



TQF.3 Course Specification

Section 1 General Information

1. Course Code and Title

In Thai	วทชพ 281 ชีวเคมี
In English	SCBM 281 Biochemistry

2. Number of Credits

3 (3-0-6)

3. Curriculum and Course Type

3.1 Program of Study	Biomedical Science and Bioinnovation Science International Program
3.2 Course Type	Compulsory

4. Course Coordinator and Instructor

4.1 Course Instructor

Prof. Dr. Sarawut Jitrapakdee
Department of Biochemistry
Faculty of Science
Mahidol University
Tel 02-2015458
Email sarawut.jit@mahidol.ac.th

4.2 Instructor

Instructors in the Department of Biochemistry

5. Semester/Class Level

5.1 Semester 1/ Class Level 2	
5.2 Number of Students Allowed	Approximately 114 Students

6. Pre-requisite

none

7. Co-requisites

SCBM 225

8. Study Site Location

Faculty of Science at Salaya Campus

9. Date of Preparation/Latest Revision of the Course Specifications

04 August 2023



Section 2 Aims and Objectives

1. Course Goals

When the course is finished students should be able to

- 1.1 Discuss chemical processes in living systems, structures, functions, interactions between biomolecules
- 1.2 Specify method to control metabolic pathways for cell functions
- 1.3 Understand energy production and consumption for synthesis and degradation of biomolecules in normal and some abnormal conditions
- 1.4 Emphasis genome organization, genetic information transfer and regulations
- 1.5 Learn principle of biochemical techniques for medical applications

2. Objectives of Course Development / Revision

2.1 Revise sequences and contents of teaching to be more suitable for development and group of students.

2.2 Course-level Learning Outcomes (CLOs)

By the end of the course, students are able to

- CLO1 Describe basic knowledge about chemical processes in living systems, structures, functions, interactions between biomolecules
- CLO2 Describe principle of metabolic pathways and controls
- CLO3 Describe principle of energy source selection and expenditure in living system
- CLO4 Describe principle of important synthesis and degradation of biomolecules
- CLO5 Describe basic principle of DNA replication, transcription, translation, regulation of gene expression and related technologies
- CLO6 Research analyze link and apply to medical applications
- CLO7 Be honest and responsible for assigned duties

Section 3 Course Description and Implementation

1. Course Description

(Thai) ความรู้พื้นฐานเกี่ยวกับสารชีวโมเลกุล การจัดเรียงโครงสร้างและหน้าที่ของโปรตีน ตัวเร่งปฏิกิริยาชีวเคมี การทำงานของเอนไซม์ วัฏจักรกรดซิตริก การถ่ายทอดอิเล็กทรอนิกส์ การย้ายหมู่ฟอสเฟตด้วยปฏิกิริยารีดอกซ์ โภชนาการ กระบวนการทางเมตาบอลิซึมในการสลายและสังเคราะห์สารชีวโมเลกุลในภาวะปกติและสภาวะผิดปกติที่สำคัญ บางอย่าง ปฏิกิริยาการเกิดอนุมูลอิสระและระบบการป้องกัน ถ่ายทอดข้อมูลทางพันธุกรรม การควบคุมการแสดงออกของยีนในระดับโมเลกุล และเทคนิคทางชีวโมเลกุลและการประยุกต์ใช้ทางการแพทย์



Structures and functions of biomolecules, protein folding, protein functions, bio-catalysis, enzyme kinetics, citric acid cycle, electron transport and oxidative phosphorylation, nutrition, anabolism and catabolism of biomolecules in normal and some important pathological stages, regulation of metabolic pathways, oxidative stress and anti-oxidative mechanism, flow of genetic information, gene regulation, and molecular techniques with medical applications

2. Number of hours per semester

Theory (hours)	Supplementary (hours)	Practice (hours)	Self-study (hours)
40	3	-	-

3. Number of Hours per Week for Individual Advice

We have Q&A sessions for students both before and after classes via social media and email and also personal talk in practical sessions. In addition, Q&A and Kahoot game for pre-examination reviews.



Section 4: Development of the expected learning outcomes

1. A brief summary of the knowledge or skills expected to develop in students; the course-level expected learning outcomes (CLOs)

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

CLO1 Describe basic knowledge about chemical processes in living systems, structures, functions, interactions between biomolecules

CLO2 Describe principle of metabolic pathways and controls

CLO3 Describe principle of energy source selection and expenditure in living system

CLO4 Describe principle of important synthesis and degradation of biomolecules

CLO5 Describe basic principle of DNA replication, transcription, translation, regulation of gene expression and related technologies

CLO6 Research analyze link and apply to medical applications including present and discuss

2. How to organize learning experiences to develop the knowledge or skills stated in number 1 and how to measure the learning outcomes

Course Code	Teaching and learning experience management	Learning outcomes measurements
CLO1	Lecture, self-study, Group discussion, Q&A	Written examination, Exercise
CLO2	Lecture, Q&A	Written examination
CLO3	Lecture, Group discussion, Q&A	Written examination, Exercise
CLO4	Lecture, Q&A	Written examination
CLO5	Lecture, Group discussion, Q&A	Written examination, Exercise
CLO6	Lecture, Q&A	Written examination



SECTION 5 LESSON PLAN AND EVALUATION

1. Lesson Plan

SCBM 281

SCBM 224 : Schedule for First Semester ,Year 2023
Group : SCBM, SCIN, ENNM (110 students.)

Day	Date	Time	Activity	Room	Instructor	Students (No.)
Session I: Biomolecules						
Monday	7 Aug. 23	9:00-10:00	Orientation	SC1-152	SJ	110
		10:00-12:00	Lecture 1-2 : Foundation of Biochemistry	SC1-152	NP	110
Monday	21 Aug. 23	9:00-12:00	Lecture 3-5 : Amino acids and proteins	SC1-152	JY	110
Monday	28 Aug. 23	9:00-12:00	Lecture 6-8 : Carbohydrates, lipids & nucleotides	SC1-152	SK	110
Monday	4 Sep. 23	9:00-12:00	Lecture 9-11 : Enzyme & Kinetics	SC1-152	DP	110
Session II: Bioenergetics & metabolism						
Monday	11 Sep. 23	9:00-10:00	Lecture 12 : Carbohydrate metabolism I	SC1-152	SJ	110
		10:00-12:00	Conference I : Structure	SC1-152	JY, 1TAs	G1,(27)
				SC1-155	SK, 1TAs	G2,(27)
				SC1-157	NP,1TAs	G3,(28)
SC1-158	TK,1TAs	G4,(28)				
Monday	18 Sep. 23	9:00-10:00	Lecture 13 : Carbohydrate metabolism II	SC1-152	SJ	110
		10:00-12:00	Lecture 14-15 : TCA cycle & oxidative phosphorylation	SC1-152	TS	110
Monday	25 Sep. 23	9:00-11:00	Lecture 16-17 : Lipid metabolism I, II	SC1-152	JM	110
		11:00-12:30	Q&A (L1-17)	SC1-152		110
Midterm Examination 2023 (Lecture 1-17)						
Monday	16 Oct. 23	9:00-11:00	Lecture 18-19 : Amino acid metabolism I, II	SC1-152	MK	110
		11:00-12:00	Lecture 20 : Nucleotide metabolism I	SC1-152	MK	110
Monday	23 Oct. 23	9:00-10:00	Lecture 21 :Nucleotide metabolism II	SC1-152	MK	110
		10:00-12:00	Lecture 22-23 :Nutrition & vitamins	SC1-152	MK	110
Monday	30 Oct. 23	9:00-10:00	Lecture 24 : Integrated metabolism	SC1-152	JM	110
		10:00-12:00	Conference 2 : Metabolism	SC1-152	SJ, 1TAs	G1,(27)
				SC1-155	SK, 1TAs	G2,(27)
				SC1-157	MK, 1TAs	G3,(28)
				SC1-158	JM, 1TAs	G4,(28)
Session III: Flow of genetic material & expression						
Monday	6 Nov. 23	9:00-11:00	Lecture 25-26 : Oxidative stress	SC1-152	LJ	110
		11:00-12:00	Lecture 27 : DNA replication & repair I	SC1-152	TK	110
Monday	13 Nov. 23	9:00-10:00	Lecture 28 : DNA replication & repair II	SC1-152	TK	110
		10:00-12:00	Lecture 29-30 : RNA synthesis & processing I, II	SC1-152	SC	110
Monday	20 Nov. 23	8:30-10:30	Lecture 31-32 : Protein synthesis & postranslation	SC1-152	LJ	110
		10:30-12:30	Lecture 33-34 : Frontiers in gene technology	SC1-152	LJ	110
Monday	27 Nov. 23	9:00-10:30	Q&A (L18-34)	SC1-152		110
		10:30-12:30	Conference 3 : DNA technology	SC1-152	LJ, 1TAs	G1,(27)
				SC1-155	JM, 1TAs	G2,(27)
				SC1-157	RT, 1TAs	G3,(28)
				SC1-158	Ol, 1TAs	G4,(28)
Final Examination 2023 (Lecture 18-34)						



2. Evaluation of the CLOs

2.1 Measurement and Evaluation of learning achievement

a. Formative assessment

Feedback for all CLO.

b. Summative assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes			
	Written exam	Group assignment and discussion	Weight
CLO1	20	10	30
CLO2	10	-	10
CLO3	10	10	20
CLO4	10	-	10
CLO5	10	10	20
CLO6	10	-	10
Total	70	30	100

(2) Measurement and evaluation

Scores come from MCQ (midterm & final examinations) 70% written exam, 30% group discussion. Grading (A, B+, B, C+, C, D+, D, F) will be determined by group statistics first then by given score ranges according to the previous years statistics. Passing score \geq 50%

(3) Re-examination (if the course allows any)

Re-exam or additional assignment may be arranged for students who got total score less than 50%.

3. Students' Appeal

Students can announce appeal to the course at course coordinator. The course coordinator will manage and report or consult to the SIM program committee.



Section 6 Teaching Resources

1. Required Texts

- 1) Ferrier, R.,D., Lippincott's Illustrated Reviews Biochemistry, 6th edition, Lippincott Williams & Wilkins (ASP)
- 2) Lehninger, L. A., Nelson, D. L., and Cox, M. M., *Principles of Biochemistry*, 4th or 5th edition, Worth, New York

2. Suggested Materials

Teaching materials as given in advance

3. Other Resources (if any)

Google Classroom Pubmed, Youtube, book websites

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

Faculty of Science has online evaluation platform for students after the course ended. Observation of student behavior and complains and feedbacks from course coordinator, teaching staffs and students

2. Strategy for Teaching Evaluation

From study group performance and from observation by third party

3. Teaching Improvement

After the course ended, we will arrange staff meeting for post evaluation and finding the plan to improve teaching strategy next year.

4. Verification of Standard of Learning Outcome for the Course

During teaching, we will evaluate achievement in each topic, expectation from student feedbacks, random checking individual student works, making an evaluation form in necessity topics and student score statistic by overall and each topic.

5. Revision Process and Improvement Plan for Course Effectiveness

- 5.1 Revise lesson plan and curriculum every 3 years or as major suggestions.
- 5.2 Change or swap or add teaching staffs to increase new information and staff experiences to widen student experiences.



Appendix
Relations between the course and the program

Table 1 Relations between the course and the PLOs

Course Name Medical Biochemistry	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
(Course Code) SCBM 224								

Remarks : Show the level of the course management with the symbols I, R, P, and M. This must correspond to the curriculum mapping written in the TQF2.

Table 2 Relations between CLOs and PLOs

(Course Code) SCBM 224	PLOs							
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
CLO1	1.1			4.2	5.2			
CLO2	1.1			4.2	5.2			
CLO3	1.1			4.2	5.2			
CLO4	1.1			4.2	5.2			
CLO5	1.1			4.2	5.2			
CLO6	1.1			4.2	5.2			

Remarks:

- a. Each CLO should clearly correspond to the PLO at the SubPLO level to show a clear connection.
- b. Describe the PLOs and SubPlos only referred to in the course in “[Table 3](#) PLOs that the course is responsible for”.

Table 3 PLOs that the course is responsible for

PLOs	SubPLOs
PLO1	1.1
	1.3
	1.4
PLO3	3.4
PLO4	4.2
PLO7	7.2