Course Syllabus

MBMB 632 DNA barcoding

Academic Year 2025

Course ID and Title: MBMB 632

DNA barcoding

ชมชม ๖๓๒

เทคนิคชีววิทยาระดับโมเลกุลในการระบุชนิดสิ่งมีชีวิต

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Institute of Molecular Biosciences, Mahidol University

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Support Staff:

1. Nawarat Suksee
2. Suthida Pansawat

Credits: 1 (0–2–1)

Curriculum: Master of Science Program in Molecular and Integrative Biosciences (Elective course)

Doctor of Philosophy Program in Molecular and Integrative Biosciences (Elective course)

Semester: 2nd Semester

Academic Year: 2025

Date and Time: February 2 – 6, 2026 (9:00 AM – 4:00 PM)

Classroom: D301 Laboratory, Institute of Molecular Biosciences, Mahidol University

Pre-Requisites:

None.

Course Learning Outcomes (CLOs):

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

1. Explain and apply foundational knowledge of molecular biology and genetics techniques to conduct related experiments. (CLO1 – Knowledge)

2. Perform essential laboratory techniques, analyze experimental results, and communicate scientific concepts effectively through discussions and presentations. (CLO2 – Skills)
3. Demonstrate scientific integrity, responsibility, and adherence to safety and ethical practices in all laboratory activities. (CLO3 – Ethics)
4. Develop critical thinking, teamwork, and interpersonal skills necessary for collaborative scientific work. (CLO4 – Character)

Alignment of Teaching and Assessment Methods to Course Learning Outcomes:

Course Learning Outcomes	Teaching Method	Assessment Method
Explain and apply foundational knowledge of molecular biology and genetics techniques to conduct related experiments. (Knowledge – Aligned with PLO1)	1. Active Discussion 2. Problem-based activities 3. Assignment	1. Assignment evaluation 2. Discussion performance 3. Report/assignment submission
Perform essential laboratory techniques and analyze experimental results. (Skills – Aligned with PLO2)	1. Hands-on lab practice 2. Problem-based project 3. Lab demonstrations	1. Laboratory performance 2. Lab report 3. Practical assessment
Demonstrate scientific integrity, responsibility, and adherence to safety and ethical practices. (Ethics – Aligned with PLO3)	1. Lab safety orientation 2. Discussion of safety and ethics 3. Lab supervision	1. Laboratory performance 2. Safety compliance check 3. Plagiarism detection 4. Report/assignment submission
Demonstrate critical thinking, teamwork, interpersonal skills, and effective scientific communication. (Character – Aligned with PLO4)	1. Group activities 2. Discussion 3. Problem-based project 4. Presentation	1. Discussion performance 2. Group activity performance 3. Presentation performance

Course Description:

DNA barcoding; DNA extraction; PCR for DNA barcoding; gel electrophoresis and gel staining; DNA sequencing; Blast search with database; and data alignment; phylogenetic tree construction; species identification

(In Thai) ดีเอ็นเอบาร์โค้ด การสกัดดีเอ็นเอ เทคนิคพีซีอาร์สำหรับดีเอ็นเอบาร์โค้ด เทคนิคการแยกดีเอ็นเอและการย้อมสีเจล การค้นหาความเหมือนหรือแตกต่างของลำดับดีเอ็นเอบาร์โค้ดกับฐานข้อมูล การจัดเรียงลำดับข้อมูล การสร้างแผนภูมิต้นไม้ การจำแนกชนิดและการระบุสปีชีส์ของสิ่งมีชีวิต

Course Schedule:

(Classroom D301 and Lab Classroom D301)

	Activities	Description	Time	Instructors and Assistants
Feb 2, 2025				
1	**Discussion: Basic genetic and DNA barcoding**	Course introduction Active Discussion: Basic genetic and DNA barcoding	9.00 – 10.30	KT/SS
2	**Discussion: DNA extraction**	Active Discussion: Principle of DNA extraction	10.30-12.00	
3	**Lab: DNA extraction**	To extract the DNA		
4	**Discussion: DNA quality and quantity**	Active Discussion: Principles of DNA quality and quantity	13.00-16.00	
5	**Lab: Measuring of DNA quality and quantity**	To determine the DNA quality and quantity		
Feb 3, 2025				
1	**Discussion: Principle of Polymerase Chain Reaction (PCR)**	Active Discussion: Polymerase chain reaction (PCR)	9.00-11.00	KT/SS
2	**Lab: Setting up PCR**	To set PCR reaction using primers for DNA barcoding		
3	**Discussion: Principle of gel electrophoresis**	Active Discussion: Gel electrophoresis	11.00-12.00	
4	**Lab: Gel electrophoresis**	To check PCR products	13.00-14.00	
5	**Discussion: Principle of DNA staining**	Active Discussion: DNA staining	14.00-16.00	
6	**Lab: DNA staining**	To stain DNA pattern		
Feb 4 – 5, 2025				
1	**Discussion: DNA sequencing and DNA barcoding data analysis**	Active Discussion: DNA sequencing and DNA barcoding data analysis	9.00 – 12.00	KT/SS
2	**Lab: DNA barcoding data analysis**	To do BLAST search and data alignment		
3	**Lab: Phylogenetic tree analysis**	To construct a phylogenetic tree	13.00 – 15.00	

4	**Lab: Practice on the identification of unknown species**	To practice the identification of unknown species with the DNA database		
5	**Discussion and Summary**	Discussion and Summary	15.00 – 16.00	
Feb 6, 2025				
1	**Student's Reflection**	To provide students with opportunities to describe their learning experiences received from this course and how it can be applied to their future learning.	9:00 – 16:00	KT/SS
2	**After Action Review**	To collect comments, suggestions from students for further improvements of the course.		

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 considered 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 (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)
4	**Lab performance (20%)**	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 (15%)**	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, discussion and conclusion (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Data presentation, analysis and interpretation (5%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
		Grammar and originality (3%)	Excellent (4) Above average (3) Average (2) Needs improvement (1)
6	**Assignment (25%)**		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	Grade	Description
80–100	A	Excellent
75–79	B+	Very Good
70–74	B	Good
65–69	C+	Fairly Good

Percentage	Grade	Description
60–64	C	Fair
55–59	D+	Poor
50–54	D	Very Poor
0–49	F	Fail

Date of Revision: Nov 11, 2025