4- **Explain** how bacterial shape relates to function, motility, and pathogenicity in some species. 5- **Relate** shape and arrangement to bacterial classification and diagnosis.	The Shape of Bacteria	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates

Week 4	2	1- **Define normal flora (microbiota):** • Explain what is meant by *normal flora* and distinguish between *resident* and *transient* microbiota. 2- **Describe the composition and distribution of normal flora:** 3- **Explain the beneficial roles of normal flora**	Normal flora	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week 5	2	Reproduction in Bacteria	**1-Describe the main method of bacterial reproduction** **2-** Understand bacterial growth patterns: **3-** Illustrate the bacterial growth curve: **4-** Differentiate between types of genetic transfer in bacteria (non-reproductive reproduction)	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week6	2	Structure of bacteria	**1-** Describe the basic shapes and arrangements of bacterial cells: **2-** Identify and describe the major	1- Interactive Lectures 2- **Multimedia Presentations**

			structural components of bacterial cells: **3-** Differentiate between Gram-positive and Gram-negative bacteria: **4-** Describe specialized bacterial structures and their functions:	**3-** Group Discussions and Debates
Week7		**Midterm Exam**		
Week8	2	Requirements for bacterial growth	1- Identify and explain the physical factors that affect bacterial growth: • Temperature: pH; Osmotic pressure. 2-Describe the chemical requirements for bacterial growth: 3- Differentiate between oxygen requirements in bacteria: 4- Understand the role of culture media in supporting bacterial growth	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week9	2	Bacterial disease	**1-** Define bacterial disease and understand pathogenesis: **2-** Describe the stages of bacterial pathogenesis:	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates

			3- Identify key bacterial virulence factors: **4-** Differentiate between exotoxins and endotoxins: **5-** Classify bacterial diseases based on affected body systems: **6-** Identify common bacterial pathogens and the diseases they cause	
Week10	2	Fungi , their mode of growth	**1-** Define fungi and understand their general characteristics: **2-** Classify fungi based on morphology and reproduction: **3-** Describe fungal structure: **4-** Explain the mode of growth of fungi: **5-** Understand the nutritional requirements of fungi: **6-** Discuss medically important fungi and fungal infections (mycoses):	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week11	2	Viruses	**1-** Define viruses and understand their general characteristics:	1- Interactive Lectures 2- **Multimedia Presentations**

			2- Describe the basic structure of viruses: **3-** Classify viruses based on key characteristics	**3-** Group Discussions and Debates
Week12	2	Steps of virus replication	**1-** Explain the steps of viral replication in host cells: **2-** Differentiate between DNA and RNA virus replication: **3-** Understand the effects of viral infection on host cells: **4-** Describe medically important viruses and the diseases they cause	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week13	2	Protozoa	1- Define protozoa and describe their general characteristics: 2- Classify protozoa based on their mode of locomotion: 3-Life cycle stages: 4- Explain modes of reproduction in protozoa: 5- Discuss the medical importance of protozoa	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates

			5- Describe how protozoal infections are transmitted:	
Week14	2	Helminths	1- **Define helminths and describe their general characteristics:** 2- **Classify helminths based on morphology and life cycle:** 3- **Describe the basic structure and features of helminths:** 4- **Understand the life cycles of medically important helminths**	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week15	2	Antibiotics and vaccines	**1-** Define antibiotics and understand their origin: **2-** Classify antibiotics based on their mechanism of action: **3-** Distinguish between bactericidal and bacteriostatic antibiotics: **4-** Explain the concept of selective toxicity: **5-** Understand antibiotic resistance	1- Interactive Lectures 2- **Multimedia Presentations** **3-** Group Discussions and Debates
Week16	2	**A preparatory week before the Final Exam**		

11- infrastructure	
1-Jawetz, Melnick, & Adelberg's Medical Microbiology Lippincott® Illustrated Reviews: Microbiology (Lippincott Illustrated Reviews Series) 4th Edition 2- Kayser, Medical Microbiology © 2005 Thieme	Required textbooks
1- **Tortora, Funke, and Case – *Microbiology: An Introduction*** . 2- **Prescott's *Microbiology*** (by Willey, Sherwood, and Woolverton) 3- **Bailey & Scott's *Diagnostic Microbiology***	Main References (Sources)
1-DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents. 2- Journal of Clinical Microbiology – Published by the American Society for Microbiology (ASM) 3- Microbiology and Molecular Biology Reviews 4- Clinical Microbiology Reviews	Recommended books and references (scientific journals, reports, etc.)
1- **Centers for Disease Control and Prevention (CDC)** https://www.cdc.gov 2- **World Health Organization (WHO)** https://www.who.int 3- **National Institutes of Health (NIH)** https://www.nih.gov	Electronic references, websites

12. Curriculum development plan
Periodic content updates based on new microbiological discoveries and public health needs

Prof.Dr.Mohammed Amer fayyadh

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