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**មហាវិទ្យាល័យឱសថសាស្រ្ត Faculty​​ of Pharmacy**

**(បរិញ្ញាបត្រ ផ្នែកឱសថសាស្រ្ត / Bachelor’s Program)**

**ឆ្នាំសិក្សា Academic Year: 2025-2026**

**ប្លង់មុខវិជ្ជាលម្អិត​​ Course Syllabus**

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| **មុខវិជ្ជា Course Title:** Microbiology | | **កូដមុខវិជ្ជា Course Code:** MIC305 |  |
| **ឆ្នាំទី** **Year**: 3 | **ឆមាស Semester:** 1 | **ចំនួនក្រេឌីត Credits:** 3 | **ម៉ោង Hours:** 45h |
| **ព្រឹទ្ធបុរសមហាវិទ្យាល័យ**  **Dean or HoD:** | Asst. Prof. Chhea Sophearom | | |
| **អ្នកសម្របសម្រួលមុខវិជ្ជា**  **Course Coordinator:** | Assi. Prof. PECHCHAMANANN Visal | | |
| **សាស្ត្រាចារ្យ Lecturer/s:** | Assi. Prof. PECHCHAMANANN Visal | | |

1. **ការពិពណ៌នាមុខវិជ្ជា Course Description:**

The course is designed to give students an understanding of Microbiology including bacteria, fungi and viruses. There are 2 parts to this course. The first part covers an introduction to microbiology, general bacteriology, virology and mycology. The second part focuses on some important human viruses (Herpes virus, hepatitis, orthomyxovirus and arbovirus). This course aims to differentiate the microorganism, explain its genetic and growth, and understand the characteristics of viruses that cause human diseases.

1. **លទ្ធផលសិក្សារំពឹងទុកនៃកម្មវិធី Program Learning Outcomes (PLOs)**

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| **No.** | **PLOs** | **Domains and levels of Bloom’s Taxonomy** |
| **PLO1** | Possess knowledge on subjects that offer a solid foundation in biomedical sciences, pharmaceutical sciences, social, behavioral and administrative pharmacy sciences and clinical sciences and pharmacy practices. | Cognitive 2 (Knowledge) |
| **PLO7** | To identify the biological read-out circuits and concept on the quality assurance: phase look ahead, analytical phase, post-analytical phase. | Cognitive 1 (Knowledge) |

*All PLOs can be found here: shared drive* <https://docs.google.com/document/d/1QnIik3Vp01BTHaa3bSnEgLNyqHzO6osu/edit?usp=sharing&ouid=107028891093176943684&rtpof=true&sd=true>

1. **លទ្ធផលសិក្សារំពឹងទុកនៃមុខវិជ្ជា** **Course Learning Outcomes, CLOs,**

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| --- | --- | --- |
| **No** | **Expected​ Learning Outcome** | **Related PLOs** |
| **CLO1** | Distinguish the morphology, structure and its functions of microorganisms. | PLO1 |
| **CLO2** | Describe the multiplication cycle of the individual microorganisms (including genetic variation) and relationship bacteria and host. | PLO1 |
| **CLO3** | Explain the epidemiology of the individual microorganisms. | PLO1 |
| **CLO4** | Describe the pathogenesis of the microorganisms. | PLO1 |
| **CLO5** | Illustrate the symptoms and clinical diseases caused by individual microorganisms. . | PLO1 |
| **CLO6** | List the methods used for the identification (diagnosis) of different microorganisms practiced in microbiology laboratory. | PLO7 |
| **CLO 7** | Describe the control, prevention, and treatment of individual microorganisms. | PLO 1 |

1. **បំណែងចែកមេរៀន Course Outline:**

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| **Week** | **Sessions** | **Topics and LLOs** | **Learning-Teaching Activities, and Assessments** | **Hours** | **CLOs** |
| 1 | 1 | **Unit 1: Structure and classification of viruses** LLO1: Know the history of virus discovery. LLO2: Recall the simplest definition of virus. LLO3: Define capsomer, capsid, genome, nucleocapsid, and envelope. LLO4: Differentiate the three main components of viral structure. LLO5: List three types of viral capsid symmetry. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Oral questioning, short written quiz. | 1.5 | CLO1 |
| 1 | 2 | **Unit 1: Structure and classification of viruses (cont.)** LLO6: Describe the nature of the viral envelope. LLO7: Explain effects of the envelope on epidemiology. LLO8: List criteria for virus classification. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Short answer exercise. | 1.5 | CLO1, CLO3 |
| 2 | 3 | **Unit 2: Bacteria Structure** LLO9: Know the history of bacteria discovery. LLO10: Compare prokaryotic vs eukaryotic cells. LLO11: Differentiate bacteria and viruses. LLO12: Compare Gram+ vs Gram– cell walls. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Think–pair–share, diagram labelling. | 3 | CLO1 |
| 2 | 4 | **Unit 3: Multiplication of virus** LLO13: Define one-step growth curve. LLO14: Describe effects of virus infection on host cells. LLO15: Differentiate persistent vs latent infections. LLO16: List steps in animal virus multiplication and describe each. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Sequence arrangement task. | 1.5 | CLO2 |
| 3 | 5 | **Unit 3: Multiplication of virus (cont.)** LLO17: Identify site of viral protein synthesis. LLO18: Explain role of reverse transcriptase. LLO19: Describe release of enveloped and non-enveloped viruses. LLO20: Explain how enveloped viruses acquire envelopes. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Concept mapping. | 1.5 | CLO2 |
| 3 | 6 | **Unit 4: Physiology and growth of bacteria – metabolism** LLO21: Classify metabolism types. LLO22: Explain catabolic and anabolic reactions. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Diagram completion. | 1.5 | CLO2 |
| 4 | 7 | **Physiology and growth of bacteria – regulation & culture** LLO23: Describe metabolic regulation. LLO24: Identify bacterial nutrients. LLO25: Explain bacterial growth and death phases. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Problem-solving questions. | 1.5 | CLO2 |
| 4 | 8 | **Pathogenesis of viral infections** LLO26: Explain virus–host interactions. LLO27: Describe viral transmission routes. LLO28: Illustrate the path of viral spread. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Diagram tracing. | 1.5 | CLO4 |
| 5 | 9 | **Pathogenesis of viral infections (cont.)** LLO29: List target organs of viral infection. LLO30: Identify pathogenicity factors related to virus and host. LLO31: Describe the host defense system. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Group presentation feedback. | 1.5 | CLO4, CLO5 |
| 5 | 10 | **Genetic variation in bacteria** LLO32: Define genetic variation and mechanisms. LLO33: List causes of variation. LLO34: Explain mutation mechanisms. LLO35: Explain why resistance mutation rate is low with combination antibiotics. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Mini-quiz. | 1.5 | CLO2 |
| 6 | 11 | **Bacteriophage** LLO36: Recall bacteriophage discovery history. LLO37: Describe E. coli culture experiments with phage T2. LLO38: Describe phage morphology. LLO39: Explain importance of bacteriophages. | L provide direct instruction to SS. SS present in groups. Formative assessment: Peer evaluation. | 1.5 | CLO1, CLO2 |
| 6 | 12 | **Diagnostic method in virology** LLO40: Explain importance of viral diagnosis. LLO41: Categorize samples for viral diagnosis. LLO42: Identify lab procedures for virus detection. LLO43: Interpret electron microscopy use for virus ID. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Lab technique matching. | 1.5 | CLO6 |
| 7 | 13 | **Diagnostic method in virology (cont.)** LLO44: Explain cell culture for virus identification. LLO45: Illustrate ELISA principles. LLO46: Illustrate PCR principles. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Practical interpretation questions. | 1.5 | CLO6 |
| 7 | 14 | **Host–Bacteria relationships** LLO49: Explain host–microbe relationship types. LLO50: Differentiate contamination, infection, and disease. LLO51: Differentiate pathogenicity and virulence. LLO52: Explain Pasteur vaccine production principle. | L provide direct instruction to SS. SS present in groups. Formative assessment: Short oral test. | 1.5 | CLO2 |
| 8 | 15 | **Diagnostic method in virology (cont.)** LLO47: Describe protein detection techniques. LLO48: Explain serology for antigen and antibody detection. | L provide direct instruction to SS. SS join Q&A and class discussion. Formative assessment: Flowchart construction. | 1.5 | CLO6, CLO7 |
| 8 | 16 | **Pathogenicity factors** LLO53: List factors influencing bacterial infection. LLO54: Explain bacterial virulence parameters. LLO55: Describe bacterial toxins. | L provide direct instruction to SS. SS present in groups. Formative assessment: Case study discussion. | 1.5 | CLO4 |
| 9 | 17 | **Body’s defense against infection** LLO56: Explain innate and adaptive defenses. LLO57: Describe skin barrier protection. LLO58: Identify inflammation signs and functions. | L provide direct instruction to SS. SS present in groups. Formative assessment: Scenario-based Q&A. | 1.5 | CLO7 |
| 9 | 18 | **Midterm Exam**  (MCQ, matching, short answers, oral) | | **1** | CLO1–CLO7 |
| 10 | 19 | **Body’s defense against infection (cont.)** LLO59: Explain fever mechanism. LLO60: Describe interferon function. LLO61: Explain phagocytosis stages. LLO62: Describe acquired immunity and antibody roles. | L provide direct instruction to SS. SS present in groups. Formative assessment: Oral questioning. | 1.5 | CLO7 |
| 10 | 20 | **Herpes Simplex Virus (HSV)** LLO63: Describe HSV morphology. LLO64: Explain HSV multiplication stages. LLO65: Describe HSV pathogenesis and clinical features. LLO66: List detection methods and treatments. | L provide direct instruction to SS. SS present in groups. Formative assessment: Clinical case analysis. | 1.5 | CLO1–CLO7 |
| 11 | 21 | **Hepatitis viruses** LLO67: Describe morphology and multiplication. LLO68: Explain pathogenesis and evolution stages. LLO69: List clinical features, detection, and treatment. | L provide direct instruction to SS. SS present in groups. Formative assessment: Quiz. | 1.5 | CLO1–CLO7 |
| 11 | 22 | **Infectious disease process** LLO70: Explain bacterial entry routes. LLO71: Describe stages of infectious diseases. LLO72: Differentiate symptoms, signs, and syndromes. LLO73: List portals of exit. | L provide direct instruction to SS. SS present in groups. Formative assessment: Group diagram work. | 1.5 | CLO4, CLO5 |
| 12 | 23 | **Hepatitis viruses (cont.)** Same LLOs as Session 21. | L provide direct instruction to SS. SS present in groups. Formative assessment: Quick recap game. | 1.5 | CLO1–CLO7 |
| 12 | 24 | **Epidemiology of infectious disease** LLO74: Define epidemiology. LLO75: Differentiate incidence and prevalence. LLO76: Define endemic, epidemic, pandemic, sporadic. LLO77: Differentiate transmission modes. | L provide direct instruction to SS. SS present in groups. Formative assessment: Classification activity. | 1.5 | CLO3 |
| 13 | 25 | **Epidemiology of infectious disease (cont.)** LLO78: Differentiate droplet vs airborne transmission. LLO79: Explain epidemiological study types. LLO80: Give example of experimental epidemiology. | L provide direct instruction to SS. SS present in groups. Formative assessment: Application exercise. | 1.5 | CLO3 |
| 13 | 26 | **Togaviruses & Flaviviruses** LLO81: Illustrate structure and replication. LLO82: Explain pathogenesis and immune response. LLO83: Describe clinical features, detection, and treatment. | L provide direct instruction to SS. SS present in groups. Formative assessment: Case scenario Q&A. | 1.5 | CLO1–CLO7 |
| 14 | 27 | **Principles & methods of microbiological diagnosis** LLO84: Explain roles of clinical biology laboratory. LLO85: State performance evaluation parameters. LLO86: List diagnostic techniques. | L provide direct instruction to SS. SS present in groups. Formative assessment: Technique matching quiz. | 1.5 | CLO6 |
| 14 | 28 | **Orthomyxoviruses** LLO87: Illustrate structure and replication. LLO88: Explain pathogenesis and immune response. | L provide direct instruction to SS. SS present in groups. Formative assessment: Summary table creation. | 1.5 | CLO1–CLO7 |
| 15 | 29 | **Orthomyxoviruses (cont.)** LLO89: Explain transmission. LLO90: Describe clinical features. LLO91: List detection methods and treatment. | L provide direct instruction to SS. SS present in groups. Formative assessment: Quiz. | 1.5 | CLO1–CLO7 |
| 15 | 30 | **Principles & methods of microbiological diagnosis (cont.)** LLO92: Explain bacterial culture principles. LLO93: Explain ELISA for antigen detection. LLO94: Explain nucleic acid amplification principles. | L provide direct instruction to SS. SS present in groups. Formative assessment: Mini-test. | 1.5 | CLO6 |
| Decided by RO | N/A | **Final Exam** (MCQ, Matching, short answers& oral exam) | | 1 | CLO1-7 |
| **Hours** | | | | | **45** |

1. **វិធីសាស្រ្តរៀន និងបង្រៀន Learning and Teaching (L&T) Methodologies:**

This course adopts student-centred learning with a mix of direct instruction, group presentations, discussions, problem-solving activities, and case studies. Students also engage in self-study through UPOP, using textbooks and uploaded resources. Interactive methods such as quizzes, peer evaluation, and scenario-based tasks encourage active participation and application of microbiological knowledge. Lecturers facilitate learning by guiding discussions, providing feedback, and integrating technology (Google Meet, UPOP, projectors, laptops) to support both in-class and online learning.

**Learning & teaching modes (or formats):**

For more information of learning and teaching methodologies, please click the link below:

<https://docs.google.com/document/d/1hKjjOqcvbWOVNfCRUbql9vPXTjtEm7Td/edit?usp=drive_link&ouid=109126004743476287024&rtpof=true&sd=true>

**Learning & teaching materials/ equipment used:**

In this course, we use various learning materials such as Textbooks, Laptops, Projectors, Handouts, etc. For Asynchronous learning, we use UPOP where students are required to do self-study including reading uploaded textbooks and lessons, etc.

* + 1. Computer
    2. Projector
    3. Speaker
    4. Markers
    5. Hard copy books
    6. Online delivery via Google meet and/or UPOP

1. **វិធីសាស្រ្តវាយតម្លៃ Assessment Methods:**

* **Assessments:**

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| --- | --- | --- | --- | --- |
| No. | Assessments | Mode of Submission | Assessment Deadline | Related CLOs |
| 1 | Midterm Exam | UPOP (at UP) – MCQ, Matching, short answers & oral exam | Week 9 | 1-7 |
| 2 | Final Exam | UPOP (at UP) – MCQ, Matching, short answers& oral exam | Decide to RO | 1-7 |

* **Grading Summary/ Formula:**

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| --- | --- | --- | --- |
| 3 credit(s) | Summative Assessments | | Minimum Pass |
| Weighting | Assessment Tasks |
| 40% | Midterm Exam | Overall total score with all assessments is 60%. |
| 60% | Final Exam |

1. **បទបញ្ជាផ្ទៃក្នុងទាក់ទងនឹងការសិក្សា និងការវាយតម្លៃ**​ **Rules and Regulations for Study and Assessments**:

* ***Assessment for Learning Policy:***

PLease refer to the link below for more detailed information on assessment policy.

Link:<https://elearning.puthisastra.edu.kh/pluginfile.php/137425/mod_resource/content/1/Assessment%20Policy.pdf>

* ***Academic Integrity Policy:***

Please refer to the link below for more detailed information on academic integrity policy.

Link:<https://elearning.puthisastra.edu.kh/pluginfile.php/137426/mod_resource/content/1/Academic%20Integrity%20Policy.pdf>

●***The use of artificial intelligence (AI) policy***

<https://elearning.puthisastra.edu.kh/pluginfile.php/151660/mod_resource/content/1/The%20Use%20of%20AI%20Policy_Approved.pdf>

1. **ឯកសារយោង ឬធនធានសិក្សាផ្សេងៗ​ References/ Resources:**

**Primary Resources:**

JACQUELYN G. BLACK. MICROBIOLOGY 7e PRINCIPLES AND EXPLORATIONS. 2008.

Patrick R. Murray, Ken S. Rosenthal, Michael A. Pfaller. MEDICAL MICROBIOLOGY. 7th EDITION. 2013.

Richard Goering, Hazel Dockrell, Mark Zuckerman, Peter Chiodini. Mims Medical Microbiology and Immunology. Elsevier. 2019.

**Additional Resources:**

BRIAN W J MAHY, MARC H V VAN REGENMORTEL. Desk Encyclopedia of GENERAL VIROLOGY. 2010.

Cynthia Nau Cornelissen, Bruce D. Fisher, Richard A. Harvey, Lippincott’s Illustrated Reviews: Microbiology. Third Edition. 2013.

Jeffrey C. Pommerville. Alcamo’s FUNDAMENTALS OF Microbiology. 9th edition. 2011.

Kenneth J. Ryan, MD, C. George Ray. Sherris Medical Microbiology. 6th edition. 2014.