



Bachelor of Science in Biotechnology (International Program)

Faculty of Science, Chulalongkorn University

STUDY PLAN

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(2-2-5)
	GEN ED - SOCIAL SCIENCE/ HUMANITIES	3
Total Credits		17

Year 1		
Second Semester		
Course	Course Name	Credit(s)
2301108	CALCULUS II [PRER: 2301107 CALCULUS I]	3(30-6)
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(2-2-5)
Total Credits		17

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(2-2-5)
	GEN ED - SOCIAL SCIENCE/ HUMANITIES	3
Total Credits		19

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 and 2305101 GENERAL BIOLOGY II]	3(3-0-6)
2305262	GENERAL GENETICS LABORATORY [COREQ: 2305261 GENERAL GENETICS/ C.F.]	1(0-3-0)
	GEN ED – INTERDISCIPLINARY	3
	GEN ED – SCIENCE AND MATHEMATICS	3
	GEN ED – LANGUAGE (non-English and non-native languages)	3
Total Credits		21

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 and 2305101 GENERAL BIOLOGY II]	3(3-0-6)
	GEN ED – INTERDISCIPLINARY	3
	GEN ED – SCIENCE AND MATHEMATICS	3
	GEN ED – LANGUAGE (non-English and non-native languages)	3
Total Credits		20

Year 3: Animal Biotechnology, Bioinformatics, Environmental Biotechnology, Microbial Biotechnology, Plant Biotechnology		
First Semester		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING	3(3-0-6)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	3(3-0-6)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	1(0-3-0)
2312302	GENERAL MICROBIOLOGY	3(2-3-4)
2300361	INTRODUCTION TO MOLECULAR BIOTECHNOLOGY	3(3-0-6)
	ELECTIVES See Appendix A (A2.1)	3 – 4
Total Credits		18 – 19

Year 3: Biotechnology Management		
First Semester		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING	3(3-0-6)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	3(3-0-6)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	1(0-3-0)
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 (A2.1)	3 – 4
Total Credits		19 – 20

Year 3: Food Biotechnology		
First Semester		
Course	Course Name	Credit(s)
2300351	BIOTECHNOLOGICAL FRONTIER IN PLANT AND ANIMAL BREEDING	3(3-0-6)
2300363	TREND IN BIOTECHNOLOGY	2(2-0-4)
2310310	GENERAL BIOCHEMISTRY [PRER: 2302112 GENERAL CHEMISTRY II/ C.F.]	3(3-0-6)
2310360	GENERAL BIOCHEMISTRY LABORATORY [COREQ: 2310310 GENERAL BIOCHEMISTRY/ C.F.]	1(0-3-0)
2312302	GENERAL MICROBIOLOGY	3(2-3-4)
2314335	PROCESSING IN FOOD BIOTECHNOLOGY I	3(3-0-6)
	ELECTIVES See Appendix A (A2.1)	3 – 4
Total Credits		18 – 19

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

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

Year 3: Food Biotechnology		
Second Semester		
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
Total Credits		20 – 21

Year 4: [REGULAR PROGRAM] First Semester		
Course	Course Name	Credit(s)
2300401	INTEGRATIVE SCIENCE PROJECT	3(0-9-0)
2300492	TRAINING	0
	ELECTIVES See Appendix A (A2.2, A2.3)	4
	FREE ELECTIVES	3
Total Credits		10

Year 4: [COOPERATIVE PROGRAM] First Semester		
Course	Course Name	Credit(s)
2300401	INTEGRATIVE SCIENCE PROJECT	3(0-9-0)
2300492	TRAINING	0
	FREE ELECTIVES	3
Total Credits		6

Year 4: [REGULAR PROGRAM] Second Semester		
Course	Course Name	Credit(s)
2300490	SEMINAR	1(1-0-2)
2300499	SENIOR PROJECT	2(0-6-0)
Total Credits		3

Year 4: [COOPERATIVE PROGRAM] Second Semester		
Course	Course Name	Credit(s)
2300490	SEMINAR	1(1-0-2)
2300498	COOPERATIVE EDUCATION	6(0-18-0)
Total Credits		7

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		
2300361	INTRODUCTION TO MOLECULAR BIOTECHNOLOGY	3(3-0-6)
2300362	BIOLOGICAL SEQUENCE ANALYSIS	3(2-2-5)
2305262	GENERAL GENETICS LABORATORY [COREQ: 2305261 GENERAL GENETICS/ C.F.]	1(0-3-0)

Group 2		
Biotechnology Management		
2300261	INDUSTRIAL ADMINISTRATION AND MANAGEMENT	1(1-0-2)
2602313	MANAGEMENT AND ORGANIZATION	3(3-0-6)
2605311	PRINCIPLE OF MARKETING	3(3-0-6)

Group 3		
Food Biotechnology		
2314335	PROCESSING IN FOOD BIOTECHNOLOGY I	3(3-0-6)
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)

A2. Electives

Regular Program	19	Credits
Cooperative Education Program	15	Credits

A2.1 Major Electives 2 – 4 Credits (Fixed Semester Courses)

Year 3 First Semester

Select all courses in one of the following groups:

Animal Biotechnology			Bioinformatics			Environmental Biotechnology			Microbial Biotechnology		
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)	2312515	MICROBIAL BIOTECHNOLOGY AND MICROBIAL INDUSTRY VISIT	3(2-3-7)
						2308359	ENVIRONMENTAL SCIENCE LABORATORY I	1(0-3-0)			
Plant Biotechnology			Biotechnology Management			Food Biotechnology					
2305481	PLANT BIOTECHNOLOGY [PRER: 2305101 GENERAL BIOLOGY II or 2303107 GENERAL BIOLOGY]	2(2-0-4)	2300500	TECHNOPRENEURSHIP	3(3-0-6)	2314375	BIOLOGICAL CHEMISTRY FOR BIOTECHNOLOGY [PRER: 2310310 GENERAL BIOCHEMISTRY, 2310360 GENERAL BIOCHEMISTRY LABORATORY]	3(3-0-6)			

A2.2 Specific Electives (Fixed Semester Courses)

Year 3 Second Semester

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

Animal Biotechnology			Bioinformatics			Environmental Biotechnology			Microbial Biotechnology		
2303251	ANIMAL WELFARE AND BIOSECURITY	2(2-0-4)	2310451	GENOMIC ANALYSIS FOR BIOTECHNOLOGY	3(2-2-5)	2308418	ENVIRONMENTAL REMEDIATION TECHNOLOGY	3(3-0-6)	2312516	MODERN MICROBIAL BIOTECHNOLOGY AND MICROBIOME	3(2-3-7)
2303341	BIOLOGY OF DISEASE	3(3-0-6)	2310506	BIOINFORMATICS I	3(2-2-8)	2308419	PRINCIPLES OF BIODEGRADATION AND BIOREMEDIATION	3(3-0-6)	2312517	MEDICAL MICROBIAL BIOTECHNOLOGY	3(2-3-7)

Plant Biotechnology			Biotechnology Management			Food Biotechnology		
2305451	PLANT TISSUE CULTURE [PRER: 2305350 PLANT PHYSIOLOGY LABORATORY or 2305357 PLANT AND ANIMAL PHYSIOLOGY LABORATORY/ C.F.]	2(2-0-4)	2300364	CLEAN BIOTECHNOLOGY	3(3-0-6)	2314434	INDUSTRIAL MICROBIOLOGY [PRER: 2312302 GENERAL MICROBIOLOGY]	3(2-3-4)
2305452	PLANT TISSUE CULTURE LABORATORY [COREQ: 230451 PLANT TISSUE CULTURE/ C.F.]	1(0-3-0)	2308341	SCIENCE COMMUNICATION	3(3-0-6)	2314435	BIOTECHNOLOGY FOR FOOD INDUSTRY [PRER: 2310310 GENERAL BIOCHEMISTRY, 2312302 GENERAL MICROBIOLOGY]	2(2-0-4)
2305354	HYDROPONICS [CONCUR: 2305355]	2(2-0-4)				2314572	FOOD PRODUCT DESIGN	2(2-0-4)
2305355	HYDROPONICS FOR CROP PRODUCTION LABORATORY [CONCUR: 2305354]	1(0-3-0)						

A2.2 Specific Electives (Fixed Semester Courses) Continued

Year 4 First Semester

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

Animal Biotechnology			Bioinformatics			Environmental Biotechnology			Plant Biotechnology		
2303435	REGENERATIVE BIOLOGY	3(3-0-6)	2310454	INTRODUCTION TO GENETIC ENGINEERING	1(1-0-2)	2308439	BIOPOLYMER IN ENVIRONMENT	3(3-0-6)	2305453*	COMMERCIAL ORNAMENTAL PLANT PRODUCTION	3(2-3-4)
			2310555	GENETIC ENGINEERING LABORATORY [COREQ: 2310454 INTRODUCTION TO GENETIC ENGINEERING/ 2310554 GENETIC ENGINEERING/ C.F.]	2(0-6-2)				2305486*	ECONOMIC MUSHROOM CULTIVATION	3(2-3-4)

Food Biotechnology		
2314573	APPLIED FOOD MICROBIOLOGY	3(3-0-6)

Conditions: * Courses are not available in the same Academic Year

A2.3 General Electives

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

Course No.	Course Name	Credit(s)
2308454	TOPICS IN ENVIRONMENTAL SCIENCE	2(2-0-4)
2308455	TOPICS IN ENVIRONMENTAL SCIENCE LABORATORY	1(0-3-0)
2308462	FUNDAMENTAL ENVIRONMENTAL HEALTH [PRER: 2308351 ENVIRONMENTAL SCIENCE I/ C.F.]	3(3-0-6)
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)
2310502	ENZYME BIOTECHNOLOGY	3(3-0-9)
2310523	GENOMICS AND PROTEOMICS	2(2-0-6)
2312355	VIROLOGY AND IMMUNOLOGY	3(3-0-6)
2312356	VIROLOGY AND IMMUNOLOGY LABORATORY [CONCUR 2312355 VIROLOGY AND IMMUNOLOGY/ C.F.]	1(0-3-0)
2312357	MICROBIAL PHYSIOLOGY AND GENETICS [CONCUR: 2312358 MICROBIAL PHYSIOLOGY AND GENETICS LABORATORY/ C.F.]	3(3-0-6)
2312358	MICROBIAL PHYSIOLOGY AND GENETICS LABORATORY	1(0-3-0)
2312371	MICROBIAL ECOLOGY	3(2-3-4)
2312372	MICROBIAL INDUSTRY VISIT	1(0-3-0)
2314425	WATER AND WASTEWATER TREATMENT FOR BIOLOGICAL INDUSTRY	2(2-0-4)
2314546	FOOD PLANT AND PROCESS DESIGN	3(3-0-9)

Remark: **Marine Biotechnology

Appendix B

Course Condition

PRER	stands for	Prerequisite
COREQ	stands for	Co-requisite
CONCUR	stands for	Concurrent
C.F.	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 GENERAL BIOLOGY LABORATORY I]

Condition: Co-requisite [2303101 GENERAL BIOLOGY I]

Guideline:

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

Condition: Prerequisite [2302101 GENERAL CHEMISTRY I] or Consent of Faculty

Guideline:

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

The “faculty” here refers to the Faculty Board or the supervisor appointed by the Dean of the faculty which supervises [2302102 GENERAL CHEMISTRY II].