

Course Syllabus

MBMB 625 **Antibacterial and Bacteriophage**

Academic year 2025

Course ID and Title MBMB 625 **Antibacterial and Bacteriophage**

Course coordinator Asst. Prof. Poochit Nonejuie, Ph.D.
 Institute of Molecular Biosciences, Mahidol University
 Tel: 0-2441-9003
 Email: Poochit.non@mahidol.edu

Instructors: Asst. Prof. Poochit Nonejuie, Ph.D.

Credits: 2 (1-2-3)

Curriculum: Master of Science Program in **Molecular and integrative biosciences** (elective course)
 Doctor of Philosophy Program in **Molecular and integrative biosciences** (elective course)

Semester offering: Second semester

Pre-requisites: None

Course learning outcomes (CLOs) and their alignment with PLOs:

CLOs	PLO1	PLO2	PLO3	PLO4
By the end of the course, student should be able to:				
1. Explain principles of antibiotic, antibiotic susceptibility testing, and mechanism of action study,	✓		✓	
2. Describe principles of phage, phage screening and phage therapy	✓		✓	
3. Apply the knowledge of microbiology and antibiotic to determine antibacterial properties of tested compounds	✓	✓	✓	✓
4. Apply the knowledge of microbiology and phage to screen for phage from environmental sample	✓	✓	✓	✓
5. Communicate scientific concepts effectively through result discussions and presentations.		✓	✓	✓

Course description

Basic microbiology techniques, Antibiotics, Mechanism of action of antibiotic, Antibiotic susceptibility testing, Fluorescence microscopy, Phages, Phage screening and isolation, Phage therapy

Alignment of Teaching and Assessment Methods to Course Learning Outcomes:

Course Learning Outcomes	Teaching Method	Assessment Method
1. Explain principles of antibiotic, antibiotic susceptibility testing, and mechanism of action study	1. Lecture 2. Discussion	1. Q&A during lecture 2. Discussion performance 3. Quiz / short exercise 4. Assignment
2. Describe principles of phage, phage screening and phage therapy	1. Lecture 2. Discussion	1. Q&A during lecture 2. Discussion performance 3. Quiz / short exercise 4. Assignment
3. Apply the knowledge of microbiology and antibiotic to determine antibacterial properties of tested compounds	1. Hands-on lab practice 2. Discussion	1. Lab performance 2. Discussion performance
4. Apply the knowledge of microbiology and phage to screen for phage from environmental sample	1. Hands-on lab practice 2. Discussion	1. Lab performance 2. Discussion performance
5. Communicate scientific concepts effectively through result discussions and presentations.	1. Lab report 2. Discussion	1. Discussion performance 2. Lab report

Course Schedule, learning activity and assessment:

	Activities	Description	Assessment methods	Scores	Time
Day 1					
1		Orientation/overview			9.00-9.30
2	Lecture, discussion, quiz	Antibiotic, antibiotic targets, and mechanism of action	Quiz xx1	-	9:30-12.00
3	Lecture, discussion, quiz	Susceptibility testing methods	Quiz xx2	-	13.00-14.00
4	Laboratory	Laboratory session on “Preparation of overnight culture of bacteria” Techniques to learn: -Bacterial overnight culture preparation from agar plate -Basic Microbiology techniques -Streaking for single colonies on agar plates	Lab Performance, lab report	-	14.00-16.00
Day 2					
1	Laboratory	Laboratory session on “Determination of minimal inhibitory concentration of antibiotics via broth microdilution method” Techniques to learn: - Basic Microbiology techniques - Spectrophotometry - Susceptibility testing (Microdilution method)	Lab Performance, lab report		9.00-12.00

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2	Lecture, discussion, quiz	- Bacterial cytological profiling (BCP) - Image analysis	Quiz xx2		13.00-15.00
3	Laboratory	Laboratory session on “Preparation of overnight culture of bacteria” Techniques to learn: -Bacterial overnight culture preparation from agar plate -Basic Microbiology techniques	Lab Performance, lab report		15.00-16.00
Day 3					
1	Laboratory	Laboratory session on “Bacterial cytological profiling (BCP) part1” Techniques to learn: -Bacterial cytological profiling (BCP) day culture preparation	Lab Performance, lab report		9.00-12.00
2	Laboratory	Laboratory session on “Bacterial cytological profiling (BCP) part2” Techniques to learn: -Fluorescence microscopy -Basic scientific image analysis	Lab Performance, lab report		13.00-16.00
Day 4					
1	Discussion	Lab discussion (Antibiotic)	discussion		9.00-12.00
Day 5					
1	Lecture, discussion, quiz	Bacteriophages and phage therapy	Quiz xx1		9.00-12.00
2	Laboratory	Laboratory session on “Phage isolation (1): Sample collection and phage enrichment” Techniques to learn: - Basic Microbiology techniques	Lab Performance, lab report		13.00-16.00

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		- Environmental sample collection -Phage enrichment			
Day 6					
1	Lecture, discussion, quiz	Phage screening, isolation and purification methods	Quiz xx2		10.00-12.00
2	Laboratory	Laboratory session on “Phage isolation (2): Phage isolation” Techniques to learn: - Basic Microbiology techniques - Enrichment filtration - Serial dilution and full plate titer	Lab Performance, lab report		13.00-16.00
Day 7					
1	Laboratory	Laboratory session on “Phage purification (1)” Techniques to learn: -Plaque typing -Plaque picking and streaking	Lab Performance, lab report		9.00-12.00
Day 8					
1	Laboratory, Discussion	Laboratory session on “Phage purification (2)” Techniques to learn: -Plaque type analysis	Lab Performance, lab report		9.00-10.00
2	Discussion	Lab discussion (Phage) and problem-based assignment on “Antibacterial” topic			10.00-12.00
Day 9					

1	Problem-based learning	Problem-based assignment	Problem-based assignment		9.00-12.00
2	Student's Reflection	To provide students opportunities to describe their learning experiences received from this course and how it can be applied to their future learning.	-	-	13.00-16.00
3	After Action Review	To collect comments, suggestions from students for further improvements of the course.	-	-	13.00-16.00

Note: Some changes might be applied as appropriate.

Assessment Criteria:

Assessment method	Performance criteria	Scoring rubric
Participation (10%)	Engagement level of learner	Active engage (4) Fairly active (2-3) Inactive (1)
Quiz (20%)	Correctness level	Raw scores will be adjusted to be in a range of % indicated above
Discussion (20%)	Participation (20%)	Active (4) Fairly active (2-3) Inactive (1)
	Interpersonal and interpersonal skill (leadership, teamwork, responsibility, patience, communication, positive attitude, active listening, critical thinking) (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Demonstrate critical and high-order thinking skills (60%)	Excellent (4) Good (3) Fair (2) Underperform (1)

Assessment method	Performance criteria	Scoring rubric
Lab performance (20%)	Safety practice (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Lab skills (40%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Time management (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Trouble shooting skills (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)
Lab report (10%)	Report organization: intro, methods, results, discussion and conclusion (40%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Data presentation, analysis and interpretation (50%)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Readability of the report (10%)	Excellent (4) Good (3) Fair (2) Underperform (1)
Problem-based assignment (20%)	Problem Recognition and Understanding of the Topic (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)

Assessment method	Performance criteria	Scoring rubric
	Organization & Structure (30%) (All arguments were clearly tied to an idea and organized in a tight, logical fashion?)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Argument and Counter-Argument (30%) (Clear, accurate and thorough?)	Excellent (4) Good (3) Fair (2) Underperform (1)
	Interpersonal and interpersonal skill (leadership, teamwork, responsibility, patience, communication, positive attitude, active listening, critical thinking) (20%)	Excellent (4) Good (3) Fair (2) Underperform (1)

Student's achievement will be graded using symbols: A, B+, B, C+, C, D+, D and F, based on the criteria as follows:

Percentage range	Grade	Description
80-100	A	Excellent
75-79	B+	Very Good
70-74	B	Good
65-69	C+	Fairly Good
60-64	C	Fair
55-59	D+	Poor
50-54	D	Very Poor
0-49	F	Fail