



**Bachelor of Science in Biotechnology (International Program)  
Faculty of Science, Chulalongkorn University**

**STUDY PLAN**

**Announcement of Changes in General Education (GenEd) Courses**

This announcement is effective from the First Semester, Academic Year 2023

**1. Modification of General Education Courses**

Effective for students with the ID 66XXXXXXXXX only!

Students are required to complete a total of 12 credits of GenEd courses by selecting courses from any category based on their interests.

The previous compulsory requirement to take specific courses from each category, including Science and Mathematics, Social Sciences, Humanities, and Interdisciplinary, has been eliminated.

**2. Grading System Adjustment**

Effective for students with the ID 66XXXXXXXXX only!

GenEd courses will be graded on a Pass/Fail basis using the S/U grading system. Student evaluation will consider their participation, activities, examinations, assignments, and other relevant factors. The Office of the Registrar will facilitate the conversion of grades according to the new grading system.

**3. Enrollment in GenEd Courses under Student Own's Faculty**

Effective for all students!

Students are allowed to enroll in GenEd courses offered by their affiliated faculty (23XXXXX) in order to have the freedom to choose subjects they are interested in. However, this must be done in accordance with the requirements set by their faculty and/or obtaining necessary approval from their academic advisors.

Year 1		
First Semester		
Course	Course Name	Credit(s)
2301107	CALCULUS I	3(3-0-6)
2302101	GENERAL CHEMISTRY I	3(3-0-6)
2302103	GENERAL CHEMISTRY LABORATORY	1(0-3-0)
2303101	GENERAL BIOLOGY I	3(3-0-6)
2303102	GENERAL BIOLOGY LABORATORY I [COREQ: 2303101 GENERAL BIOLOGY I]	1(0-3-0)
5503111	ENGLISH COMMUNICATION FOR SCIENCE I	3(3-0-6)
	GEN ED	3
	<b>Total Credits</b>	<b>17</b>

Year 1		
Second Semester		
Course	Course Name	Credit(s)
2301108	CALCULUS II [PRER: 2301107 CALCULUS I]	3(3-0-6)
2302102	GENERAL CHEMISTRY II [PRER: 2302101 GENERAL CHEMISTRY I/ C.F.]	3(3-0-6)
2304151	ESSENTIAL PHYSICS	3(3-0-6)
2304197	PHYSICS LABORATORY FOR BIOLOGISTS	1(0-3-0)
2305101	GENERAL BIOLOGY II	3(3-0-6)
2305102	GENERAL BIOLOGY LABORATORY II [COREQ: 2305101 GENERAL BIOLOGY I]	1(0-3-0)
5503122	ENGLISH COMMUNICATION FOR SCIENCE II [PRER: 5503111 ENGLISH COMMUNICATION FOR SCIENCE I]	3(3-0-6)
	<b>Total Credits</b>	<b>17</b>

Year 2		
First Semester		
Course	Course Name	Credit(s)
2300251	CONCEPTS AND ISSUES IN BIOTECHNOLOGY	3(3-0-6)
2301170	COMPUTER AND PROGRAMMING	3(3-0-6)
2301172	COMPUTER AND PROGRAMMING LABORATORY [COREQ: 2301170 COMPUTER AND PROGRAMMING]	1(0-2-1)
2301286	PROBABILITY AND STATISTICS [PRER: 2301107 CALCULUS I]	3(3-0-6)
2302271	ORGANIC CHEMISTRY I [PRER: 2302102 GENERAL CHEMISTRY II/ C.F.]	3(3-0-6)
5503213	COMMUNICATION AND PRESENTATION SKILLS FOR SCIENCE [PRER: 5503122 ENGLISH COMMUNICATION FOR SCIENCE II]	3(3-0-6)
	GEN ED	3
	<b>Total Credits</b>	<b>19</b>

Year 2		
Animal Biotechnology, Bioinformatics, Environmental Biotechnology, Marine Biotechnology, Microbial Biotechnology, Plant Biotechnology		
Second Semester		
Course	Course Name	Credit(s)
2300252	PRINCIPLES OF BIOLOGICAL PROCESS ENGINEERING	3(3-0-6)
2300253	SCIENCE ETHICS	1(1-0-2)
2302203	ORGANIC CHEMISTRY LABORATORY [PRER: 2302103 GENERAL CHEMISTRY LABORATORY]	1(0-3-0)
2302272	ORGANIC CHEMISTRY II [PRER: 2302271 ORGANIC CHEMISTRY I/ C.F.]	3(3-0-6)
2305261	GENERAL GENETICS [PRER: 2303101 GENERAL BIOLOGY I & 2305101 GENERAL BIOLOGY II]	3(3-0-6)
2305262	GENERAL GENETICS LABORATORY [COREQ: 2305261 GENERAL GENETICS/ C.F.]	1(0-3-0)
	GEN ED	6
	GEN ED – LANGUAGE (non-English and non-native languages)	3
	<b>Total Credits</b>	<b>21</b>

Year 2		
Biotechnology Management, Food Biotechnology		
Second Semester		
Course	Course Name	Credit(s)
2300252	PRINCIPLES OF BIOLOGICAL PROCESS ENGINEERING	3(3-0-6)
2300253	SCIENCE ETHICS	1(1-0-2)
2302203	ORGANIC CHEMISTRY LABORATORY [PRER: 2302103 GENERAL CHEMISTRY LABORATORY]	1(0-3-0)
2302272	ORGANIC CHEMISTRY II [PRER: 2302271 ORGANIC CHEMISTRY I/ C.F.]	3(3-0-6)
2305261	GENERAL GENETICS [PRER: 2303101 GENERAL BIOLOGY I & 2305101 GENERAL BIOLOGY II]	3(3-0-6)
	GEN ED	6
	GEN ED – LANGUAGE (non-English and non-native languages)	3
	<b>Total Credits</b>	<b>20</b>

Year 3 Animal Biotechnology, Bioinformatics, Environmental Biotechnology, Marine Biotechnology, Microbial Biotechnology, Plant Biotechnology <b>First Semester</b>		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING [PRER: 2305261 GENERAL GENETICS/ C.F.]	3(3-0-6)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	1(0-2-1)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	3(3-0-6)
2312302	GENERAL MICROBIOLOGY	3(2-3-4)
2300361	INTRODUCTION TO MOLECULAR BIOTECHNOLOGY	3(3-0-6)
	ELECTIVES See Appendix A (A2.2, A2.3)	5 - 6
	<b>Total Credits</b>	<b>18 - 19</b>

Year 3 Animal Biotechnology, Bioinformatics, Environmental Biotechnology, Marine Biotechnology, Microbial Biotechnology, Plant Biotechnology <b>Second Semester</b>		
Course	Course Name	Credit(s)
2300399	PROJECT PROPOSAL	1(1-0-2)
2300362	BIOLOGICAL SEQUENCE ANALYSIS	3(2-2-5)
	ELECTIVES See Appendix A (A2.2, A2.3)	9 - 11
	GEN ED - SPECIAL GROUP	3
	FREE ELECTIVES	3
	<b>Total Credits</b>	<b>19 - 21</b>

Year 3 Biotechnology Management <b>First Semester</b>		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING [PRER: 2305261 GENERAL GENETICS/ C.F.]	3(3-0-6)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	1(0-2-1)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	3(3-0-6)
2312302	GENERAL MICROBIOLOGY	3(2-3-4)
2300261	INDUSTRIAL ADMINISTRATION AND MANAGEMENT	1(1-0-2)
2602313	MANAGEMENT AND ORGANIZATION	3(3-0-6)
	ELECTIVES See Appendix A (A2.2, A2.3)	5 - 6
	<b>Total Credits</b>	<b>18 - 19</b>

Year 3 Biotechnology Management <b>Second Semester</b>		
Course	Course Name	Credit(s)
2300399	PROJECT PROPOSAL	1(1-0-2)
2605311	PRINCIPLE OF MAKETING	3(3-0-6)
	ELECTIVES See Appendix A (A2.2, A2.3)	9 - 11
	GEN ED - SPECIAL GROUP	3
	FREE ELECTIVES	3
	<b>Total Credits</b>	<b>19 - 21</b>

Year 3 Food Biotechnology <b>First Semester</b>		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING [PRER: 2305261 GENERAL GENETICS/ C.F.]	3(3-0-6)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	1(0-2-1)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	3(3-0-6)
2312302	GENERAL MICROBIOLOGY	3(2-3-4)
2314335	PROCESSING IN FOOD BIOTECHNOLOGY I	3(3-0-6)
	ELECTIVES See Appendix A (A2.2, A2.3)	5 - 6
	<b>Total Credits</b>	<b>18 - 19</b>

Year 3 Food Biotechnology <b>Second Semester</b>		
Course	Course Name	Credit(s)
2300399	PROJECT PROPOSAL	1(1-0-2)
2314336	PROCESSING IN FOOD BIOTECHNOLOGY II [PRER: 2304335 PROCESSING IN FOOD BIOTECHNOLOGY I]	3(3-0-6)
2314339	PROCESSING IN FOOD BIOTECHNOLOGY LABORATORY [COREQ: 2304336 PROCESSING IN FOOD BIOTECHNOLOGY II]	1(0-3-0)
	GEN ED - SPECIAL GROUP	3
	ELECTIVES See Appendix A (A2.2, A2.3)	9 - 10
	FREE ELECTIVES	3
	<b>Total Credits</b>	<b>20 - 21</b>

**Remark:** "GEN ED - SPECIAL GROUP" refers to courses from the list of general education courses, excluding those in Science and Mathematics. According to "Free Electives", students have the freedom to choose any course available in the Semester International System that is offered at Chulalongkorn University. However, for courses outside the BBTech curriculum and general education, it is necessary for students to inform the BBTech Program Coordinator prior to registration.

Year 4: [REGULAR PROGRAM]		
First Semester		
Course	Course Name	Credit(s)
2300401	INTEGRATIVE SCIENCE PROJECT	3(0-9-0)
2300490	SEMINAR	1(1-0-2)
2300492	TRAINING	0
	ELECTIVES See Appendix A (A2.2, A2.3)	4
	FREE ELECTIVES	3
	<b>Total Credits</b>	<b>11</b>

Year 4: [REGULAR PROGRAM]		
Second Semester		
Course	Course Name	Credit(s)
2300499	SENIOR PROJECT	2(0-6-0)
	<b>Total Credits</b>	<b>2</b>

Year 4: [COOPERATIVE PROGRAM]		
First Semester		
Course	Course Name	Credit(s)
2300401	INTEGRATIVE SCIENCE PROJECT	3(0-9-0)
2300490	SEMINAR	1(1-0-2)
2300492	TRAINING	0
	FREE ELECTIVES	3
	<b>Total Credits</b>	<b>7</b>

Year 4: [COOPERATIVE PROGRAM]		
Second Semester		
Course	Course Name	Credit(s)
2300498	COOPERATIVE EDUCATION	6(0-18-0)
	<b>Total Credits</b>	<b>6</b>

**Remark:** According to "Free Electives", students have the freedom to choose any course available in the Semester International System that is offered at Chulalongkorn University. However, for courses outside the BBTech curriculum, it is necessary for students to inform the program coordinator prior to registration.

## Appendix A

### Elective Courses

#### A1. Required Electives 7 Credits

Select all courses in one of the following groups:

Group 1 Animal Biotechnology, Bioinformatics Environmental Biotechnology Microbial Biotechnology, Plant Biotechnology			Group 2 Biotechnology Management			Group 3 Food Biotechnology		
Course	Course Name	Credit(s)	Course	Course Name	Credit(s)	Course	Course Name	Credit(s)
2300361	INTRODUCTION TO MOLECULAR BIOTECHNOLOGY	3(3-0-6)	2300261	INDUSTRIAL ADMINISTRATION AND MANAGEMENT	1(1-0-2)	2314335	PROCESSING IN FOOD BIOTECHNOLOGY I	3(3-0-6)
2300362	BIOLOGICAL SEQUENCE ANALYSIS	3(2-2-5)	2602313	MANAGEMENT AND ORGANIZATION	3(3-0-6)	2314336	PROCESSING IN FOOD BIOTECHNOLOGY II [PRER: 2304335 PROCESSING IN FOOD BIOTECHNOLOGY I]	3(3-0-6)
2305262	GENERAL GENETICS LABORATORY [COREQ: 2305261 GENERAL GENETICS/ C.F.]	1(0-3-0)	2605311	PRINCIPLE OF MARKETING	3(3-0-6)	2314339	PROCESSING IN FOOD BIOTECHNOLOGY LABORATORY [COREQ: 2304336 PROCESSING IN FOOD BIOTECHNOLOGY II]	1(0-3-0)

#### A2. Electives

<b>Regular Program</b>	<b>19</b>	<b>Credits</b>
<b>Cooperative Education Program</b>	<b>15</b>	<b>Credits</b>

#### A2.1 Major Electives (Fixed Semester Courses)

##### First Semester

Select all courses in one of the following groups:

Animal Biotechnology			Bioinformatics			Environmental Biotechnology		
Course	Course Name	Credit(s)	Course	Course Name	Credit(s)	Course	Course Name	Credit(s)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)	2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)	2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2303425	FRONTIERS IN ANIMAL BIOTECHNOLOGY	3(3-0-6)	2300301	COMPUTER SKILLS IN BIOINFORMATICS	3(2-3-4)	2308351	ENVIRONMENTAL SCIENCE I	3(3-0-6)
						2308359	ENVIRONMENTAL SCIENCE LABORATORY I	1(0-3-0)

  

Microbial Biotechnology			Plant Biotechnology			Biotechnology Management		
Course	Course Name	Credit(s)	Course	Course Name	Credit(s)	Course	Course Name	Credit(s)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)	2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)	2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2312515	MICROBIAL BIOTECHNOLOGY AND MICROBIAL INDUSTRY VISIT	3(2-3-7)	2305481	PLANT BIOTECHNOLOGY [PRER: 2305101 GENERAL BIOLOGY II or 2303107 GENERAL BIOLOGY]	2(2-0-4)	2300500	TECHNOPRENEURSHIP	3(3-0-6)

  

Food Biotechnology		
Course	Course Name	Credit(s)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2314375	BIOLOGICAL CHEMISTRY FOR BIOTECHNOLOGY [PRER: 2310310 GENERAL BIOCHEMISTRY, 2310360 GENERAL BIOCHEMISTRY LABORATORY/ C.F.]	3(3-0-6)

## A2.2 Specific Electives (Fixed Semester Courses)

### First Semester

To be expertise, select all courses in one of the following groups:

Animal Biotechnology		
Course	Course Name	Credit(s)
2303435	REGENERATIVE BIOLOGY [PRER: 2303101 GEN BIO I and 2303102 GEN BIO LAB I/ C.F.]	3(2-3-4)

Bioinformatics		
Course	Course Name	Credit(s)
2310454	INTRODUCTION TO GENETIC ENGINEERING	1(1-0-2)
2310506	BIOINFORMATICS I	3(2-2-8)

Environmental Biotechnology		
Course	Course Name	Credit(s)
2308439	BIOPOLYMER IN ENVIRONMENT	3(3-0-6)

Plant Biotechnology		
Course	Course Name	Credit(s)
2305453	COMMERCIAL ORNAMENTAL PLANT PRODUCTION	3(2-3-4)
2305486	ECONOMIC MUSHROOM CULTIVATION	3(2-3-4)

Microbial Biotechnology		
Course	Course Name	Credit(s)
2312589	IMMUNOTECHNOLOGY [PRER: 2312482 IMMUNOLOGY/ C.F.]	2(1-3-4)

Food Biotechnology		
Course	Course Name	Credit(s)
2314573	APPLIED FOOD MICROBIOLOGY	3(3-0-9)

### Second Semester

To be expertise, select all courses in one of the following groups:

Animal Biotechnology		
Course	Course Name	Credit(s)
2303455	BIOLOGY OF DISEASE	3(3-0-6)

Bioinformatics		
Course	Course Name	Credit(s)
2310451	GENOMIC ANALYSIS FOR BIOTECHNOLOGY	3(2-2-5)
2310555	GENETIC ENGINEERING LABORATORY [COREQ: 2310454 INTRODUCTION TO GENETIC ENGINEERING/ 2310554 GENETIC ENGINEERING/ C.F.]	2(0-6-2)

Environmental Biotechnology		
Course	Course Name	Credit(s)
2308418	ENVIRONMENTAL REMEDIATION TECHNOLOGY	3(3-0-6)
2308419	PRINCIPLES OF BIODEGRADATION AND BIOREMEDIATION	3(3-0-6)

Microbial Biotechnology		
Course	Course Name	Credit(s)
2312516	MODERN MICROBIAL BIOTECHNOLOGY AND MICROBIOME	3(3-0-9)
2312517	MEDICAL MICROBIAL BIOTECHNOLOGY	3(3-0-6)

Plant Biotechnology		
Course	Course Name	Credit(s)
2305451	PLANT TISSUE CULTURE [PRER: 2305350 PLANT PHYSIOLOGY LABORATORY or 2305357 PLANT AND ANIMAL PHYSIOLOGY LABORATORY/ C.F.]	2(2-0-4)
2305452	PLANT TISSUE CULTURE LABORATORY [COREQ: 230451 PLANT TISSUE CULTURE/ C.F.]	1(0-3-0)
2305354	HYDROPONICS [CONCUR: 2305355]	2(2-0-4)
2305355	HYDROPONICS FOR CROP PRODUCTION LABORATORY [CONCUR: 2305354]	1(0-3-0)

Biotechnology Management		
Course	Course Name	Credit(s)
2300364	CLEAN BIOTECHNOLOGY	3(3-0-6)
2308341	SCIENCE COMMUNICATION	3(3-0-6)

Food Biotechnology		
Course	Course Name	Credit(s)
2314434	INDUSTRIAL MICROBIOLOGY [PRER: 2312302 GENERAL MICROBIOLOGY]	3(2-3-4)
2314435	BIOTECHNOLOGY FOR FOOD INDUSTRY [PRER: 2310310 GENERAL BIOCHEMISTRY, 2312302 GENERAL MICROBIOLOGY]	2(2-0-4)
2314572	FOOD PRODUCT DESIGN	2(2-0-6)

### A2.3 General Electives

Select any courses from A2.2 or select any courses as shown below:

Course No.	Course Name	Credit(s)
2309417*	PRINCIPLES OF AQUACULTURE	3(3-0-6)
2309419*	MARINE MICROALGAL CULTURE METHODOLOGY	3(2-3-4)
2309519*	FISH AND SHELLFISH NUTRITION	3(2-3-7)
2309522*	BREEDING AND LARVICULTURE OF ECONOMIC AQUATIC ANIMALS	3(2-3-7)

Remark: \*Marine Biotechnology

## Appendix B

### Course Condition

<b>PRER</b>	stands for	Prerequisite
<b>COREQ</b>	stands for	Co-requisite
<b>CONCUR</b>	stands for	Concurrent
<b>C.F.</b>	stands for	Consent of Faculty

#### **Guidelines to follow for Conditions are as follows:**

##### **B1. Prerequisite**

Example: [2301108 CALCULUS II]  
Condition: Prerequisite [2301107 CALCULUS I]

Guideline:

Students can register for [2301108 CALCULUS II] when they have studied [2301107 CALCULUS I] and have been awarded A, B+, B, C+, C, D+, D or S.

##### **B2. Co-requisite**

Example: [2303102 GEN BIO LAB I]  
Condition: Co-requisite [2303101 GEN BIO I]

Guideline:

- 2.1 *Registration:* Students can register for [2303102 GEN BIO LAB I] when
  - 2.1.1 students registered for course [2303101 GEN BIO I] and [2303101 GEN BIO I] were awarded A, B+, B, C+, C, D+, D, F, S or U.
  - 2.1.2 register for [2303102 GEN BIO LAB I] and [2303101 GEN BIO I] in the same semester.
- 2.2 *Dropping:* In case of 2.1.2, if students drop [2303101 GEN BIO I], they must drop [2303102 GEN BIO LAB I] as well.
- 2.3 *Withdrawal:* In case of 2.1.2, if students withdraw [2303101 GEN BIO I], they must withdraw [2303102 GEN BIO LAB I] as well.

##### **B3. Concurrent**

Example: [2305354 HYDROPONICS]  
Condition: Concurrent [2305355 HYDROPONICS LAB]  
[2305355 HYDROPONICS LAB]  
Condition: Concurrent [2305354 HYDROPONICS]

Guideline:

- 3.1 *Registration:* Students must register for both [2305354 HYDROPONICS] and [2305355 HYDROPONICS LAB] or vice versa.
- 3.2 *Dropping:* If students drop [2305354 HYDROPONICS], they must drop [2305355 HYDROPONICS LAB] as well or vice versa.
- 3.3 *Withdrawal:* If students withdraw [2305354 HYDROPONICS], they must withdraw [2305355 HYDROPONICS LAB] as well or vice versa.
- 3.4 *Late registration:*
  - 3.4.1 If students are awarded F for either [2305354 HYDROPONICS] or [2305355 HYDROPONICS LAB], they can register for the course for which they have been awarded F in the following semester.
  - 3.4.2 In case of elective courses such as [2305354 HYDROPONICS] and [2305355 HYDROPONICS LAB], and for [2305354 HYDROPONICS], the student has been awarded A, B+, B, C+, C, D+, D or S, while for [2305355 HYDROPONICS LAB] they have been awarded F, students do not have to register [2305355 HYDROPONICS LAB] in the following semester.
  - 3.4.3 If the student has been awarded F both [2305354 HYDROPONICS] and [2305355 HYDROPONICS LAB], students can choose to register for [2305354 HYDROPONICS] before [2305355 HYDROPONICS LAB] or vice versa in the following semester.

##### **B4. Consent of Faculty**

Example: [2302102 GEN CHEM II]  
Condition: Prerequisite [2302101 GEN CHEM I] or Consent of Faculty

Guideline:

In case without prerequisite [2302101 GEN CHEM I], students can register for [2302102 GEN CHEM II] when they are allowed to by the faculty.

**Remark:** The "faculty" here refers to the Faculty Board or the supervisor appointed by the Dean of the faculty which supervises [2302102 GEN CHEM II].