

**Module (Course Syllabus) Catalogue  
 2022-2023**

College /Institute	Khabat Technical Institute	
Department	Food Security and Public Health	
Year (Stage)	1 <sup>st</sup>	
Module Name	General Microbiology	
Module Code	GEM204	
Semester	2 <sup>nd</sup>	
Credits	6	
Module Type	Prerequisite <input type="checkbox"/> Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>	
Weekly hours	2	
Weekly hours (Theory)	( 1 ) hr class	(-----) hr workload
Weekly hours (Practical)	( 3 ) hr class	(-----) hr workload
Instructor (Theory)	Ausama Abdulwahab Safar	
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Lecturer (Practical)	Nahla Muhammad Ali Khalil	
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**Course Book**

<b>Course Description</b>	The fundamentals of microbiology: Lectures are focused on the structure of prokaryotic and eukaryotic microorganisms, and host-microbe interactions. Laboratory sessions are focused on pure culture techniques, methods of staining and the colonial and biochemical identification of microorganisms.
<b>Course objectives</b>	After completion of the lecture component of the course, successful students should be able to: 1. Explain the ubiquity and the wide range of ecological habitats of microorganisms in nature.

	<p>2. Appreciate the diversity of microorganisms and microbial communities and recognize how microorganisms solve the fundamental problems their environments present.</p> <p>3. Understand the role microorganisms play in the biotechnology and food industries, like wine and baking, that are important to human well-being.</p> <p>4. Identify methods used in the identification of organisms involved in diseases and disease treatment and prevention.</p> <p>5. Define and explain basic medical terminology as related to Microbiology.</p>
<p><b>Laboratory Learning Outcomes</b></p>	<p><b>1. The Use and Care of the Microscope</b></p> <ul style="list-style-type: none"> <li>• Identify the parts of the microscope, and understand their functions.</li> <li>• Demonstrate the proper method of focusing, changing objectives, carrying the microscope, and cleaning the microscope.</li> <li>• Use the microscope, especially the oil immersion lens, effectively.</li> <li>• Define and understand the following terms and concepts: resolving power, parfocal, field of view, and magnification.</li> </ul> <p><b>2. Aseptic Techniques. Transfer and Colony Selection Techniques</b></p> <ul style="list-style-type: none"> <li>• To perform basic bacteriological transfer techniques using broth and agar cultures.</li> <li>• Handle bacteriological cultures and inoculation loops aseptically.</li> <li>• Recognize selected properties of bacterial broth and agar slant cultures.</li> <li>• Distinguish basic features of bacterial colonies, broth cultures, and agar slant growths.</li> </ul> <p><b>3. Bacterial Smears and Simple Stains</b></p> <ul style="list-style-type: none"> <li>• Effectively perform the appropriate aseptic techniques required in the handling of bacterial cultures.</li> <li>• Prepare and stain bacterial smears.</li> <li>• Locate, examine, and interpret stained bacterial smears.</li> <li>• Distinguish among basic bacterial shapes.</li> <li>• Develop a perspective on size relationships among bacteria, and blood cells.</li> </ul> <p><b>4. The Gram Stain</b></p> <ul style="list-style-type: none"> <li>• Carry out the Gram stain procedure correctly.</li> <li>• Differentiate between Gram-positive and Gram-negative reactions.</li> <li>• Interpret Gram stain reactions with unknown specimens.</li> <li>• Recognize the importance of the Gram stain in disease detection and diagnosis.</li> <li>• List at least two bacterial species to be Gram-positive and two species to be Gram-negative.</li> </ul> <p><b>5. Spore and Capsule Stains</b></p> <ul style="list-style-type: none"> <li>• Carry out a standard procedure for the demonstration of bacterial spores.</li> <li>• Detect the presence of bacterial spores in a culture.</li> </ul>

	<ul style="list-style-type: none"><li>• Distinguish between vegetative cells and bacterial spores.</li><li>• Carry out a negative staining technique.</li></ul> <p><b>6. The Use of Selective and Differential Media</b></p> <ul style="list-style-type: none"><li>• Understand the basic differences among differential, enriched, selective, and combined media.</li><li>• Recognize the role of such media in the isolation and identification of microorganisms.</li></ul> <p><b>7. The Fungus</b></p> <ul style="list-style-type: none"><li>• Recognize the macroscopic (mycelial phase) and microscopic features of common molds and yeasts.</li><li>• Recognize the major structures of fleshy mushrooms.</li><li>• Identify fungal structures in foods and other materials.</li><li>• Learn the importance of fungi for causing infectious diseases in humans and especially in immuno- compromised individuals, most common pathogens and their diagnosis.</li><li>• Identify fungi and spores in permanent smears.</li></ul>
<b>Student's Obligation</b>	<ol style="list-style-type: none"><li>1. Writing reports particularly in practical lessons as well as to scientific excursion.</li><li>2. Planning scientific trips in order to introduce students to hospitals and pathogen analysis centers, as well as to food industrial companies.</li><li>3. Students are required to submit a seminar at the end of the semester.</li></ol>
<b>Forms of teaching</b>	Theory lectures are presented in classes to students in different ways using projectors, posters, manual papers and white boards.
<b>Assessment scheme</b>	Methods used to assess students are different including: <ul style="list-style-type: none"><li>• Mid-term exams (theoretical &amp; practical) 24%</li><li>• Quizzes 8%</li><li>• Reports and seminar 16%</li><li>• Homework 10%</li><li>• Class activity 2%</li><li>• Final exam (comprehensive) 40%</li></ul>
<b>Course Reading List and References</b>	<ul style="list-style-type: none"><li>• <b>Brock Biology of Microorganisms</b>, 16th edition (2020); Michael T. Madigan, Kelly S. Bender, Daniel H. Buckley, W Matthew Sattley, David A. Stahl, Pearson Education Publication.</li><li>• <b>Ryan &amp; Sherris Medical Microbiology</b>, Eighth Edition Paperback (2022); Charles Sterling, J. Andrew Alspaugh, Kenneth Ryan, &amp; 7 More.</li><li>• <b>Microbiology: An Introduction</b>, 13th edition, Pearson (2019); Gerard J. Tortora, Berdell R. Funke, Christine L. Case.</li><li>• <b>Sherris Medical Microbiology</b>, Seventh Edition (2018); Kenneth J. Ryan, Md, McGraw-Hill Education Publication.</li></ul>

	<ul style="list-style-type: none"> <li>• <b>Prescott's Microbiology</b>, tenth edition (2017); Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton, McGraw-Hill Education Publication.</li> </ul>
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Week No.	Theory	Theoretical aspect	Practical aspect
19-2-2023	1 <sup>st</sup> Week An introduction to microbiology	<ul style="list-style-type: none"> <li>• The origin and development of microorganisms, Science goals and fields.</li> <li>• Naming and Classification - binary designation.</li> </ul>	Study the Fundamentals, applications and learning the methods and skills for important devices used in microorganism labs with laboratory safety practice
26-2-2023	2 <sup>nd</sup> Week Microbial techniques (microscopes)	<ul style="list-style-type: none"> <li>• General characteristics of the different microbial aggregates that are acellular (viruses - viroids - and prions) and cellular prokaryotic and eukaryotic (bacteria - fungi - algae - protozoa).</li> </ul>	Learning and applying methods about sterilizers and disinfections. Physical sterilization (heat - filtration - radiation). Chemical sterilization (types examples-working methods).
5-3-2023	Holiday		
12-3-2023	Spring Holiday		
19-3-2023	Spring Holiday		
26-3-2023	3 <sup>rd</sup> Week Microbial techniques (microscopes)	<ul style="list-style-type: none"> <li>• The history of the discovery of microorganisms, Theories of spontaneous generation.</li> <li>• The development of microbial techniques - fermentation techniques ... etc.,</li> <li>• The contributions of scientists to the development of microorganisms (briefly).</li> </ul>	<p>- Definition of microscope, types of electron microscopes - different types of microscopes.</p> <p>- Simple (anatomical) and compound microscopes (BFM, DFM, PCM, FM)</p> <p>Electron microscopy (principle of work - structure - types - TEM, SEM, STEM and its use)</p>
2-4-2023	4 <sup>th</sup> Week Bacteria	Their presence, characteristics, shape, cell arrangement, bacterial cell structure.	Aerobic and anaerobic cultivation- different bacterial media- Isolation of microorganisms from different sources.

9-4-2023	Holiday		
16-4-2023	5 <sup>th</sup> Week Bacteria	Cell wall of positive and negative bacteria, gram stain, capsule, cell membrane, cytoplasm, nucleotides, plasmid, flagella, and filaments.	Study of some bacterial genera
23-4-2023	6 <sup>th</sup> Week Fungi	Their environment, general characteristics, thallus structure (cell wall, plasma membrane, growth of fungal hyphae, sexual and asexual reproductive structures)	Staining Methods of bacterial and fungal cells and methods identification
30-4-2023	7 <sup>th</sup> Week Fungi	Nutrition and reproduction in fungi - the economic importance of fungi - a study of some fungal examples	Study of some fungal genera
	8 <sup>th</sup> Week Viruses	Define viruses Its history, its discovery, and its general characteristics (presence, size, shape, structure, classification, reproduction).	Study of some viral genera
	9 <sup>th</sup> Week Viruses	The economic importance of viruses - viroids - prions - phages of bacteria	Study of some genera of algae
	10 <sup>th</sup> Week	Seminar	Seminar
	11 <sup>th</sup> Week		
	Algae and Protozoans		

Typical questions:

Q--/ Complete the table of differences between Simple and Compound Microscope below?

Characteristics	Simple Microscope	Compound Microscope
Number of lenses	-----	-----
Condenser lens	-----	-----
Light source	-----	Illuminator

Mirror type	Concave reflecting	A concave mirror on one side and a plane mirror on the other side
Level of magnification	One level only	-----
Magnifying power	Up to 300X	2,000X
Adjusting Magnification	No	Yes

Q--/ Complete the following sentences:

- 1- There are many types of microscopes like -----, -----, -----, -----, -----.
- 2- Gamma irradiation – used for sterilizing large batches of small volume items such as -----, -----, and -----.
- 3- ----- used to produce particles and pyrogen-free fluid, composed of nitrocellulose, work by electrostatic attraction and physical pore size, purify -----.

Q/ Match the microorganisms in column A to their descriptions in column B.

**Column A**

- \_\_\_\_\_ a. Archaea
- \_\_\_\_\_ b. Algae
- \_\_\_\_\_ c. Bacteria
- \_\_\_\_\_ d. Fungi
- \_\_\_\_\_ e. Helminths
- \_\_\_\_\_ f. Protozoa
- \_\_\_\_\_ g. Viruses

**Column B**

1. Not composed of cells
2. Cell wall made of chitin
3. Cell wall made of peptidoglycan
4. Cell wall made of cellulose; photosynthetic
5. Unicellular, complex cell structure lacking a cell wall
6. Multicellular animals
7. Prokaryote without peptidoglycan cell wall

Khabat Technical Institute

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20. Extra notes:
21. Peer review <b>پێداچوونەوهی هاوڕێ</b>

Dr. Ausama Abdulwahab