澳門理工大學
Universidade Politécnica de Macau
Macao Polytechnic University

PEKING UNIVERSITY HEALTH SCIENCE CENTER-MACAO POLYTECHNIC UNIVERSITY NURSING ACADEMY (AE)

BACHELOR OF SCIENCE IN NURSING

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	NMIC1101-111 /-112/-113		
Learning Module	Microbiology (微生物學)		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese and English		
Credits	3	Contact Hours	45 hours
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MODULE DESCRIPTION

The objectives of this module are the following:

This 45-hour subject is one of the foundation subjects of the Nursing program. It will introduce basic principles in microbiology. Basic knowledge of microbiology includes the classification of microorganisms and characteristics based on analysis techniques. This course utilizes the theoretical approach to study microorganisms and offers the student a comprehensive knowledge of microbiology. It includes practical techniques and a discussion of handling microorganisms designed to complement lecture topics. It is necessary and valuable for students applying to health professional programs. It includes 37 lecture hours and 8 practical and discussion hours.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Master the fundamental characteristics and types of microorganisms, emphasizing health applications.
M2.	Understand microorganisms' physiology, growth, reproduction, and genetics.
M3.	Understand the processes through which microorganisms, including bacteria, viruses, fungi, protozoa, and parasites, cause serious infectious diseases.
M4.	Understand basic microorganism analysis techniques, including microscopy, culture, aseptic techniques, and microbiology laboratory safety.
M5.	Understand the precautions of sample and patient handling and transporting.
M6.	Understand the strategy of vaccines and epidemiology.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

The PILOs are aligned with the Dublin descriptors, including knowledge and understanding, acquisition, application, critical judgment, communication skills, and learning skills/ability.

PILOs	M1	M2	M3	M4	M5	M6
P1. Demonstrate an understanding of the holistic nature of the client's health status involving individual, family, and community aspects.	✓	✓	✓	✓	✓	✓
P2. Demonstrate effective communication skills and the ability to establish and maintain a therapeutic relationship with clients.	✓	✓	✓	✓	✓	✓
P3. Demonstrate acquisition, mastery, and application of knowledge and skills for nursing practice, including biological sciences, social sciences, and humanities, by making appropriate clinical reasoning and performing safe and therapeutic practice.	✓	✓	✓	✓	✓	✓
P4. Demonstrate the ability to maintain legal and ethical standards of nursing practice.	✓	✓	✓	✓	✓	✓
P5. Demonstrate the ability to carry out relevant research and contribute to the community's health.	✓	✓	✓	✓	✓	✓
P6. Work effectively and efficiently alone or in teams.	✓	✓	✓	✓	✓	✓
P7. Demonstrate the ability to identify and evaluate health care issues.					✓	✓
P8. Demonstrate critical judgment and apply the principles of evidence-based practice to deliver nursing care.			✓	✓	✓	✓

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	Introduction to medical microbiology (1 hour) The Scope of Microbiology: Define microbiology and microorganisms, and identify the major organisms included in the science of microbiology. The Historical Foundations of Microbiology: Outline the major events in the history of microbiology, including the major contributors to the early development of microscopy, medical advances, aseptic techniques, and the germ theory of disease. Explain the main features of the scientific method and differentiate between inductive and deductive reasoning and between hypothesis and theory. Taxonomy: Organizing, Classifying, and Naming Microorganisms. Define taxonomy and its supporting terms: classification, nomenclature, and identification. Describe the goals of nomenclature and how the binomial system is structured. Know how to correctly write a scientific name. Discussion (1 hour)	2
1	A survey of cells and microorganisms (3 hours) Major characteristics of prokaryotic cells: Describe the fundamental characteristics of cells. Describe the generalized anatomy of bacterial cells. Distinguish among the types of external cell appendages. Explain the	3

	concept of the cell and describe its structure. Major characteristics of eukaryotic cells: Describe the evolutionary history of eukaryotic cells. Provide a substantial theory regarding how eukaryotic cells originated and how multicellularity came to be. List the eukaryotic groups and their body plans. Describe the plan of a basic eukaryotic cell and organelles, and indicate the structures all cells possess and those found only in some groups.	
1	Microbial nutrition, metabolism, and microbial growth (1 hour) Microbial metabolism: Describe the major environmental factors to which microbes must adapt for survival. Nutritional requirements: Define nutrition and nutrients and their subcategories based on need and quantity. Describe the main categories of nutritional types among organisms. Environmental conditions: Describe the range of temperatures a microbe can function within. Explain the adaptive temperature groups, with examples of microbes that exist in them. List the major gases and describe microbial requirements for these gases. Outline the adaptations of microbial groups to variations in pH. Identify microbial adaptations to osmotic pressure. Biofilm: Define growth and explain the process of binary fission. Describe the process of population growth and how it is measured. Explain the stages in the population growth curve and their practical importance. Discussion (1 hour)	2
2	Normal flora, Infection, and disease (3 hours) Normal flora: Describe some of the major interactions between humans and the microbes that share our habitats. Discuss the characteristics of the normal microbiota and the types of functions they serve. Briefly relate the sources and conditions that influence the development of microbiota in the major body systems. Identify which bodily sites remain free of living organisms and explain why this is necessary. Etiology and classification of infectious diseases: Identify and define the terms associated with infectious diseases. Patterns of disease: Describe the clinical stages of infection. Use correct terminology to explain the manifestations of infections and inflammation. Spread of infections: Discuss the major portals of exit and how they influence the end stages of infection and disease. Differentiate between communicable and noncommunicable infectious diseases. Nosocomial infections: Explain the primary methods of tracking infections and diseases in a population. Discuss important aspects of health-care-associated infections and their impact on patients in clinical settings. Explain what is meant by universal precautions and discuss how they are implemented.	3
2	The Fungi of Medical Importance (3 hours) Fungi as Infectious Agents. Organization of Fungal Diseases. Subcutaneous Mycoses. Cutaneous Mycoses. Superficial Mycoses. Opportunistic Mycoses Fungal Allergies and Intoxications.	3

3	Microbial control (2 hours) Terminology: Summarize the major categories of microbial control and their purposes. Identify the targets of antimicrobial control agents and explain what effects these agents have. Physical methods: List the major types of physical agents used in controlling microbes. Describe the basic effects of the physical method on microbes. Chemical methods: Define the terms that are used to describe chemical control of microbes. Microbial resistance to control agents: Explain the desirable features of antimicrobial chemicals and what factors influence their effectiveness.	2
3	Innate & adaptive immunity (2 hours) Nonspecific Defenses Mechanism: Summarize the characteristics of basic host defenses. Differentiate between the three lines of defense. Explain the nature of the different types of innate, nonspecific defenses. Inflammation: Describe the main events in the inflammatory reaction and explain what is occurring in each. Describe the mechanism behind fever and explain its beneficial and harmful effects. Specific defense mechanism: Summarize the general features of adaptive, acquired immunity. Define immunocompetence, antigens, specificity, and memory as they relate to the immune system. Outline the overall phases in a specific immune response. Vaccine: Explain the purposes of immunotherapy and immunization. Describe the sources and uses of artificial passive immunization and artificial active immunization or vaccination. Discuss which factors are involved in vaccine development and new strategies for developing vaccines. Disorders in immunity: Summarize the main categories of immunopathology and their medical consequences. Discuss the factors involved.	2
3	The fundamental properties of viruses (2 hours) Virus structure and chemical composition Virus classification Virus replication	2
3/4	The RNA Viruses That Infect Humans (5 hours) Enveloped Segmented Single-Stranded RNA Viruses Enveloped Non-segmented Single-Stranded RNA Viruses Other Enveloped RNA Viruses: Coronaviruses, Togaviruses, and Flaviviruses Arboviruses: Viruses Spread by Arthropod Vectors Retroviruses and Human Diseases Nonenveloped Single-Stranded and Double-Stranded RNA Viruses Prions and Spongiform Encephalopathies Practice (1 hour)	6
4/5	The DNA Viruses That Infect Humans (4 hours) Viruses in Human Infections and Diseases. Enveloped DNA Viruses: Poxviruses. Enveloped DNA Viruses: The Herpesviruses. The Viral Agents of Hepatitis. Nonenveloped DNA Viruses. Discussion (1 hour)	5

4	Bacterial diseases of the respiratory system (2 hours) Structure and function of the respiratory system: Differentiate pharyngitis, laryngitis, tonsillitis, sinusitis, and epiglottitis. Describe how microorganisms are prevented from entering the respiratory system. Normal flora of the respiratory system: Characterize the normal microbiota of the upper and lower respiratory systems. Microbial disease of the upper respiratory system: List the causative agent, symptoms, prevention, preferred treatment, and laboratory identification tests for streptococcal pharyngitis, scarlet fever, diphtheria, cutaneous diphtheria, and otitis media. Microbial disease of the lower respiratory system: List the causative agent, symptoms, prevention, preferred treatment, and laboratory identification tests for pertussis and tuberculosis. List the etiology, method of transmission, and symptoms of melioidosis. Practice (1 hour)	3
5	Bacterial diseases of the digestive system (1 hour) Structure and function of the digestive system: Name the structures of the digestive system that contact food. Normal flora of the digestive system: Identify parts of the gastrointestinal tract that normally have microbiota. Microbial disease of the digestive system: Describe the events that lead to the disease of the digestive system. Practice (1 hour)	2
5	Bacterial diseases of the urinary and reproductive systems (2 hours) Structure and function of the urinary system: List the antimicrobial features of the urinary system. Structure and function of the reproductive system: Identify the portals of entry for microbes into the female and male reproductive systems. Normal flora of the urinary and reproductive systems: Describe the normal microbiota of the upper urinary tract, the male urethra, and the female urethra and vagina. Diseases of the urinary system: Describe the modes of transmission for urinary and reproductive system infections. List the microorganisms that cause cystitis, pyelonephritis, and leptospirosis, and name the predisposing factors for these diseases. Diseases of the reproductive systems: List the causative agents, symptoms, methods of diagnosis, and treatments for gonorrhea, nongonococcal urethritis (NGU), pelvic inflammatory disease (PID), syphilis, lymphogranuloma venereum (LGV), chancroid, and bacterial vaginosis. Viral diseases of the reproductive systems: Practice (1 hour)	3
6	The Parasites of Medical Importance (3 hours) The Parasites of Humans Major Protozoan Pathogens The Flagellates (Mastigophorans) Apicomplexan Parasites A Survey of Helminth Parasites Nematode (Roundworm) Infestations Flatworms: The Trematodes and Cestodes The Arthropod Vectors of Infectious Disease	3

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5	M6
T1. Interactive lectures: in-depth coverage of the principles of microbiology is presented with PowerPoint slides and other supplementary materials if necessary.	✓	✓	✓	✓		
T2. Q & A during class: allowed to raise questions from instructor or students for discussion.			✓	✓	✓	✓
T3. Microbiology laboratory class: Glo-germ hand wash education system and disinfectants: apply microbiology knowledge, understand hand hygiene's role to reduce the burden of healthcare-associated infection; air culture practicing: understand the usage of air culture and the manifestation of calculation of bacteria.	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

This learning module is graded on a 100-point scale, with 100 being the highest possible score and 50 being the passing score.

Any student from the Faculty of Health Sciences and Sports (FCSD) scoring less than 35% of the total mark in the final examination will be given an "F" grade for the module, even if the overall grade is 50% or higher.

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Midterm exam	35	M1-M6
A2. Final exam	60	M1-M6
A3. Microbiology laboratory report	5	M1-M6
A4. Re-sit exam	--	M1-M6

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

Marks Ranges	Grade	Grade Point	Grade Definitions**
93–100 88 – 92	A A-	4.0 3.7	Excellent
83 – 87	B+	3.3	Very Good
78–82 73 – 77	B B-	3.0 2.7	Good
68–72 63–67 58 – 62	C+ C C-	2.3 2.0 1.7	Satisfactory
53 – 57 50 – 52	D+ D	1.3 1.0	Passed
0 – 49	F	0	Failed

REQUIRED READINGS

1. 郭曉奎 彭宜紅 (主編)(2024)《醫學微生物學》(第 10 版) 人民衛生出版社 ISBN 9787117365932
2. Barry Chess (2023). Talaro's foundations in Microbiology (12th ed.). New York: McGraw-Hill Education. ISBN: 9781266182617

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and program coordinators will consider all feedback and respond with actions formally in the annual program review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments, and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook, which is distributed upon admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.