Course Syllabus
MBMB 654 Virological Techniques
Academic year 2025

Course ID and Title MBMB 654 Virological Techniques

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Credits: 2 (0-4-2)

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):

By the end of the course, students should be able to:

1. Consistently apply scientific integrity, responsibility, and safety practices.
2. Interpret method limitations and select the appropriate technique based on experimental goals and viral properties.
3. Analyze and troubleshoot experimental outcomes, adjusting methodologies based on results and theory-driven reasoning.
4. Use professional interpersonal skills to coordinate tasks, provide constructive feedback, and engage in scientific discussions that promote collective problem-solving.
5. Effectively present experimental results with appropriate visualization tools (figures, graphs, tables) and support interpretations with evidence.

Alignment of Teaching and Assessment Methods to Course Learning Outcomes:

Course Learning Outcomes	Teaching Method	Assessment Method
1. Consistently apply scientific integrity, responsibility, and safety practices.	1. Lab safety orientation 2. Discussion 3. Lab report 4. Assignment	1. Laboratory performance 2. Discussion performance 3. Report and assignment submission 4. Assignment 5. Plagiarism detection
2. Interpret method limitations and select the appropriate technique based on experimental goals and viral properties.	1. Hands-on lab practice 2. Discussion 3. Lab report 4. Assignment	1. Laboratory performance 2. Lab report 3. Practical exam
3. Analyze and troubleshoot experimental outcomes, adjusting methodologies based on results and theory-driven reasoning.	1. Problem-based project 2. Discussion 3. Assignment	1. Laboratory performance 2. Discussion performance 3. Assignment 4. Practical exam
4. Use professional interpersonal skills to coordinate tasks, provide constructive feedback, and engage in scientific discussions that promote collective problem-solving.	1. Problem-based project 2. Discussion 3. Group activities	1. Laboratory performance 2. Discussion performance 3. Performance in group activities
5. Effectively present experimental results with appropriate visualization tools (figures, graphs, tables)	1. Discussion 2. Presentation	1. Discussion performance 2. Presentation performance

and support interpretations with evidence.		

Course description:

Virological techniques; basic cell culture techniques; virus infection, virus isolation, inoculation and propagation; cell lines, embryonated egg; virus detection and quantification; plaque titration, quantitative real-time PCR, digital PCR, Enzyme-linked immunosorbent assay (ELISA), Plaque Reduction Neutralization Test (PRNT), Focus Reduction Neutralization Test (FRNT)

(In Thai) เทคนิคทางไวรัสวิทยา การเพาะเลี้ยงเซลล์ระดับพื้นฐาน การติดเชื้อไวรัส การแยกเชื้อไวรัส การเพาะและการเพิ่มจำนวนไวรัส เซลล์ไลน์ ไข่ไก่ฟัก การตรวจและการหาปริมาณไวรัส พลาคไตเตรชั่น ปฏิกิริยาลูกโซ่โพลิเมอเรสแบบเรียลไทม์ ปฏิกิริยาลูกโซ่ดิจิทัล เอนไซม์-ลิงค์อิมมูโนซอร์เบนท์แอสเซย์ การทดสอบแอนติบอดีลบล้างฤทธิ์ด้วยวิธีพลาคแอสเซย์ การทดสอบแอนติบอดีลบล้างฤทธิ์ด้วยวิธีโฟกัส

Course Schedule (Tentative): 23 Feb - 6 Mar 2025
(Lab BSL2 B409 Institute of Molecular Biosciences)

	Activities	Description	Time	Instructors and Assistants
Day 1				
1	Active discussion: Virological techniques workflow	- To introduce the course and experimental workflow. - Lab safety orientation; BSL2 competency test	9.00 – 1200	CT
2	Lab: Basic cell culture techniques	- To seed cells for virus isolation[(1)]	13.00 – 16.00	CT
Day 2				
1	Lab: Virus isolation[(1)]	- To inoculate C6/36 cells with patient serum for virus isolation[(1)]	9.00 – 12.00	CT

	Lab: Embryonated eggs Inoculation[2]	- To inoculate virus into embryonated eggs for virus propagation (Allantoic Sac Inoculation)[2]	13.00 – 16.00	AK
Day 3				
1	Lab: Viral infection observation [1, 2]	- To observe morphology of the infected cells (cytopathic effect; CPE)[1] - To observe embryo viability of the inoculated eggs[2]	9.00 – 12.00	AK
2	Active discussion/ demonstration	Virus titration and quantitation methods	13.00 – 16.00	CT
Day 4				
1	Lab: Virus titration; Plaque assay and TCID50 (1)	- To seed cells into 12 multi-well cell culture plate for plaque assay and 96 multi-well plate for TCID50.	9.00 – 12.00	CT
2	Active discussion/ demonstration	Digital PCR	13.00 – 16.00	CT
Day 5				
1	Lab: Virus collection from the infected cells	- To collect viruses from the infected cells (3 dpi)	9.00 – 12.00	CT
2	Lab: Virus titration; Plaque assay and TCID50 (3)	- To titrate virus titer by plaque assay and TCID50[3]	13.00 – 16.00	CT

	Activities	Description	Time	Instructors and Assistants
Day 6				
1	Lab: Virus titration; Plaque assay and TCID50[(3)]	- To titrate virus titer by plaque assay and TCID50 (fixation, staining, counting and calculation)[(3)]	9.00 – 12.00	CT
2	Lab: Allantoic collection[(2)]	- To collect allantoic fluid from virus inoculated eggs (day 6 post virus inoculation in embryonic eggs)[(2)]	13.00 – 16.00	CT
Day 7				
1	Lab: Virus quantification by quantitative real-time PCR [(4)]	- To quantitate viral copy numbers of the by quantitative real-time PCR[(4)]	9.00 -12.00	CT
2	Lab: Virus quantification by quantitative real-time PCR [(4)]	- To quantitate viral copy numbers of the by quantitative real-time PCR; result analysis[(4)]	13.00 -16.00	CT
Day 8				
1	Lab/demonstration:	- To demonstrate PRNT/FRNT assay	9.00 – 12.00	CT
2	Lab/demonstration:	- To demonstrate ELISA assay	13.00 – 16.00	CT
Day 9				
1	Active discussion: Virus quantification results analysis	- To comparatively analyze virus quantification from different approaches	9.00 – 12.00	CT

	Lab: Practical exam	- Practical exam	9.00 – 12.00	CT
Day 10				
1	Active discussion	- Virus–host cell Interaction scenario in infectious disease	9.00 – 12.00	CT
2	Presentation, discussion, reflection, and after-action review	- To present results achieved in the class. - To discuss the techniques and applications of virus detection and quantification. - To provide students opportunities to describe their learning experiences received from this course and how they can be applied to their future learning. - To collect comments, and suggestions from students for further improvements of the course.	13.00 – 16.00	CT

Assessment Criteria:

Assessment method		Performance criteria	Scoring rubric
1	Class attendance & participation (5%)	Attendance and punctuality (2.5%)	Punctually (4) Seldom late (2-3) Moderately late (1) Frequently late or absent without notification (0) *Attending the class after 5 minutes is determined late

		Participation (2.5%)	Frequently participates (4) Moderately participates (2-3) Seldom participates (1) Never participates (0)
2	Practical exam (15%)		
3	Assignment (presentation) (15%)	Presentation (2.5%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
		Organization (2.5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Content accuracy (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Supporting evidence (2%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (1%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Participation and performance (2%)	Active (4) Fairly active (2-3) Inactive (1)

3	Discussion (10%)	Professional and interpersonal skills (responsibility, teamwork, and leadership) (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Creative and high-order thinking skills (8%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Safety practice (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
4	Lab performance (30%)	Lab plan (preparation and readiness) (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Lab skills (10%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Time management (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Troubleshooting skills (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)

		Punctual submission (2%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
5	Lab report (25%)	Report organization: intro, methods, results, discussion and conclusion (10%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Data presentation, analysis and interpretation (15%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (3%)	Excellent (4) Above average (3) Average (2) Needs improvement (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

Date of Revision: 14 November 2025