

Pathogenic Bacteriology Course Description

Pathogenic Bacteriology is a core course in medical microbiology that provides students with a comprehensive understanding of bacteria that cause human diseases. The course covers the morphology, classification, physiology, growth, and pathogenic mechanisms of medically important bacteria, as well as host–pathogen interactions and the body's immune response to bacterial infections. Students learn the epidemiology, laboratory diagnosis, treatment, prevention, and control of bacterial diseases, with emphasis on clinically significant pathogens affecting different body systems. The course also develops practical laboratory skills in bacterial isolation, identification, staining techniques, culture methods, biochemical testing, antimicrobial susceptibility testing, and biosafety practices

1. Educational Institution	Shatt Al-Arab University
2. Scientific Department	Pathological Analysis Sciences
3. Course Name / Code	Pathogenic bacteriology / PATH-212
4. Available Attendance Forms	Basic Educational Activity
5. Semester / Year	First Semester 2025-2026
6. Total Study Hours	150
7. Date of Preparation of This Description	2026/2025

8. Course Objectives

The Pathogenic bacteriology course aims to:

- 1- Understand the biology of pathogenic bacteria
- 2-Recognize the most important virulence factors of pathogenic bacteria and their ability to infect and dissemination
- 3- Review clinically significant bacterial pathogens
- 4- Understand diagnostic and therapeutic strategies (tests and methods used to diagnose pathogenic bacteria depending on morphological, cultural, biochemical characteristics)

A - Cognitive Objectives

- 1- Recognize different bacterial species and classify them according to their pathogenicity, whether they were normal flora member, or pathogenic or opportunistic
- 2-Identifying bacterial morphological characteristics
- 3-Identifying their virulence determinants
- 4.-Identifying the principle basics of dividing pathogenic bacteria
- 5-Collect, handle, and process clinical specimens appropriately for bacteriological analysis.
- 6-Use diagnostic media and biochemical tests to differentiate between bacterial species.

B - Course-Specific Skill Objectives

- 1- **Demonstrate safe microbiological laboratory practices**, including the proper use of personal protective equipment (PPE), aseptic techniques, biosafety procedures, Collect, transport and maintaining specimen quality.
- 2- **Prepare and perform Gram staining** and accurately interpret the microscopic appearance of pathogenic bacteria.
- 3- **Culture bacteria** using appropriate media and incubation conditions to obtain isolated colonies.
- 4- **Perform biochemical identification tests** (e.g., catalase, coagulase, oxidase, urease, indole, citrate, TSI, and carbohydrate fermentation tests) for bacterial identification.
- 5- **Use selective, differential, and enrichment media** appropriately for the isolation of clinically important bacterial pathogens.
- 6- **Identify major pathogenic bacteria** based on their microscopic appearance, cultural characteristics, biochemical properties, and clinical significance
- 7- **Use laboratory equipment correctly**, including microscopes, incubators, autoclaves, biosafety cabinets, and inoculating instruments

Teaching and Learning Methods

1. Interactive lectures covering the morphology, classification, pathogenesis, laboratory diagnosis, treatment, and prevention of pathogenic bacteria.
2. Hands-on training in aseptic techniques, bacterial culture, staining methods, biochemical identification, and antimicrobial susceptibility testing.
3. Collaborative learning through discussion of pathogenic mechanisms, laboratory results, and clinical applications.
4. Independent reading of textbooks, scientific articles, laboratory manuals, and clinical guidelines.
5. learning through the use of digital resources, online lectures, and educational platforms.

Assessment Methods

1. Written tests (**Quizzes**, midterm, and final examination) to measure the Cognitive aspect.
2. Reports and practical assignments to evaluate applied skills.
3. Practical laboratory tests to measure the ability of students to make cultural media, microscopic examination and staining techniques.
4. A practical project involving the design and implementation of an application in the field of Pathogenic bacteriolog.
5. Class participation and presentations to evaluate interaction and the ability to present and analyze results.

C - Affective and Value Objectives

- 1- **Demonstrate professionalism** in all laboratory and clinical activities.
- 2- **Adhere to biosafety and infection control regulations** to protect themselves, colleagues, patients, and the environment.
- 3- **Recognize the importance of ethical conduct** in the handling of clinical specimens, laboratory data, and patient confidentiality.
- 4- **Appreciate the role of pathogenic bacteriology** in the prevention, diagnosis, treatment, and control of infectious diseases.
- 5- **Demonstrate responsibility and accountability** when performing laboratory procedures and reporting results

D - General and Transferable Qualification Skills (Other Skills Related to Employability and Personal Development)

- 1- **Communicate effectively** with colleagues, healthcare professionals, and patients using appropriate scientific and professional terminology.
- 2- **Work collaboratively** as an effective member of a multidisciplinary healthcare or laboratory team.
- 3- **Apply critical thinking and problem-solving skills** to analyze microbiological data and make evidence-based decisions.
- 4- **Use information and communication technology (ICT)** to retrieve, analyze, and present scientific information from reliable sources.
- 5- **Manage time effectively** to complete laboratory work, assignments, and professional responsibilities within deadlines.

9. Course Structure

Week	Lecture Topic	Practical Lab	Learning Method	Learning Outcomes
1	Structure of Bacterial Cells , Differences between bacteria and other Microorganisms	Safety procedures in the pathogenic bacteria laboratory	Theoretical lecture, presentation, practical training	1. Identify the concept of the bacterial cell. 2. Understand bacterial cell components 3. understanding safety procedure of bacterial laboratory
2	Growth of bacteria	Types of Culture media	Interactive lecture, applied examples, practical lab	1- Define bacterial growth and the phases of the bacterial growth curve 2- Explain the environmental factors affecting bacterial growth.

				3- Classify bacteria according to their oxygen requirements
3	Classification of Medically Important Bacteria, Normal flora	Sterilization of culture media	Theoretical explanation, application-based learning, lab	1- Define bacterial classification and explain its importance in medical microbiology. 2- Describe the major criteria used to classify medically important bacteria. 3- Explain the beneficial and harmful roles of the normal flora
4	Pathogenesis of Pathogenic Bacteria	Staining of Bacterial cells	Lecture, solving examples, practical lab	1- Define pathogenesis, pathogenicity, virulence, and virulence factors 2- Explain the major bacterial virulence factors, such as Capsules ; Adhesins ; Enzymes ;Toxins 3-Explain steps of bacterial staining
5	Overview of the Major Pathogens Introduction to Anaerobic Bacteria	biochemical tests	Lecture, mini-project, lab	1. Understand the Major bacterial Pathogens 2.Describe anaerobic bacteria .
6	Gram-Positive Cocci	Diagnostic procedure of gram-positive Cocci	Lecture, practical lab, applied learning	1- Define Gram-positive cocci and describe their general characteristics. 2-Classify the medically important Gram-positive cocci into major genera, including: • <i>Staphylococcus</i> • <i>Streptococcus</i> • <i>Enterococcus</i>
7	Midterm Examination	Practical Assessment	Written and practical test	1. Measure academic achievement. 2. Assess practical skills.

				3. Identify areas for improvement.
8	Gram-Negative Cocci	Diagnostic procedure of gram-Negative Cocci	Lecture, practical lab, applied learning	1- Define Gram-negative cocci and describe their general morphological and staining characteristics. 2- Identify the medically important Gram-negative cocci, including: • <i>Neisseria gonorrhoeae</i> • <i>Neisseria meningitidis</i> 3- Describe the cultural, biochemical, and antigenic characteristics of these organisms
9	Gram-Positive Rods	Diagnostic of gram-Positive Rods	Lecture, lab, project-based learning	1- Classify the medically important Gram-positive rods, including: <i>Clostridium</i> spp. <i>Listeria monocytogenes</i> 2- Describe the laboratory methods used for the identification of Gram-positive rods.
10	Gram-Negative Rods Related to the Enteric Tract <i>E. coli</i> , <i>Klebsiella</i> ,	Taxonomic characteristics of enteric bacteria	Lecture, practical lab, applied learning	1- Describe the general characteristics of enteric Gram-negative rods and their medical importance. 2- Describe the morphology, cultural characteristics, biochemical properties, and antigenic structure of <i>E. coli</i> and <i>Klebsiella</i> spp.
11	<i>Salmonella</i> , <i>Shigella</i>	Diagnostic of <i>Salmonella</i> and <i>Shigella</i>	Lecture, practical lab, applied learning	1- Describe the taxonomy and general characteristics

				of Salmonella and Shigella species. 2- Explain the morphology, cultural characteristics, biochemical properties, and antigenic structures of these organisms.
12	Gram-Negative Rods Related to the Respiratory Tract	Taxonomic characteristics of Gram-Negative Rods Related to the Respiratory Tract	Lecture, practical lab, applied learning	1- Describe the general characteristics of medically important Gram-negative rods associated with respiratory tract infections. 2- Identify the major respiratory Gram-negative rod pathogens, including: <i>Haemophilus influenzae</i> ; <i>Bordetella pertussis</i>
13	Mycobacterium	Diagnosis of bacteria using the VITEK device	Lecture, practical lab, applied learning	1-Describe the general characteristics of the genus Mycobacterium , including its morphology, acid-fast properties, and unique cell wall structure. 2- Differentiate between Mycobacterium tuberculosis , Mycobacterium leprae , and non-tuberculous mycobacteria (NTM). 3- Explain the epidemiology, transmission, and risk factors associated with tuberculosis . 4- Describe the virulence factors and pathogenic mechanisms of <i>Mycobacterium tuberculosis</i> .
14	Helicobacter	Breath test for Helicobacter	Lecture, practical lab, applied learning	1- Describe the general characteristics of the genus Helicobacter ,

				particularly <i>Helicobacter pylori</i>. 2- Explain the morphology, cultural characteristics, and biochemical properties of <i>H. pylori</i>, including its microaerophilic nature and urease activity .
15	Student Project Presentations and Final Review	Final Project Presentation	Presentations, discussion, project evaluation	1. Present an integrated project. 2. Employ acquired skills in solving a practical problem. 3. Discuss results and evaluate performance.

10. Infrastructure

Required Prescribed Books and Sources

- 1- Levinson, W. (2014). *Review of Medical Microbiology and Immunology* (13th ed.). McGraw-Hill Education.
- 2- Jawetz, Melnick, & Adelberg's Medical Microbiology Twenty-Sixth Edition
- 3- Lippincott's Review of Microbiology
- 4- Bailey & Scott's **Diagnostic Microbiology**
- 5- Todar's Online Textbook of Bacteriology

1. Course Development Plan

- 1-Update course content to include recent advances in bacteriology.
- 2-Ensure alignment with the program learning outcomes
- 3-Update laboratory exercises according to current biosafety guidelines.

4-Introduce modern bacterial identification techniques such as:

-PCR ; MALDI-TOF mass spectrometry (where available) ;Automated identification systems

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