Course Syllabus

MBMB 648 Starch Modification for Functional Food Innovation

Academic Year 2025

Course ID and Title: MBMB 648
Starch Modification for Functional Food Innovation
ชมชม ๖๔๘
การดัดแปรแป้งเพื่อนวัตกรรมอาหารฟังก์ชัน

1. **Course Coordinator:** Assoc. Prof. Kanokporn Triwitayakorn, Ph.D.
Tel. 02-441-9003 to 7 Ext. 1368, Mobile: 089-155-8964
Email: kanokporn.tri@mahidol.ac.th
Office and Lab: D301-1 (3nd floor, wing-D)
Institute of Molecular Biosciences, Mahidol University

Instructor:

1. Assoc. Prof. Kanokporn Triwitayakorn, Ph.D.
Email: kanokporn.tri@mahidol.ac.th


Discussion Teaching Assistant:

1. Piengtawan Tappiban, Ph.D.
Email: piengtawan.tap@mahidol.ac.th
Website: https://mb.mahidol.ac.th/piengtawan-profile/

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: March 16 – 20, 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. Analyze the structural characterization, physicochemical properties, modification techniques (physical, chemical, and enzymatic), and health implications of starch, including the types and importance of resistant starch (RS) (**Knowledge**).

2. Execute laboratory procedures for the extraction, modification, and property analysis of starch, specifically applying modification techniques to increase resistant starch (RS) content (**Skills**).
3. Propose product concepts and functional food ideas derived from starch modification, while considering the ethical responsibilities and societal impacts of developing novel food ingredients (**Ethics**).
4. Exhibit effective collaboration, critical thinking, and a commitment to scientific rigor when designing experiments and explaining the application of modified starches in food development (**Character**).

Alignment of Teaching and Assessment Methods to Course Learning Outcomes:

Course Learning Outcomes	Teaching Method	Assessment Method
1. Analyze the structural characterization, physicochemical properties, modification techniques (physical, chemical, and enzymatic), and health implications of starch, including the types and importance of resistant starch (RS) (**Knowledge** – Aligned with **PLO1**).	1. Active Discussion	1. Q&A during discussion 2. Discussion performance 3. Quiz / short exercise 4. Assignment
2. Execute laboratory procedures for the extraction, modification, and property analysis of starch, specifically applying modification techniques to increase resistant starch (RS) content (**Skills** – Aligned with **PLO2**).	1. Instructions 2. Active Discussion 3. Hands-on lab practice 4. Problem-based learning	1. Discussion performance 2. Lab performance 3. Quiz / short exercise 4. Problem-based learning (scientific content and inventive idea)
3. Propose product concepts and functional food ideas derived from starch modification, while considering the ethical responsibilities and societal impacts of developing novel food ingredients (**Ethics** – Aligned with **PLO3**).	1. Discussion (about scientific integrity, responsibility, and safety practice) 2. Assignment 3. Writing lab report 4. Hands-on lab safety practice	1. Attendance (presence, absence, on-time?) 2. Task submission (on-time?) 3. Lab report writing (plagiarism?) 4. Lab performance (follow safety practice and teamwork or leadership skills) 5. Lab report writing (plagiarism and performance)

Course Learning Outcomes	Teaching Method	Assessment Method
6. Exhibit effective collaboration, critical thinking, and a commitment to scientific rigor when designing experiments and explaining the application of modified starches in food development (**Character** – Aligned with **PLO4**).	1. Discussion 2. Writing lab report 3. Individual or group assignment/presentation 4. Problem-based learning	1. Discussion performance (active participation?) 2. Lab report writing performance 3. Performance in the team (teamwork or leadership skills)

Course Description:

Structural characterization of starch; Starch physicochemical properties; Resistant starch for health-promoting benefits; Starch modification; Physical, chemical, and enzymatic modification; Starch extraction; modified starch; Functional food.

(In Thai) โครงสร้างโมเลกุลของแป้ง คุณสมบัติทางเคมีกายภาพของแป้ง แป้งทนย่อยเพื่อสุขภาพ การดัดแปรแป้ง การดัดแปรแป้งด้วยวิธีกายภาพ เคมี และการใช้เอนไซม์ การสกัดแป้ง แป้งดัดแปร อาหารฟังก์ชัน

Course Schedule:

(Classroom D301 and Lab Classroom D301)

	Activities	Description	Time	Instructors and Teaching Assistants
Day 1 – 2 (March 16 -17, 2025)				
1	**Active Discussion: Overview and Background**	To go over the concept of the following topics: (1) Structural characterization and physicochemical properties of starch. (2) Type of resistant starch (RS) and summarize the importance of RS in health-promoting benefits. (3) Starch modification (4) Functional food	9:00 – 10:30	**KT/PT**
2	**Lab: Starch extraction**	To extract starch from cassava flour.	10:30 – 12:00	**KT/PT**
3	**Lab: Starch modification**	To modify starch based on physical method.		
4	**Lab: Starch extraction (continue)**	To wash the starch slurry.	13:30 – 16:00	**KT/PT**

	Activities	Description	Time	Instructors and Teaching Assistants
5	**Lab: Starch modification**	To modify starch using a chemical method.		
6	**Discussion**	To discuss the factors influencing starch extraction, starch modification, and functional food.		
Day 3 (March 18, 2025)				
1	**Lab: Starch extraction (continue)**	To wash and dry the starch slurry.	9:00 – 10:00	**KT/PT**
2	**Lab: Starch properties**	To measure the content of RS.	10:00 – 12:00	
3	**Lab: Starch modification**	To continue the methods of physical and chemical modification.	12:30 – 15:30	
4	**Lab: Starch properties**	To measure the content of RS.		
5	**Discussion**	To discuss experimental designs and applications of starch modification.	15:30 – 16:00	
Day 4 (March 19, 2025)				
1	**Lab: Starch properties (continue)**	To finish the method of RS measurement.	9:00 – 14:00	**KT/PT**
2	**Lab: Pitching your functional food start-up.**	To present the ideas of functional food products and their applications and benefits.	14.00 – 15:00	
3	**Discussion**	To discuss the RS result and the limitations of functional foods.	15:00-16:00	
Day 5 (March 20, 2025)				
1	**Recap of Content Learned**	To recap/wrap up the content students have learned	9:00 – 16:00	**KT/PT**
2	**Student's Reflection**	To provide students with opportunities to describe their learning experiences received from this course and how they can be applied to their future learning.		
3	**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 (5%)	Attendance and punctuality (2%)	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 (3%)	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 (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 (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	Pitching your functional food start-up (20%)		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: Nov 11, 2025