Program of Biotechnology for International Students (2019)

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, Guangdong Provincial "Pearl River Talent Program" for Innovation and Entrepreneurship, Cryo-EM Center, Plant and Food Research Institute, Neuroscience Research Institute 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 life science was approved to be the Guangdong Provincial key discipline in 2016. In 2018, the Department was authorized to confer doctoral and master degrees, which sets the department on track to be developed with top-tier priority in 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 (48credits)	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 General Education Required Courses, Major Required Courses (Table 1), Major Elective Courses (Table 2).

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 BIO103 or MED101
Declare major at the end of Second Year	PHY103B	General Physics B (I)	
	PHY105B	General Physics B (II)	PHY101B
	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 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	MA101B	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	PHY101B	PHY
PHY104	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	Credit	Lab Credits	Hours/week	Term	Language Instruction	Prerequisite	Dept
GE131	Physical Education I	1		2	1/Fall	C	NA	PE Center
GE132	Physical Education II	1		2	1/Spr	C	NA	
GE231	Physical Education III	1		2	2/Fall	C	NA	
GE232	Physical Education IV	1		2	2/Spr	C	NA	
Total		4		8				

(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/

CLE034	Chinese History	2	2	Spr/Fall	B/E	NA	HUM/ SSC
Total		16	28				

(IV) English Language

All students are required to undertake the English Placement Test before selecting courses, based on which students will be assigned to 3 levels to be ready for the courses with English as the instruction language.

SUSTech English III, English for Academic Purposes are required for Level A.

SUTech English II, SUSTech English III, English for Academic Purposes for Level B.

SUSTech English I, SUSTech English II, SUSTech English III, English for Academic for Level C.

Course Code	Course Name	Credit	Hours/week	Instruction Language	Prerequisite	Dept
CLE021	SUSTech English I	4	4	E	NA	CLE
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 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.
MA107B	Linear Algebra B	4		4	Spr/ Fall		NA	MATH
CH102-17	General Chemistry Laboratory A	1.5	1.5	3	Spr		CH101A	CHEM
MA212	Probability and Statistics	3		3	Spr/ Fall		MA102B	MATH
BMEB131	Introduction to Biomedical Engineering	2		2	Spr			BME
Total		10.5	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	Advised term to take the course	Instruction language	Prerequisite	Dept.
Major Foundational Courses	BIO 104	General Biology Laboratory	2	2	4	Spr/Fall	1/Spr/Fall	B/E	BIO102B or BIO103 or MED101	BIO
	BIO 201	Biochemistry (Macromolecules)	3		3	Spr/Fall	2/Fall	B/E	BIO103 CH101A	BIO
	BIO 203	Microbiology	3		3	Spr/Fall	2/Fall	B/E		BIO
	BIO 320	Molecular Biology	3		3	Spr/Fall	2/Fall	B/E	BIO103	BIO
	BIO 202	Biochemistry II (Metabolism)	3		3	Spr/Fall	2/Spr	B/E	BIO201	BIO
	BIO 222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO103 BIO201 BIO320	BIO
	BIO 210	Biostatistics	3		3	Spr/Fall	2/Spr	E	BIO103	BIO
	Total		19	4	23					
Major Core Courses	BIO 301	Genetics	3		3	Spr/Fall	2/Spr	B/E		BIO
	BIO 303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO301	BIO
	BIO 206-15	Cell Biology	4		4	Spr/Fall	3/Fall	B/E	BIO103	BIO
	BIO 208	Cell Biology Laboratory	2	2	4	Spr/Fall	3/Fall	B/E	BIO104 BIO206-15	BIO
	BIO 401-16	Genetic Engineering	3		3	Fall	3/Fall	B	BIO320	BIO
	BIO 340	Protein Engineering	3		3	Spr	3/Spr	E		BIO
	BIO 302	Modern Biotechnology	3		3	Spr	3/Spr	B	BIO201 BIO206-15	BIO
	BIO 346	Separation Methods in Biochemstry	3		3	Spr	3/Spr	B	BIO201	BIO
	Total		23	4	27					
Practice-based Courses	BIO480A 17	Projects of Science and Technology Innovation I	2	2	4	Fall/Spr/ Smr	1/Smr	B/E		BIO
	BIO490	Thesis	8	8	16	Spr	4/Spr	B/E		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	Instruction language	Prerequisite	Dept.
CH203	Organic Chemistry I	4		4	Fall	2/Fall	B	CH101A	CHEM
CH206	Organic Chemistry II	4		4	Spr	2/Spr	B	CH203	CHEM
CH205	Analytical Chemistry	4		4	Fall	2/Fall	B	CH101A	CHEM
CH313	Chemical Biology	3		3	Fall	3/Fall	B	CH206	CHEM
CH317	Medicinal Chemistry	3		3	Fall	4/Fall	C	CH206	CHEM
BMEB 221	Biomedical Instrumentation	4	2	6	Spr	2/Spr	C	NA	BME
ESE313	Introduction to Ecology	3		3	Fall	3/Fall	E	NA	ESE
MED306	Histology and Embryology	3		3	Fall	3/Fall	B	BIO206-15 BIO320	MED
MED304	Physiology and Pathophysiology I	3		3	Fall	3/Fall	B	BIO202, BIO320, CH203, BIO206-15	MED
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/Smr	B	BIO103	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 BIO207-15	BIO
BIO205	Microbiology Laboratory	2	2	4	Fall	2/Fall	B/E	BIO104; BIO203 or ESE301	BIO
BIO308	Frontier in Life Sciences Seminar and Journal Club	2		2	Spr	2/Spr	B	NA	BIO
BIO309	Computational Biology	3	1	4	Fall	3/Fall	B	NAs	BIO
BIO311-14	Animal Physiology	3		3	Spr/ Fall	3/Fall	B/E		BIO
BIO313-15	Animal Physiology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104 BIO311-14	BIO
BIO305	Model Organism and Developmental Biology	3		3	Spr	3/Spr	B	BIO103	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	Spr	3/Spr	B	BIO104 BIO305	BIO
BIO323	Advanced Cell Biology	2		2	Spr	3/Spr	B	BIO206-15	BIO
BIO304	Systems Biology	3		3	Spr/ Fall	3/Fall	B	Dept. BIO: BIO206-15, MA212 Dept. MATH: BIO103, MA212, MA206 Dept. BME: BIO103, MA212, BMEB311 Dept. PHY: BIO103, MA212, PHY203-15	BIO

BIO306	Bioinformatics	4	2	6	Spr	3/Spr	B	BIO309	BIO
BIO310	Neurobiology	3		3	Spr/ Fall	3/Spr	B/E	BIO201	BIO
BIO331	Protein Structure and Function	3	1	4	Spr	3/Spr	B	BIO201	BIO
BIO332	Stem Cell and Regenerative Medicine	2		2	Spr	3/Spr	B	BIO206-15	BIO
BIO403-16	Molecular Pharmacology	3		3	Spr	3/Spr	E	BIO206-15 BIO311-14	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Spr	B	BIO208	BIO
BIO348	Scientific Writing and Communication	1		1	Spr	3/Spr	B		BIO
BIO411-16	Dynamical Systems Simulation in Biology	3		3	Fall	4/Fall	B/E	BIO103 MA101B MA107B	BIO
BIO405	Immunology	3		3	Fall	4/Fall	E	BIO206-15	BIO
BIO470	Summer Off-Campus Intership	2	2	4	Smr		C	BIO104	BIO
BIO480 B17	Projects of Science and Technology Innovation II	2	2	4	Fall/ Spr/ Smr		B/E	BIO480A17	BIO
BIO480 C17	Projects of Science and Technology Innovation III	2	2	4	Fall/ Spr/ Smr		B/E	BIO480B17	BIO
Total		89	22	111					
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	Instruction language	Prerequisite	Dept.
CS102B	Introduction to Computer Programming B	3	1	4	Spr/Fall	1/Fall	B/E	NA	CSE
PHY104	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
BIO104	General Biology Laboratory	2	2	4	Spr/Fall	1/Spr/Fall	B/E	BIO102B or BIO103 or MED101	BIO
BIO211	Basic Synthetic Biology and Laboratory	2	1	3	Smr	1/Smr	B	BIO103	BIO
BIO209-15	Plant Physiology Laboratory	2	2	4	Fall	2/Fall	B	BIO104 BIO207-15	BIO
BIO205	Microbiology Laboratory	2	2	4	Fall	2/Fall	B/E	BIO104; BIO203 or ESE301	BIO
BIO222	Biochemistry and Molecular Biology Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO201 BIO320	BIO
BMEB221	Biomedical Instrumentation	4	2	6	Spr	2/Spr	C		BME
BIO303	Genetics Laboratory	2	2	4	Spr	2/Spr	B/E	BIO104 BIO301	BIO
BIO309	Computational Biology	3	1	4	Fall	3/Fall	B		BIO
BIO208	Cell Biology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104 BIO206-15	BIO
BIO313-15	Animal Physiology Laboratory	2	2	4	Fall	3/Fall	B/E	BIO104 BIO311-14	BIO
BIO307	Model organism and Developmental Biology Laboratory	1	1	2	Spr	3/Spr	B	BIO104 BIO305	BIO
BIO306	Bioinformatics	4	2	6	Spr	3/Spr	B	BIO309	BIO
BIO331	Protein Structure and Function	3	1	4	Spr	3/Spr	B	BIO201	BIO
BIO344	Modern Biotechnology Laboratory	2	2	4	Spr	3/Spr	B	BIO208	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		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		BIO
Total		55.5	44.5	100					

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)	1008	48	48	33.6%
General Education (GE) Elective Courses			14	9.8%
Major Foundational Courses	368	19	19	13.3%
Major Core Courses	432	23	23	16.1%
Major Elective Courses	1776	89	29	20.2%
Research Projects, Internship and Undergraduate Thesis/Projects	320	10	10	7.0%
Total (not including English courses)	3904	189	143	100%

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

Curriculum Structure of Biotechnology

