



## TQF 3 Course Specifications

### Section 1 General Information

1. Course code and course title

Thai สรีรวิทยาและพันธุกรรมของจุลินทรีย์  
English Microbial Physiology and Genetics

2. Number of credits .....4 (4-0-8).....

3. Program and type of subject

3.1 Program Undergraduate Degree (International Program)  
3.2 Type of Subject Required for Biology and Biotechnology concentration

4. Course Coordinator and Course Lecturer

4.1 Course Coordinator Associate Professor Dr. Prayad Pokethitiyook.  
4.2 Course Lecturer Associate Professor Dr. Prayad Pokethitiyook  
Dr. Tumnoon Charaslertrangsri

5. Trimester/ Year of Study

5.1 Trimester 1 per year  
5.2 Course Capacity Approximately 25 students

6. Pre-requisite ICBI 214 General Microbiology

7. Co-requisites N/A

8. Venue of Study Mahidol International College

9. Date of Latest Revision

Month May Year 2018



## Section 2 Goals and Objectives

### 1. Course Goals

The aim of this course is to integrate biochemistry and genetics to enhance the understanding of the microbial cell and the robust and diverse nature of life emphasizing microorganisms. This course is intended to be a required third or final year class for the biotechnology as well as biology concentrations.

### 2. Objectives of Course Development/Revision

#### 2.1 Course Objectives

After tasking this course students will have the theoretical background and understanding of microbial physiology and genetics that is necessary to conduct microbiological laboratory research or attend professional school or graduate school (science, engineering and medicine). It will also enhance the student's ability to engage the public on recent microbiology issues. Application of directing bacteria to work in new areas such as bio-sensor and generation of valuable products from waste and turning waste into bio-energy like microbial fuel cell and bio-crude will also be focused.

#### 2.2 Course-level Learning Outcomes: CLOs

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

1. CLO1: Describe and demonstrate an understanding of cellular structure and the functional components of microbial cells and how organisms build and maintain a proton motive force. (1.1)
2. CLO2: Assess how environmental conditions can be manipulated to enhance the ways cells metabolize nutrients necessary for life including carbon, nitrogen, sulfur and phosphorus or comprehend how cellular physiology is altered by interactions between microbes and the environment. (1.2)
3. CLO3: Comprehend and appreciate how biochemical pathways and processes are integrated into a life-network, which provides robustness to life. (1.5)
4. CLO4: Comprehend, critically analyze and appreciate that the diversity of life is driven by the metabolic diversity of microbes. (2.1)



### Section 3 Course Management

#### 1. Course Description

(Thai) การเติบโตของจุลินทรีย์ เมตาบอลิซึม โครงสร้างและหน้าที่ของจุลินทรีย์ การควบคุมเมตาบอลิซึมโดยยีน โครงสร้างทางพันธุศาสตร์ของจุลินทรีย์ การเก็บรักษาสายพันธุ์ การแสดงออกและการแลกเปลี่ยนสารพันธุกรรมในเซลล์จุลินทรีย์

(English) Microbial growth, metabolism; microbial structures and functions; gene structure regulation of microbial metabolism; microbial genetic structure; maintenance, expression, and exchange of genetic materials in microbial cells.

#### 2. Credit hours per trimester

| Lecture<br>(Hour(s)) | Laboratory/field<br>trip/internship<br>(Hour(s)) | Self-study<br>(Hour(s)) |
|----------------------|--|-------------------------|
| 48                   | 0  | 84                      |

#### 3. Number of hours that the lecturer provides individual counseling and guidance.

2-3 hours per weeks



### 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. CLO1: Describe and demonstrate an understanding of cellular structure and the functional components of microbial cells and how organisms build and maintain a proton motive force. (1.1)
2. CLO2: Assess how environmental conditions can be manipulated to enhance the ways cells metabolize nutrients necessary for life including carbon, nitrogen, sulfur and phosphorus or comprehend how cellular physiology is altered by interactions between microbes and the environment. (1.2)
3. CLO3: Comprehend and appreciate how biochemical pathways and processes are integrated into a life-network, which provides robustness to life. (1.5)
4. CLO4: Comprehend, critically analyze and appreciate that the diversity of life is driven by the metabolic diversity of microbes. (2.1)

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

| Course Code | Teaching methods                        | Evaluation Methods                 |
|-------------|---|------------------------------------|
| CLO1        | Lecture, video clip                     | assignment, quiz, exam             |
| CLO2        | Lecture, video clip, group discussion   | assignment, quiz, exam             |
| CLO3        | Lecture, group discussion, mini-project | assignment, term paper, exam       |
| CLO4        | Lecture, field trip                     | Assignment, exam field trip report |



### Section 5 Teaching and Evaluation Plans

#### 1. Teaching plan

| Week | Topic  | Number of Hours |                                 | Teaching Activities/ Media                    | Lecturer |
|------|--|-----------------|---------------------------------|---|----------|
|      |  | Lecture Hours   | Lab/Field Trip/Internship Hours |   |          |
| 1    | Introduction to Microbial physiology and genetics and its scope                                | 2               |                                 | Lecture/ Power point and Video clip           | PP       |
| 2-3  | Microbial life, growth and diversity   | 6               | 4                               | Lecture/ Power point and Video clip/fieldtrip | PP       |
| 4-5  | Microbes in the environment, its metabolic pathway, energy production and metabolite transport | 8               |                                 | Lecture/ Power point and Video clip           | PP       |
| 6-7  | Microbial anaerobic pathway for special purpose metabolites syntheses                          | 2               | 4                               | Lecture/ Power point and Video clip/fieldtrip | PP       |
| 8    | Microbial fuel cell and biosensor  | 4               |                                 | Lecture/ Power point and Video clip           | PP       |
| 9    | Macromolecular synthesis and processing, protein synthesis                                     | 4               |                                 | Lecture/ Power point and Video clip           | TC       |
| 10   | DNA exchange: mutation, mutagenesis and repair   | 4               |                                 | Lecture/ Power point and Video clip           | TC       |
| 11   | Gene expression and regulation of gene expression for valuable products syntheses              | 6               |                                 | Lecture/ Power point and Video clip           | TC       |
|      | Total  | 40              | 8                               |   |          |



2. Plan for Assessing Course Learning Outcomes

2.1 Assessing and Evaluating Learning Achievement

(1) Tools and Percentage Weight in Assessment and Evaluation

| Learning Outcomes | Assessment Methods        | Assessment Ratio (Percentage) |     |
|-------------------|---------------------------|-------------------------------|-----|
|                   |                           |                               |     |
| CLO1              | Writing Examination - MCQ | 10                            | 25  |
|                   | Quiz                      | 15                            |     |
| CLO2              | Writing Examination - MCQ | 10                            | 25  |
|                   | Quiz                      | 15                            |     |
| CLO3              | Writing Examination - MCQ | 10                            | 25  |
|                   | Quiz, Individual Report   | 15                            |     |
| CLO4              | Writing Examination - MCQ | 10                            | 25  |
|                   | Group Report              | 15                            |     |
| Total             |                           |                               | 100 |

(2) Grading System

- 1. Mid-term examination 35%
- 2. Final examination 35%
- 3. Fieldtrip and Reports 15%
- 5. Class assignments and attendance 15%

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

N/A - (Not applicable with MUIC)

3. Student Appeals NA



### **Section 6 Teaching Materials and Resources**

1. Textbooks and/or other documents/materials
  - 1) Power point lecture class materials
  - 2) Class materials supplement
2. Recommended textbooks and/or other documents/materials
  - 1) Environmental Biotechnology: Principles and Applications Book by Bruce E. Rittmann and Perry L. McCarty, McGraw-Hill, 2001.

### **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 Program

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

| (Course Name)<br>Microbial physiology<br>and Genetics | Program Learning Outcomes (PLOs) |      |      |      |      |      |
|---|----------------------------------|------|------|------|------|------|
|   | PLO1                             | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
| (Course code)<br>ICBI 315                             | P                                | 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 PLOs

| (Course code)<br>ICBI 315 | Program Learning Outcomes (PLOs) |      |      |      |      |      |
|---------------------------|----------------------------------|------|------|------|------|------|
|                           | PLO1                             | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 |
| CLO1 .....                | 1.1                              |      |      |      |      |      |
| CLO2 .....                | 1.2                              |      |      |      |      |      |
| CLO3 .....                | 1.5                              |      |      |      |      |      |
| CLO4 .....                |                                  | 2.1  |      |      |      |      |

**Table 3** The description of PLOs and Sub Los of the course

|      |         |
|------|---------|
| PLOs | SubPLOs |
|------|---------|





Undergraduate Program

Course Title: Microbial Physiology and Genetics

Mahidol University International College

Course Code: ICBI315

Division of Science

|  |  |
|--|--|
| PLO1 Apply discipline-specific knowledge and technical skills in biological sciences | 1.1 Possess knowledge in microbial physiology and genetics |
|  | 1.2 Apply knowledge in microbial physiology and genetics   |
|  | 1.5 Integrate specific knowledge across discipline         |
| PLO2 Appraise scientific information critically                                      | 2.1 Comprehend qualitative, quantitative data and/or idea  |