TQF 3 Course Specification

Section 1 General Information

1. Course Code and Title

In Thai .....

In English ICBI 415 Biotechnology

2. Number of Credits 4 (Theory 4 hrs. Practice 0 hrs. Self-Study 8 hrs./week)

3. Curriculum and Course Type

3.1 Curriculum Bachelor Degree Program (International)

3.2 Course Type Compulsory Course

4. Course Coordinator and Lecturer

4.1 Course Coordinator Asst. Prof. Tumnoon Charaslertrangsi, Ph.D.
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4.2 Course Instructor Simab Kanwal, Ph.D., Post Doc
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5. Trimester/Class Level

5.1 Trimester 1/2022-2023

5.2 Number of Students Allowed Approximately 40 Students

6. Pre-requisite

ICBI 214 General Microbiology, ICBI 225 Biochemistry

7. Co-requisites

N/A

8. Study Site Location Mahidol University Salaya Campus **Time** Friday, 12:00 to 14:00, 15:00 to 17:00

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

10 August 2022

Section 2 Aims and Objectives

1. **Course Goals**

Students will expand their knowledge about latest applications of scientific principles in relation to animals, plants and microorganisms; production of cellular compounds in public health, agriculture and industry.

2. Objectives of Course Development/Revision

2.1 Course Objectives

This course aims to provide the undergraduate biological sciences students with knowledge and abilities as follows:

2.1.1. Introduction to the principles, practices and technological applications that use biological systems or living organisms to create or modify products or processes for a specific use.

2.1.2. Broad introduction to the four types of Biotechnology branches, covering key concepts.

2.1.3. The use of biotechnology in various fields, including medicine, agriculture, environmental protection, forensic science, and basic science

2.1.4. Description of model organisms, ethnobotany and drug development

2.1.5. Bioethical factors in biotechnology; risks, benefits, and the social factors involved

2.1.6. Development of critical thinking and communication skills in students required in the field of biotechnology

2.1.7. In addition, the lessons regarding the biotechnology industry and understanding of potential employment opportunities in biotechnology shall also be included in the course

2.2 Course-level Learning Outcomes: CLOs

On completion of the course, the students will be able to ..... (CLOs)

1. CLO1 - Describe the concepts and techniques in biotechnology that illustrate the understanding of the advanced techniques
2. CLO2 - Identify the risks and benefits of biotechnology to society
3. CLO3 - Develop comprehensive understanding of science, technology and business management, along with the entrepreneurial skills required to exploit technological advances within a competitive environment.
4. CLO4 – Understand the potential employment opportunities in biotechnology

Section 3 Course Description and Implementation

1. Course Description

(English) Technology and the applications of scientific principles in relation to animals, plants, microorganisms; production of cellular compounds in public health, agriculture and industry; The Biotechnology Industry; Careers in Biotechnology

2. Number of hours per trimester

Theory (hours)	**Practice** (hours)	**Self-study** (hours)
48 (4 hours x 12 weeks)	0	96 (8 hours x 12 weeks)

3. Number of Hours per Week for Individual Advice

4 hrs

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)**

   1. CLO1 - Through lectures, students will learn the concepts and techniques in biotechnology
   2. CLO2 - Students will apply their theoretical knowledge to improve the quality and quantity of the biotechnological products
   3. CLO3 - The analyses of case study and research readings will let students to apply the biotechnology knowledge and techniques to innovate solutions to address the problem at hand.
   4. CLO4 – Students will learn the use of various software programs in the field of biotechnology and also learn to evaluate the online databases.

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

CLOs	Teaching and learning experience management			Learning outcomes measurements			
	Lecture	Participation and discussion	Research readings and software demonstration	Quiz	Presentations	Exams	Attendance
CLO1	X	X		MCQ, problem solving questions	Oral presen-tation	MCQ, short and long answer	X
CLO2	X	X		MCQ, problem solving questions	Oral presen-tation	MCQ, short and long answer	X
CLO3	X	X	X	MCQ, problem solving questions	Oral presen-tation	MCQ, short and long answer	X
CLO4	X		X				

SECTION 5 LESSON PLAN AND EVALUATION

1. Lesson Plan

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
1	Foundations of Biotechnology; Introduction of Biotechnology terms, skills and knowledge about an authentic biotechnology project, historical development of biotechnology and identification of modern technologies that fall within the realm of biotechnology, applications and future perspectives	4		Lecture (ppt.)	SK
2	Four types of Biotechnology; Color classification of branches of biotechnology, Characterization of biotechnology for use in various fields, including medicine, agriculture, environmental protection, forensic science, and basic science	3		Lecture (ppt.)	SK
		1		Group discussion	
3	Use of various organisms in biotechnology, examples of model organisms specific to the biotechnology industry and experimentation with a model organism as a tool	3		Lecture (ppt.)	SK
		1		Group discussion	
4	Instrumentation in Biotechnology; Development of Lab procedures and standard safety laboratory operating procedures, including the use of sterile techniques; hypothesis formation, data collection, and data analysis	2		Lecture (ppt.)	SK
		2		Demonstration	
5	**Midterm exam**	4			SK
6	Food and fermentation biotechnology, cell banking and downstream processing, analysis and automation, genomics, proteomics, metabolomics; Oral presentations	4		Lecture (ppt.) Oral presentation Discussion	SK
7	Research readings; Biotechnology in medicine; Medical nanobiotechnology	2		Lecture (ppt.)	SK
		2		Research paper reading and analysis	

Teaching Period	Topics/Details	Number of hours		Methods: Teaching Media	Lecturer
		Theory*	Practice**		
8	Bioassays; Ethnobotany and drug development using combinatorial chemistry; Computer applications in biotechnology; Bioinformatics – Databases, Data retrieval tools – (BLAST, PubMED)	2		Lecture (ppt.)	SK
		2		Software programs demonstration	
9	Field tour (date is subject to change)	4		Lecture Workplace based experience	SK
10	Bioethics; Societal views of Biotechnology, Pros and cons of development, production, and use of biotechnology products; GMOs and Biosafety; Group discussion related to bioethical questions; Oral presentations and discussion	4		Lecture (ppt.) Oral presentation Discussion	SK
11	Biotechnology Industry; Bringing a product to market; patenting, product safety, legislation and marketing; Careers in biotechnology; Course Closure; Summarize key learning across the subject of biotechnology, evaluation of personal experience and performance in the course	4		Lecture (ppt.)	SK
12	**Final exam**	4			SK
	Total hours of the entire trimester	48			

2. Plan for Assessment of Expected Course-Level Learning Outcomes (CLOs)

2.1 Measurement and Evaluation of learning achievement

A. Formative Assessment

Students shall be assessed for self-discipline: punctuality, responsibility, self-control, and self-motivated work as well as on the basis of homework assignments for originality, integrity, and academic honesty.

Students will be evaluated their understanding and ability to apply their knowledge to research by written exam including short-answer and essay questions. Evaluation methods shall be comprising Quizzes, assignments, midterm and final exam. Following is the grading scheme:

- Midterm Exam 35%
- Final Exam 35%
- Quizzes and assignments 10%
- Class Participation (active attendance, at least 80% of class events) 5%
- Presentations and research analysis 15%

B. Summative Assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Evaluation Method*				Weight (Percentage)
	Quiz/Assignment	Presentation	Exam	Discussion	
CLO1	3	3	20	2	**28**
CLO2	3	3	20	1	**27**
CLO3	2	3	20	1	**26**
CLO4	2	6	10	1	**19**
Total	**10**	**15**	**70**	**5**	**100**

(2) Measurement and evaluation

Score	Grade
80-100	A
75-79.99	B+

70-74.99	B
65-69.99	C+
60-64.99	C
55-59.99	D+
50-54.99	D
<50	F

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

Not applicable in MUIC

3. Students' Appeal

Following MUIC policy

Section 6 Teaching Resources

1. Required Texts

1) Lehninger Principles of Biochemistry - David L. Nelson; Michael M. Cox
2) Biotechnology: Science for the New Millennium, Second Edition, 2E - Ellen Daugherty, MST., San Mateo Biotechnology Career Pathway, Paradigm Publishing
3) Text books and material resources relevant to the outlined contents/Lecture handouts
4) Teacher generated

2. Suggested Materials

1) Research publications
2) Internet exploration

3. Other Resources (if any)

N/A

Section 7 Evaluation and Improvement of Course Implementation

1. Strategy for Course Effectiveness Evaluation by Students

1.1 Student evaluation following by:

1.1.1 Course content

1.1.2 Course management

1.1.3 Suggestions

2. Strategy for Teaching Evaluation

2.1. Instructor reflection, feedback, and TQF5 report

2.2. Post-course student evaluation

3. Teaching Improvement

3.1 Quantitative analysis of student assessment outcomes

4. Verification of Standard of Learning Outcome for the Course

Passing score, assignment submission, and descriptive analysis of the assignment score.

5. Revision Process and Improvement Plan for Course Effectiveness

Course reflection and submission of TQF5

Appendix

Relations between the course and the program

Table 1 Relations between the course and the PLOs

Biotechnology (ICBI 415)	PLOs		
	PLO1	PLO2	PLO3
	R	R	R

Table 2 Relations between CLOs and PLOs

(ICBI 415)	PLOs		
	PLO1	PLO2	PLO3
CLO1	1.1		
CLO2			3.1, 3.2
CLO3	1.2		3.3
CLO4	1.3	2.1,2.2,2.3	

Table 3 PLOs and SubPLOs that the course is responsible for

PLOs	SubPLOs
1. Apply knowledge and technical skills of diverse biological disciplines to address health, societal and environmental issues. Apply scientific integrity, professionalism, and competencies to function independently	1.1. Explain the fundamental and detailed knowledge of biological sciences

as well as as a team player.	
	1.2. Apply technical skills in biological sciences to address health, societal and environmental issues
	1.3. 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 a meaningful conclusion from the materials. Apply moral and ethical values when dealing with issues relating to humans, animals, and the environment, enabling actions based on moral and ethical judgment.	2.1. Draw meaningful conclusion from the learning materials such as scientific articles, research methodology, and scientific findings
	2.2. Retrieve relevant scientific information independently from textbooks, literatures, and databases
	2.3. Recognize ethical issues in human and animal experimentation

3.Proficient in oral and written communication of biological sciences concepts formally and informally to both scientific community and general audience. Demonstrate innovative mindset to formulate and create solutions for situations relevant to oneself, the well-being of others, and the natural environment	3.1. Proficient in communication of ideas, concepts, and findings in biological sciences to both the scientific community and the wider society
	3.2. Formulate a process for data acquisition based on scientific methodology 3.3. Create networks to learn from others and create new ideas