



TQF 3 Course Specifications Section 1 General Information

1. Course code and course title

Thai	ICBI 215 ชีวเคมีทั่วไป
English	ICBI 215 General Biochemistry I

2. Number of credits 4 (4-0-8) (Lecture/Lab/Self-study)

3. Program and type of subject

3.1 Program Bachelor of Science (Biological Sciences)

3.2 Type of Subject Required Major course

4. Course Coordinator and Course Lecturer

4.1 Course Coordinator Manchuta Dangkulwanich, PhD

4.2 Course Lecturers Manchuta Dangkulwanich, manchuta.dan@mahidol.edu

5. Trimester/ Year of Study

5.1 Trimester All trimesters (excluding summer session) / for all students in all International College Undergraduate Programs

5.2 Course Capacity Approximately 40 students

6. Pre-requisite ICBI 101 Biology I, ICCH 221 Organic Chemistry I

7. Co-requisites ICBI 272 General Biochemistry Laboratory

8. Venue of Study Mahidol University, Salaya Campus



Section 2 Goals and Objectives

1. Course Goals

To provide an overview of biochemical principles, the structures and functions of biomolecules: amino acids, peptides, proteins, nucleic acids, carbohydrates, and lipids, as well as metabolic pathways common to prokaryotes, plants, and animals, equipping the students with the ability to analyze data from various biochemical experiments, an understanding of chemical reactions that sustain life at the molecular level, and the importance of biochemistry in the 21st century.

2. Objectives of Course Development/Revision

2.1 Course Objectives

Understanding of the principles of biochemistry and metabolic pathways is essential for the student's future endeavors in all areas of the life sciences, including applied sciences such as environmental, medical, and food sciences. This course aims to offer the basic principles of biochemistry, the structures and functions of biomolecules, their metabolisms, as well as their applications and impacts in the real world.

2.2 Course-level Learning Outcomes: CLOs

By the end of the course, students will be able to (CLOs)

1. CLO 1 Describe the structure and function of biomolecules
2. CLO 2 Explain the metabolic processes and their integration
3. CLO 3 Apply biochemical concepts to solve problems in biochemistry
4. CLO 4 Apply mathematic skills to biological problems
5. CLO 5 Use effective means of communication to collaborate with peers

Section 3 Course Management

1. Course Description

โครงสร้างและหน้าที่ของชีวโมเลกุลทั้งโปรตีน คาร์โบไฮเดรต ไขมัน และกรดนิวคลีอิก การเร่งปฏิกิริยาชีวภาพ พลังงานในสิ่งมีชีวิต วิถีเมแทบอลิซึมและการควบคุมในระดับเซลล์และโมเลกุล

Structure and function of biomolecules, especially proteins, carbohydrates, lipids, and nucleic acids, biological catalysis, bioenergetics, metabolic pathways and regulations at the cellular and molecular level

2. Credit hours per trimester

Lecture (Hour(s))	Laboratory/field trip/internship (Hour(s))	Self-study (Hour(s))
48	0	96

3. Number of hours that the lecturer provides individual counseling and guidance.
1 hour/week



Section 4 Development of Students' Learning Outcome

1. Short summary on the knowledge or skills that the course intends to develop in students (CLOs)

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

1. CLO 1 Describe the structure and function of biomolecules
2. CLO 2 Explain the metabolic processes and their integration
3. CLO 3 Apply biochemical concepts to solve problems in biochemistry
4. CLO 4 Apply mathematic skills to biological problems
5. CLO 5 Use effective means of communication to collaborate with peers

2. Teaching methods for developing the knowledge or skills specified in item 1 and evaluation methods of the course learning outcomes

ICCH 371	Teaching methods	Evaluation Methods
CLO1	Reading assignment, interactive lecture, case studies, quiz, group activities, group discussion,	Class discussion, exam
CLO2	Reading assignment, interactive lecture, case studies, quiz, group activities, group discussion	Class discussion, exam
CLO3	Reading assignment, group activities, case studies, group discussion	Class discussion, exam
CLO4	Reading assignment, demonstration, group activities, group discussion, case studies	Class discussion, exam
CLO5	Demonstration, group discussion	Observation, Peer evaluation



Section 5 Teaching and Evaluation Plans

1. Teaching plan

Class	Topic/Details	Number of Hours		Online	On campus	Teaching Activities/ Media	Lecturer
		Lecture Hours	Lab Hours				
1	Tue 10:00 – 11:50 The foundations of Biochemistry	2	0		X	Reading assignment, interactive lecture, quiz, group, activities, case studies, group discussion, demonstration	Manchuta Dangkulwanich
2	Thu 10:00 – 11:50 Water's roles in biochemistry	2	0		X		
3	Tue 10:00 – 11:50 Amino acids and peptides	2	0		X		
4	Thu 10:00 – 11:50 Exploring proteins	2	0		X		
5	Tue 10:00 – 11:50 Protein function	2	0		X		
6	Thu 10:00 – 11:50 Enzyme kinetics	2	0		X		
7	Tue 10:00 – 11:50 Carbohydrates	2	0		X		
8	Thu 10:00 – 11:50 Nucleic acids and DNA-based technologies	2	0		X		
9	Tue 10:00 – 11:50 Lipids, Membrane and Transport	2	0		X		
10	Thu 10:00 – 11:50 Lipids, Membrane and Transport	2	0		X		
11	Tue 10:00 – 11:50 Signal Transduction	2	0		X		
12	Thu 10:00 – 11:50 Basic concepts and Design of metabolism	2	0		X		
13	Tue 10:00 – 11:50 Glycolysis and Gluconeogenesis	2	0		X		
14	Thu 10:00 – 11:50 The citric cycle	2	0		X		
15	Tue 10:00 – 11:50 The electron transport chain	2	0		X		
16	Thu 10:00 – 11:50 Oxidative phosphorylation	2	0		X		
17	Tue 10:00 – 11:50 The light reaction of photosynthesis	2	0		X		
18	Thu 10:00 – 11:50 The Calvin cycle	2	0		X		
19	Tue 10:00 – 11:50 Glycogen metabolism and the pentose phosphate pathway	2	0		X		
20	Thu 10:00 – 11:50 Glycogen metabolism and the pentose phosphate pathway	2	0		X		
21	Tue 10:00 – 11:50 Fatty acid and Lipid metabolism	2	0		X		



Required Major Course
 Course Title: General Biochemistry
 Course Code ICBI 215

Undergraduate Program
 Mahidol University International College
 Science Division

22	Thu 10:00 – 11:50 Fatty acid and Lipid metabolism	2	0		X		
23	Tue 10:00 – 11:50 Metabolism of Nitrogen-containing molecules	2	0		X		
24	Thu 10:00 – 11:50 Metabolism of Nitrogen-containing molecules	2	0		X		
Total		48	0	0	48		

2. Plan for Assessing Course Learning Outcomes

2.1 Assessing and Evaluating Learning Achievement

a. Formative Assessment

- Worksheet
- Class discussion
- Group discussion
- Case study
- Quizzes and Online homework 25%

b. Summative Assessment

- Midterm Exam I 25%
- Midterm Exam II 25%
- Final Exam 25%

(1) Tools and Percentage Weight in Assessment and Evaluation

Learning Outcomes	Assessment Methods	Assessment Ratio (Percentage)	
CLO1 Describe the structure and function of biomolecules	Midterm I	20	25
	Assignments	5	
CLO2 Explain the metabolic processes and their integration	Midterm II	20	25
	Assignments	5	
CLO3 Apply biochemical concepts to solve problems in biochemistry	Midterm II	5	35
	Final	25	
	Assignments	5	
CLO4 Apply mathematic skills to biological problems	Midterm I	5	10
	Assignments	5	
CLO 5 Use effective means of communication to collaborate with peers	Peer evaluation	5	5
			100



(2) Grading System

Grade	Achievement	Final Score (% Range)	GPA
A	Excellent	90-100	4.0
B+	Very good	85-89	3.5
B	Good	80-84	3.0
C+	Fairly good	75-79	2.5
C	Fair	70-74	2.0
D+	Poor	65-69	1.5
D	Very Poor	60-64	1.0
F	Fail	Less than 60	0.0

(3) Re-examination (If course lecturer allows to have re-examination)

N/A - (Not applicable with MUIC)

3. Student Appeals

According to OAA standard protocols.



Section 6 Teaching Materials and Resources

1. Textbooks and/or other documents/materials

(1) Tymoczko, J.L., Berg, J.M., and Stryer L. **Biochemistry: a short course**, 3rd edition, USA: W.H. Freeman and Co.; 2015.

2. Recommended textbooks and/or other documents/materials

(1) Nelson, D.L. and Cox, M. M. **Lehninger Principles of Biochemistry** 7th Edition, USA: W.H. Freeman and Co.; 2017.

(2) Ferrier, D.R. **Lippincott Illustrated Reviews: Biochemistry** 7th Edition, USA: Wolters Kluwer; 2017.

(3) Selected readings from pertinent scientific journals and textbooks or video clips, as posted on the course's e-learning site

3. Other Resources (If any)

N/A

Section 7 Evaluation and Improvement of Course Management

1. Strategies for evaluating course effectiveness by students

1.1 Student feedback of instructors, teaching methods and materials, and course content through MUIC student evaluation forms

2. Strategies for evaluating teaching methods

2.1 Evaluation of effectiveness based on student evaluation scores and comments

2.2 Evaluation through peer observations by co-instructor or other Division faculty

3. Improvement of teaching methods

3.1 Adjustments based on student feedback, personal observations, comments from peer observations and discussions with supervisor and/or other Division faculty in one-on-one and/or group meetings as specified by MUIC guidelines

4. Verification process for evaluating students' standard achievement outcomes in the course

4.1 Verification through student performance on assessments based on MUIC/Division standards

5. Review and plan for improving the effectiveness of the course

5.1 Course instructors (and coordinator/supervisor) will meet to discuss results of student evaluations and student performance based on learning outcomes in order to identify point for improvement

5.2 Strategy for improvement set according to MUIC/Division guidelines



Appendix
Alignment between Courses and General Education courses

Table 1 The relationship between course and Program Learning Outcomes (PLOs)

General Biochemistry (ICBI215)	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
	R	R				

Note: Indicate the level of CLOs by letter I, R, P or M. Using the information as shown in the Curriculum Mapping of TQF2.

Table 2 The relationship between CLOs and Program LOs (Number in table = Sub LOs)

ICBI215	Learning Outcomes in the Biological Sciences Program (BI-PLOs)					
	1	2	3	4	5	6
CLO1 Describe the structure and function of biomolecules	1.1					
CLO2 Explain the metabolic processes and their integration	1.2					
CLO3 Apply biochemical concepts to solve problems in biochemistry	1.2					
CLO4 Apply mathematic skills to biological problems	1.5	2.1				
CLO 5 Use effective means of communication to collaborate with peers		2.1				



Table 3 The description of Program LOs and Sub LOs of the course

Program Learning Outcomes (PLOs)	SubPLOs
1. Apply knowledge and technical skills of diverse biological disciplines to address health, societal and environmental issues	1.1 Explain the fundamental and detailed knowledge of biological sciences
	1.2 Apply knowledge in biological sciences to address health, societal and environmental issues
	1.3 Perform experimentation in laboratory or field
	1.4 Apply technical skills in biological sciences to address health, societal and environmental issues
	1.5 Integrate biological sciences knowledge and technical skills across different disciplines to solve problems in biological sciences
2. Critically appraise information from scientific articles/journals, biological research methodology and experimentation to draw meaningful conclusion from the materials	2.1 Explain qualitative and quantitative data and/or ideas in basic biological sciences
	2.2 Draw meaningful conclusion from the learning materials such as scientific articles, research methodology, and scientific findings
	2.3 Retrieve relevant scientific information independently from textbooks, literatures and databases
	2.4 Manage scientific literatures using a reference-management program
	2.5 Assess the scientific relevance of information acquired to the objective at hand
3. Proficient in oral and written communication of biological sciences concepts formally and informally to both scientific community and general audience	3.1 Proficient in oral communication of ideas, concepts and findings in biological sciences to both the scientific community and the wider society
	3.2 Proficient in written communication of ideas, concepts and findings biological sciences to both the scientific community and the wider society



Program Learning Outcomes (PLOs)	SubPLOs
4. Apply scientific integrity, professionalism, and competencies to function independently as well as a team player	4.1 Maintain data integrity using appropriate tools and acceptable methods
	4.2 Work independently or coordinate with others to complete tasks at hand
	4.3 Apply concepts of lab and fieldwork safety when carrying out the tasks
	4.4 Set, plan and accomplish the assigned project in a timely manner
5. Apply moral and ethical values when dealing with issues relating to humans, animals and the environment, enabling actions based on moral and ethical judgment	5.1 Recognize ethical issues in human and animal experimentation
	5.2 Recognize emerging ethical issues in biological sciences
	5.3 Apply accepted ethical standards to resolve ethical dilemma
	5.4 Implement the course of action in accordance with moral and ethical judgement
6. Demonstrate innovative mindset to formulate and create solutions for situations relevant to oneself, the well-being of others, and the natural environment	6.1 Formulate lines of enquiry to drive problem solving relevant to oneself, the well-being of others, and the natural environment
	6.2 Formulate a process for data acquisition based on scientific methodology
	6.3 Demonstrate systematic and logical thinking in formulating solutions through the application of knowledge and technical skills acquired from the different biological science disciplines
	6.4 Explain the potential for knowledge transfer to innovation
	6.5 Create networks to learn from others and create new ideas