

**Course Syllabus**  
**MBMB 654 Virological techniques**  
**Academic year 2025**

<b>Course ID and Title</b>	MBMB 654 Virological techniques
<b>Course coordinator</b>	Chutima Thepparit, Ph.D. Institute of Molecular Biosciences, Mahidol University Tel: 0-2441-9003 to 7 Ext. 1XXX Email: chutima.thp@mahidol.edu
<b>Instructors:</b>	1. Chutima Thepparit, Ph.D. 2. Asst. Prof. Alita Kongchanakul, Ph.D. 3. Duangnapa kovanich, Ph.D. 4. Promsin Masrinoul, Ph.D.
<b>Supporting staffs</b>	CVD supporting staffs
<b>Credits:</b>	2 (0-4-2)
<b>Curriculum:</b>	Master of Science Program in <b>Molecular and Integrative Biosciences</b> (elective course) Doctor of Philosophy Program in <b>Molecular and Integrative Biosciences</b> (elective course)
<b>Semester offering:</b>	Second semester
<b>Pre-requisites:</b>	None

**Course learning outcomes (CLOs):**

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

1. Demonstrate scientific integrity, responsibility, and safety practices
2. Exhibit laboratory skills in virological techniques
3. Apply the skills and knowledge of virological techniques to conduct the associated experiments.
4. Demonstrate critical thinking, teamwork, and interpersonal skills
5. Effectively communicate scientific concepts and findings through discussions and presentations.

**Alignment of Teaching and Assessment Methods to Course Learning Outcomes:**

<b>Course Learning Outcomes</b>	<b>Teaching Method</b>	<b>Assessment Method</b>
1. Demonstrate scientific integrity, responsibility, and safety practices	<ol style="list-style-type: none"> <li>1. Lab safety orientation</li> <li>2. Discussion</li> <li>3. Lab report</li> <li>4. Assignment</li> </ol>	<ol style="list-style-type: none"> <li>1. Laboratory performance</li> <li>2. Discussion performance</li> <li>3. Report and assignment submission</li> <li>4. Assignment</li> <li>5. Plagiarism detection</li> </ol>
2. Exhibit laboratory skills in virological techniques	<ol style="list-style-type: none"> <li>1. Hands-on lab practice</li> </ol>	<ol style="list-style-type: none"> <li>1. Laboratory performance</li> <li>2. Lab report</li> </ol>
3. Apply the skills and knowledge of virological techniques to conduct the associated experiments.	<ol style="list-style-type: none"> <li>1. Problem-based project</li> <li>2. Discussion</li> <li>3. Assignment</li> </ol>	<ol style="list-style-type: none"> <li>1. Laboratory performance</li> <li>2. Discussion performance</li> <li>3. Assignment</li> </ol>
4. Demonstrate critical thinking, teamwork, and interpersonal skills	<ol style="list-style-type: none"> <li>1. Problem-based project</li> <li>2. Discussion</li> <li>3. Group activities</li> </ol>	<ol style="list-style-type: none"> <li>1. Laboratory performance</li> <li>2. Discussion performance</li> <li>3. Performance in group activities</li> </ol>
5. Effectively communicate scientific concepts and findings through discussions and presentations	<ol style="list-style-type: none"> <li>1. Discussion</li> <li>2. Presentation</li> </ol>	<ol style="list-style-type: none"> <li>1. Discussion performance</li> <li>2. Presentation performance</li> </ol>

**Course description:**

Virological techniques; basic cell culture techniques; virus infection, inoculation and propagation; cell culture, embryonated egg, mosquito; virus detection and quantification; plaque titration, TCID50, quantitative real-time PCR, ELISA.

## Course Schedule (Tentative):

(Classroom XXX and Lab Classroom XXX)

	Activities	Description	Time	Instructors and Assistants
Day 1				
1	Lecture/Discussion: Virological techniques workflow	- To introduce the course and experimental workflow. - Lab safety orientation; BSL2	9.00 – 12.00	CT
2	Lab: Basic cell culture techniques	- To seed cells into cell culture flask (for virus propagation)	13.00 – 16.00	CT/AK
Day 2				
1	Lab: Virus propagation (1)	- To infect the cells with virus for virus propagation	9.00 – 12.00	CT/AK
		- To inoculate virus into embryonated eggs for virus propagation (Allantoic Sac Inoculation)	13.00 – 16.00	AK/CT
Day 3				
1	Lab: Virus propagation (2)	- To observe morphology of the infected cells (cytopathic effect; CPE) - To observe embryo viability of the inoculated eggs.	9.00 – 10.00	CT/AK
2	Lab: Virus inoculation in mosquitoes	-To demonstrate virus inoculation in mosquitoes	11.00 – 16.00	CT/AK
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/AK
2	Self-study;			
Day 5				
1	Lab: Virus collection from the infected cells	- To collect virus from the infected cells (3 dpi)	9.00 – 12.00	CT/AK

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2	Lab: Virus titration; Plaque assay and TCID50 (2)	- To titrate virus titer by plaque assay and TCID50	13.00 – 16.00	CT/AK
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	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)	9.00 – 12.00	CT/AK
2	Lab: Allantoic collection	- To collect allantoic fluid from virus inoculated eggs (day 3 post virus inoculation in embryonic eggs)	13.00 – 16.00	AK/CT
Day 7				
1	Lab: Virus quantification by quantitative real-time PCR (1)	- To quantitate viral copy numbers of the by quantitative real-time PCR	9.00 -12.00	CT/DK
2	Lab: Virus quantification by quantitative real-time PCR (2)	- To quantitate viral copy numbers of the by quantitative real-time PCR; result analysis	13.00 -16.00	CT/DK
Day 8				
1	Lab discussion: Virus quantification results analysis	- To comparatively analyze virus quantity from different approach	9.00 – 12.00	CT/AK
2	Lab: ELISA (1)	- To coat the 96 multi-well plate with antibody for ELISA (plate preparation)	13.00 – 16.00	PM/DK
Day 9				

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1	Lab: ELISA (2)	- To quantitate virus by ELISA (Assay procedure; blocking, sample incubation)	9.00 – 12.00	PM/DK
		- To quantitate virus by ELISA (Assay procedure; substrate addition and detection)	13.00 – 16.00	PM/DK
Day 10				
1	Lab: ELISA (3)	- To calculate ELISA results	9.00 – 12.00	PM/DK
2	Presentation, discussion, reflection, and after-action review	<ul style="list-style-type: none"> <li>- To present results achieved in the class.</li> <li>- To discuss the techniques and applications of virus detection and quantification.</li> <li>- To provide students opportunities to describe their learning experiences received from this course and how they can be applied to their future learning.</li> <li>- To collect comments, and suggestions from students for further improvements of the course.</li> </ul>	13.00 – 16.00	CT/AK/DK/PM

**Assessment Criteria:**

Assessment method		Performance criteria	Scoring rubric
1	Class attendance & participation (10%)	Attendance and punctuality (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 (5%)	Frequently participates (4) Moderately participates (2-3) Seldom participates (1) Never participates (0)
2	Assignment (15%)	Punctual assignment submission (1%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
		Organization (2%)	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 (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (2%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
3	Discussion (15%)	Participation and performance (2%)	Active (4) Fairly active (2-3) Inactive (1)
		Professional and interpersonal skills	Excellent (4) Above average (3)

		(responsibility, teamwork, and leadership) (5%)	Average (2) Needs improvement (1)
		Creative and high-order thinking skills (8%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
4	Lab performance (30%)	Safety practice (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		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)
5	Lab report (30%)	Punctual submission (2%)	On-time (4) 1 day late (3) 2 days late (2) 3 days late (1) 4 days late or later (0)
		Report organization: intro, methods, results,	Excellent (4) Above average (3) Average (2)

	discussion and conclusion (10%)	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: XXX 20XX