Program of Biotechnology for International Students (2020)

I. Introduction

Life science has been central to the development of the 21st century natural sciences, and its development is related to people's health and well-being. Today, life and health industry has become a new driving force to promote the development of the world economy. Therefore, the central and local governments set the strategic priorities to foster advancing emerging life science related industries.

Life science is one of the key disciplines of the Southern University of Science and Technology (SUSTech). Founded in 2012, the Department of Biology is among the first established academic departments in the university. Since its founding, the Department has assembled groups of faculty members with diverse research interests and expertise to tackle fundamental problems of life science. All of the faculty members had prior research experience at top internationally-acclaimed universities before joining SUSTech and some of them had been awarded tenures in these universities or research institutions worldwide.

The faculty of the department are supported by the state-of-the-art scientific research platform facilities and talent recruitment programs, such as the Guangdong Provincial Key Laboratory of Cellular Microenvironment and Disease Research, Key Laboratory of Molecular Design for Plant Cell Factory of Guangdong Higher Education Institutes, Guangdong Provincial "Pearl River Talent Program" for Innovation and Entrepreneurship, Cryo-EM Center, Plant and Food Research Institute, SUSTech-UQ Joint Centre for Neuroscience and Neural Engineering and Experimental Animal Center. Concentrated on five major areas, namely molecular cell biology, neurobiology, plant biology, system biology and structural biology, their research focuses on the frontiers of life science and high-impact human health issues, with cross-disciplinary approaches.

The Department of Biology's life science program was approved as a key discipline at the provincial level (Guangdong) in 2016. In 2018, the Department was authorized to confer doctorate and master's degrees to graduate students, and was designated as a postdoctoral workstation in 2019. These developments set the department on track to be developed as a top-tier academic institution of Guangdong province.

In the backdrop of advancing biotechnology and expanding the academic programs offered by the Department, Biotechnology program was launched to train students with cross-disciplinary vision and the essential knowledge framework to develop cutting-edge biotechnology. It aims to cultivate talents who will be competent in basic research, applied research, technology development and industrial innovation in the field of biotechnology.

II. Objectives and Learning Outcomes

(I)Objectives

The purpose of this major is, through theoretical and experimental courses as well as scientific innovation projects, to inspire students to fully understand the basic principles of life science,

chemistry, information and engineering, and to master the basic theory, knowledge and skills of life science and technology. It aims to cultivate professionals with a solid theoretical basis and innovation, cross-disciplinary and cutting-edge awareness, who can transform modern biological knowledge into socially beneficial products, technologies and services, or who are able to continue their study at more advanced levels.

(II) Requirements

1. Mastering basic theoretical knowledge of mathematics, physics, chemistry, computer and life science.

2. Having the ability to write scientific papers in English and to do academic presentations in English.

3. Understanding the theoretical frontiers, application prospects and latest developments in biotechnology, and carrying out research and development related to the biotechnology industry in the laboratory.

4. Having the ability to identify, analyze and communicate ethical and social issues related to advances in the field of biotechnology.

5. Having the ability of analysis, organization, and communication and being able to engage in discipline-related work in enterprises and public institutions or to continue postgraduate studies.

III. Study Length and Graduation Requirements

Study length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 143 credits (not including English courses);

Category	Module	Minimum Credit Requirement
General Education (GE) Required Courses (48 credits)	Science	28
	Physical Education	4
	Chinese Languages & Culture	16
General Education (GE) Elective Courses (14 credits)	Humanities	4
	Social Sciences	4
	Arts	2
	Science	4
Major Course (81 credits)	Major Foundational Courses	19
	Major Core Courses	23
	Major Elective Courses	29
	Research Projects, Internship and Undergraduate Thesis / Projects	10
Total (not including English courses)		143

IV. Discipline

Biotechnology

V. Main Courses

For details please refer to Major Required Course (Foundational and Core Courses) (Table 1).

VI. Practice-Based Courses

See Table 3

VII. Pre-requisites for Major Declaration

Major Declaration Time	Course Code	Course Name	Prerequisite
Declare major at the end of First Year	MA101B	Calculus I A	
	MA102B	Calculus II A	MA101B
	CH101A	General Chemistry A	
	BIO103	Principles of Biology	
	BIO104	General Biology Laboratory	BIO102B or MED101
Declare major at the end of Second Year	PHY103B	General Physics B (I)	
	PHY105B	General Physics B (II)	PHY103B
	CS102B	Introduction to Computer Programming B	
	BIO201	Biochemistry （Macromolecules）	BIO103，CH101A
	BIO203	Microbiology	
	BIO320	Molecular Biology	BIO103
Note: Students need to complete all the courses above (include the pre-requisites for Major Declaration at the end of First Year) when they declare major at the end of Second Year.			

VIII. Requirements for of GE Required Courses

(I) Science Module

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept.
MA101B	Calculus I A	4		4	Spr/ Fall	B/E	NA	MATH
MA102B	Calculus II A	4		4	Spr/ Fall	B/E	MA 101B	MATH
PHY103B	General Physics B (I)	4		4	Spr/ Fall	B/E	NA	PHY
PHY105B	General Physics B (II)	4		4	Spr/ Fall	B/E	PHY 103B	PHY
PHY104B	Experiment of Foundamental Physics	2	2	4	Spr/ Fall	B/E	NA	PHY
CH101A	General Chemistry A	4		4	Spr/ Fall	B/E	NA	CHEM
CS102B	Introduction to Computer Programming B	3	1	4	Spr/ Fall	B/E	NA	CSE
BIO103	Principles of Biology	3		3	Spr/ Fall	B/E	NA	BIO
Total		28	3					

(II) Physical Education

Course Code	Course Name	Credits	Hours/week	Terms	Instruction language	Prerequisite	Dept.
GE131	Physical Education I	1	2	Fall	C	NA	PE Center
GE132	Physical Education II	1	2	Spr	C	NA	
GE231	Physical Education III	1	2	Fall	C	NA	
GE232	Physical Education IV	1	2	Spr	C	NA	
GE331	Physical Education V	0	/	Fall	C	NA	
GE332	Physical Education Ⅵ	0	/	Spr	C	NA	
GE431	Physical Education Ⅶ	0	/	Fall	C	NA	
GE432	Physical Education Ⅷ	0	/	Spr	C	NA	
Total		4	8				

Note: All physical education courses are general required courses. For Semester 1-4, each course(GE131.GE132,GE231,GE232) counted as 1 credit ; for semester 5-8,（GE331.GE332,GE431,GE432） are extracurriculum courses without no credits, details can be referred to Physical Education Curriculum Program of Sustech.

(III) Chinese Languages & Culture

Course Code	Course Name	Credit	Hours/week	Term	Language Instruction	Prerequisite	Dept.
CLE008	Elementary Chinese I	2	4	1/Fall	B	NA	CLE
CLE009	Elementary Chinese II	2	4	1/Spr	B	CLE008	
CLE027	Intermediate Chinese I	2	4	2/Fall	B	CLE009	
CLE028	Intermediate Chinese II	2	4	2/Spr	B	CLE027	
CLE031	Advanced Chinese I	2	4	3/Fall	B	CLE028	
CLE032	Advanced Chinese II	2	4	3/Spr	B	CLE031	
CLE033	Chinese Culture	2	2	Spr/Fall	B/E	NA	CLE/ HUM/ SSC
CLE034	Chinese History	2	2	Spr/Fall	B/E	NA	

(IV) English Language

Students will undertake the English Placement Test and be placed into three levels according to the result of the test and their performance in the National College Entrance Exam. Students at different levels are required to take the courses with a different credit value in total.

Level A: 6 credits; SUSTech English III, and English for Academic Purposes

Level B: 10 credits; SUSTech English II, SUSTech English III, and English for Academic Purposes

Level C: 14 credits; SUSTech English I, SUSTech English II, SUSTech English III, and English for Academic Purposes.

Course Code	Course Name	Credit	Hours/week	Instruction Language	Prerequisite
CLE021	SUSTech English I	4	4	E	NA
CLE022	SUSTech English II	4	4	E	CLE021
CLE023	SUSTech English III	4	4	E	CLE022
CLE030	English for Academic Purposes	2	2	E	CLE023

IX. Requirements for of GE Elective Courses

(I) Students are required to complete 4 credits for the Humanities Module and Social Sciences Module respectively, and 2 credits for the Music and Art Module. (Information about the available courses and the instruction language will be announced before the course selection session)

(II) Students are required to complete 4 credits for Science Module

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Instruction Language	Prerequisite	Dept
BMEB131	Introduction to Biomedical Engineering	2		2	Fall	B	NA	BME B
CH102-17	General Chemistry Laboratory A	1.5	1.5	3	Spr	B	CH101A	CHE M
ESE202	Introduction to Environmental Sciences	2		2	Spr/ Fall	E	NA	ESE
ESE331	Conservation in the Anthropocene	3		3	Spr	E	ESE313	ESE
MA107B	Linear Algebra B	4		4	Spr /Fall	B/E	NA	MAT H
MA212	Probability and Statistics	3		3	Spr/ Fall	B/E	MA102a or MA102B	MAT H
Total		15.5	1.5					

X. Major Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Course Category	Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	take the course Advised term to	language Instruction	Prerequisite	Dept
Major Foundational Courses	BIO104	General Biology Laboratory	2	2	4	Spr/Fall	1/Spr	B/E	BIO102B or MED101	BIO
	BIO201	Biochemistry （Macromolecules）	3		3	Spr/Fall	2/Fall	B/E	BIO103 CH101A	BIO
	BIO203	Microbiology	3		3	Spr/Fall	2/Fall	B/E	NA	BIO
	BIO320	Molecular Biology	3		3	Spr/Fall	2/Fall	B/E	BIO103	BIO
	BIO202	Biochemistry II （Metabolism）	3		3	Spr/Fall	2/Spr	B/E	BIO201	BIO
	BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO201	BIO
	BIO210	Biostatistics	3		3	Spr/Fall	2/Spr	E	BIO103	BIO
	Total		19	4						
Major Core Courses	BIO301	Genetics	3		3	Spr/Fall	2/Spr	B/E	NA	BIO
	BIO303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO222 BIO301	BIO
	BIO206-15	Cell Biology	4		4	Spr/Fall	3/Fall	B/E	BIO103	BIO
	BIO208	Cell Biology Laboratory	2	2	4	Spr/Fall	3/Fall	B/E	BIO206-15	BIO
	BIO401-16	Genetic Engineering	3		3	Spr/Fall	3/Fall	B/E	BIO320	BIO
	BIO340	Protein Engineering	3		3	Fall	3/Fall	B	BIO201 BIO320	BIO
	BIO302	Modern Biotechnology	3		3	Spr	3/Spr	B	BIO201	BIO
	BIO346	Bioseparations	3	1	4	Spr	3/Spr	B	BIO202 BIO320	BIO
	Total		23	5						
Major Practical	BIO480 A17	Projects of Science and Technology Innovation I	2	2	4	Fall/Spr /Smr	1/Smr	B/E	NA	BIO
	BIO490	Thesis	8	8	16	Spr	4/Spr	B/E	NA	BIO
	Total		10	10						

Projects of Science and Technology Innovation accept students to start their laboratory training from the 2nd to the 10th semesters.

Table 2: Major Elective Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Advised term to take the course	language Instruction	Prerequisite	Dept
CH203	Organic Chemistry I	4		4	Spr	1/Spr	B	CH101A	CHEM
CH206	Organic Chemistry II	4		4	Fall	2/Fall	B	CH203	CHEM
CH216	Analytical Chemistry I	3		3	Fall	2/Fall	B	CH101A	CHEM
CH217	Analytical Chemistry Laboratory I	2	2	4	Fall	2/Fall	B	CH216	CHEM
CH313	Chemical Biology	3		3	Fall	3/Fall	B	CH206	CHEM
CH317	Medicinal Chemistry	3		3	Fall	4/Fall	C	CH206	CHEM
ESE313	Introduction to Ecology	3		3	Fall	3/Fall	E	ESE202	ESE
MED304	Physiology and Pathophysiology I	3		3	Fall	3/Fall	B	BIO202 BIO320 CH203	MED
MED306	Histology and Embryology	3	1	4	Fall	3/Fall	B	BIO206-15 BIO320	MED
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/ Smr	B	BIO103	BIO
BIO205	Microbiology Laboratory	2	2	4	Spr/Fall	2/Fall	B/E	BIO104	BIO
BIO207-15	Plant Physiology	3		3	Fall	2/Fall	B	BIO103	BIO
BIO209-15	Plant Physiology Laboratory	2	2	4	Fall	2/Fall	B	BIO104	BIO
BIO217	Biological Psychology	3		3	Fall	2/Fall	B	BIO103	BIO
BIO308	Frontier in Life Sciences Seminar and Journal Club	2		2	Spr	2/Spr	B	NA	BIO
BIO304	Systems Biology	3		3	Spr/Fall	3/Fall	B/E	BIO103 MA212	BIO
BIO309	Computational Biology	3	1	4	Fall	3/Fall	B	NA	BIO
BIO311-14	Animal Physiology	3		3	Spr/Fall	3/Fall	B/E	NA	BIO
BIO313-15	Animal Physiology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104	BIO
BIO332	Stem Cell and Regenerative Medicine	2		2	Fall	3/Fall	B	BIO206-15	BIO
BIO305	Model Organism and Developmental Biology	3		3	Spr	3/Spr	B	BIO103	BIO
BIO306	Bioinformatics	4	2	6	Spr	3/Spr	B	BIO309	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	Spr	3/Spr	B	BIO104	BIO
BIO310	Neurobiology	3		3	Spr/Fall	3/Spr	B/E	BIO201	BIO
BIO323	Advanced Cell Biology	2		2	Spr	3/Spr	B	BIO206-15	BIO
BIO331	Protein Structure and Function	3	1	4	Spr/Fall	3/Spr	B	BIO201	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Spr	B	BIO208	BIO

BIO403-16	Molecular Pharmacology	3		3	Spr	3/Spr	E	BIO206-15 BIO311-14	BIO
BIO348	Scientific Writing and Communication	1		1	Spr	3/Smr	E	NA	BIO
BIO405	Immunology	3		3	Fall	4/Fall	E	BIO206-15	BIO
BIO411-16	Dynamical Systems Simulation in Biology	3		3	Fall	4/Fall	B/E	BIO103 MA101B MA107B	BIO
BIO470	SummerOff-Campus Intership	2	2	4	Smr		C	BIO104	BIO
BIO480B17	Projects of Science and Technology Innovation II	2	2	4	Fall/Spr/Smr		B/E	BIO480A17	BIO
BIO480C17	Projects of Science and Technology Innovation III	2	2	4	Fall/Spr/Smr		B/E	BIO480B17	BIO
Total		89	23	112					
Note: A minimum of 29 credits(include at least 6 lab credits) MUST be taken to fulfill Major Requirements.									

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credit	Lab Credits	Hours/week	Term	Advised term to take the course	language Instruction	Prerequisite	Dept
CS102B	Introduction to Computer Programming B	3	1	4	Spr/Fall	1/Fall	B/E	NA	CSE
PHY104B	Experiment of Foundamental Physics	2	2	4	Spr/Fall	1/Spr	B/E	NA	PHY
CH102-17	General Chemistry Laboratory A	1.5	1.5	3	Spr	1/Spr	B	CH101A	CHEM
CH217	Analytical Chemistry Laboratory I	2	2	4	Fall	2/Fall	B	CH216	CHEM
MED306	Histology and Embryology	3	1	4	Fall	3/Fall	B	BIO206-15 BIO320	MED
BIO104	General Biology Laboratory	2	2	4	Spr/Fall	1/Spr	B/E	BIO102B or MED101	BIO
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/Smr	B	BIO103	BIO
BIO205	Microbiology Laboratory	2	2	4	Spr/Fall	2/Fall	B/E	BIO104	BIO
BIO209-15	Plant Physiology Laboratory	2	2	4	Fall	2/Fall	B	BIO104	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO201	BIO
BIO303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO222 BIO301	BIO
BIO208	Cell Biology Laboratory	2	2	4	Spr/Fall	3/Fall	B/E	BIO206-15	BIO
BIO309	Computational Biology	3	1	4	Fall	3/Fall	B	NA	BIO
BIO313-15	Animal Physiology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104	BIO
BIO306	Bioinformatics	4	2	6	Spr	3/Spr	B	BIO309	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	Spr	3/Spr	B	BIO104	BIO
BIO331	Protein Structure and Function	3	1	4	Spr/Fall	3/Spr	B	BIO201	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Spr	B	BIO208	BIO
BIO346	Bioseparations	3	1	4	Spr	3/Spr	B	BIO202 BIO320	BIO
BIO470	Summer Off-Campus Intership	2	2	4	Smr		C	BIO104	BIO
BIO480A17	Projects of Science and Technology Innovation I	2	2	4	Fall/Spr/Smr	1/Smr	B/E	NA	BIO
BIO480B17	Projects of Science and Technology Innovation II	2	2	4	Fall/Spr/Smr		B/E	BIO480A17	BIO
BIO480C17	Projects of Science and Technology Innovation III	2	2	4	Fall/Spr/Smr		B/E	BIO480B17	BIO
BIO490	Thesis	8	8	16	Spr	4/Spr	B/E	NA	BIO
Total		59.5	46.5	106					

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	Credit Requirements	Percentage of the Total*
General Education (GE) Required Courses (not including English courses)	1072	48	48	33.6%
General Education (GE) Elective Courses			14	9.8%
Major Foundational Courses	368	19	19	13.3%
Major Core Courses	448	23	23	16.0%
Major Elective Courses	1792	89	29	20.3%
Research Projects, Internship and Undergraduate Thesis/Projects	320	10	10	7.0%
Total (not including English courses)	4000	189	143	100%

* Percentage of the total= Credit requirements of each line / Total credit requirements

Curriculum Structure of Biotechnology