

# 生物技术

## Biotechnology

专业代码：071002

学制：4年

Program Code: 071002

Duration: 4 years

### 培养目标：

本专业培养坚持社会主义道路，知识、能力、素质协调发展，具有扎实数理化基础、科学素养和国际化视野，掌握生物技术领域坚实的基础理论、系统的专业知识和专门的实验技能，能在生物技术及相关领域从事科学研究、技术开发、产品生产、人才培养及生产管理等方面工作的高级技术与管理人才。

### Educational Objectives:

This major is to train advanced technical personnel and talented manager with upholding the socialist road, harmonious development on knowledge, ability and quality, who has solid and basic knowledge of natural science, scientific literacy and international vision, master basic theory, professional knowledge and specialized experiment skills about biotechnology, can do scientific research, technology development, talent training and production management on teaching and scientific research units, biotechnology industry and related fields.

### 毕业要求：

№1.基础知识：具有坚实的生物技术专业基础理论和专门知识，具有较强的基本实验技能，并掌握一定的人文社科、经济管理等方面的基础知识。

№2.问题分析：能够应用生物技术的基本原理，识别、表达、并通过文献研究分析生物领域复杂科学问题，以获得有效结论。

№3.设计/开发解决方案：能够设计针对复杂生物领域科学问题的解决方案，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。

№4.研究：能够基于科学原理并采用科学方法对复杂生命科学问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

№5.使用现代工具：能够针对复杂科学问题，开发、选择与使用恰当的技术、资源、现代信息技术工具，并能够理解其局限性。

№6.技术与社会：能够基于生物技术的相关背景知识进行合理分析，评价专业实践和复杂问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。

№7.环境和可持续发展：能够理解和评价针对复杂生命问题的专业实践对环境、社会可持续发展的影响。

№8.职业规范：具有人文社会科学素养、社会责任感，能够在科学实践中理解并遵守职业道德

和规范，履行责任。

№9.个人和团队：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。

№10.沟通：能够就复杂生物技术问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

№11.项目管理：理解并掌握项目管理原理与经济决策方法，并能在多学科环境中应用。

№12.终身学习：具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

### **Student Outcomes:**

№1.Basic Knowledge: Basic theory, specialized knowledge and experimental skills about biotechnology, also with basic knowledge of humanity, social sciences, economical administration etc.

№2.Problem Analysis: An ability to identify, formulate and analyze complex scientific problems, reaching to substantiated conclusions using basic principles of biotechnology.

№3.Design / Development Solutions: An ability to design solutions for complex scientific problems and innovatively design systems, components or process that meet specific needs with societal, public health, safety, legal, cultural and environmental considerations.

№4.Research: An ability to conduct investigations of complex biotechnology problems based on scientific theories and adopting scientific methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

№5.Applying Modern Tools: An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools with an understanding of the limitations.

№6.Technology and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional technique practice.

№7.Environment and Sustainable Development: An ability to understand and evaluate the impact of professional biological solutions in environmental and societal contexts and demonstrate knowledge of and need for sustainable development.

№8.Professional Standards: An understanding of humanity science and social responsibility, being able to understand and abide by professional ethics and standards responsibly in engineering practice.

№9.Individual and Teams: An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

№10.Communication: An ability to communicate effectively on complex technique problems with the community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive clear instructions, and communicate in cross-cultural contexts with international perspective.

№11.Project Management: Demonstrate knowledge and understanding of project management principles

and methods of economic decision-making, to function in multidisciplinary environments.

№12.Lifelong Learning: A recognition of the need for, and an ability to engage in independent and life-long learning with the ability to learn continuously and adapt to new developments.

### **专业简介：**

生物技术是生物科学与工程学院生物学一级学科下的理学专业，于 2004 年在原有工科基础上以“秉承工科优势，加强理学研究”的理念设立。专业建设的主要任务是以国家战略性新兴产业发展和广东构建具有国际竞争力的生物产业体系为依托，为国家及地区的生物技术产业提供人才、技术、产品及服务。学院拥有国家生物学一级学科博士点，生物学一级学科为广东省重点学科，拥有 8 个教学实验室和 10 个科研实验室，生物科学与工程教学实验中心为广东省实验教学示范中心。专业所在的生物技术系专职教师全部具有博士学位，副高以上占任课教师比例达 85% 以上。

### **Program Profile:**

Biotechnology is one major of natural science belonging to first-level discipline-Biology and it was established on 2004 on account of idea “Taking over engineering advantage, Strengthening biological science” . The primary mission of this major is to provide talents, technology, products and service for national and localized biotechnology industry depending on the development of national strategic emerging industry and establishment of bio-Tech industry systems in Guangdong. The school of biotechnology and biological engineering possess Ph.D. degrees of first-level discipline on Biology and it was the key discipline of Guangdong Province with eight teaching laboratory and ten research laboratory. Center for Experiment teaching was the demonstration centre in Guangdong. All the teachers in the department of biotechnology owned Ph.D degree. And over 85% of teachers have been employed as associate professors and even higher.

### **专业特色：**

生命科学已进入组学（基因组、转录组、蛋白组、代谢组学）时代，本专业在核心教学课程的基础上，侧重发展基于组学的生物信息学、系统生物学、合成生物学等前沿技术，加强基因组科学、干细胞与再生医学等创新人才培养模式。

### **Program Features:**

Life science enters into era of omics including genomics, transcriptomics, proteomics and metabonomics and this major plays extra emphasis on bioinformatics, systems biology and synthetic biology and related frontier technology , strength those innovative program including Genomics and Stem Cell and regenerative medicine.

**授予学位：**理学学士学位

**Degree Conferred:** Bachelor of Natural Sciences

## **主干课程：**

生物化学、微生物学、分子生物学、细胞生物学、遗传学、基因组学、生物信息学、生物统计学、分子生物学实验、细胞生物学实验。

## **Core Courses:**

Biochemistry, Microbiology, Molecular Biology, Cell Biology, Essentials of Genetics, Genomics, Bioinformatics, Biostatistics, Experiment of Molecular Biology, Experiment of Cell Biology,

## **特色课程：**

全英语教学课程：微生物学

双语教学课程：生物化学、分子生物学、遗传学、生物统计学

研究型课程：自主科研训练

含新生研讨课：生物科学与工程概论

专题研讨课：生物制药技术

本研贯通课：现代生物分析仪器原理与实验

创新实践课程：生物工程与生物技术综合性实验

创业教育课程：生物技术创新与创业

## **Featured Courses:**

Courses Taught in English: Microbiology

Bilingual Courses: Biochemistry, Molecular Biology, Genetics, Biostatistics

Research Courses: Independent research and training

Freshmen Seminars: Introduction to biology and biological engineering

Special Topics: Bio-Pharmaceutical Technology

Baccalaureate-Master's Integrated Courses: Principle and Experiment of Modern Bioanalytic instruments

Innovation Practice: Integrated Experiment of Biological Engineering and Biotechnology

Entrepreneurship Courses: Innovation and entrepreneurship of Biotechnology



## 2.类别统计表 (Category Registration Form)

学时 Academic Hours					学分 Credits						
总学时数 Total	其中 Include		其中 Include		总学分数 Total	其中 Include		其中 Include			其中 Include
	必修学时 Compulsory	选修学时 Elective	理论教学学时 Theory Course	实验教学学时 Lab		必修学分 Compulsory	选修学分 Elective	集中实践教学环节学分 Practice-concentrated Training	理论教学学分 Theory Course Credits	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2300	2004	296	1852	448	173	154.5	18.5	35	124	14	11

### 三、专业教学计划表 (Teaching Schedule)

类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes	
				总学 时 Class Hours	上机 Computer-aided Class Hours	实验 Lab Hours	实践 Practice Hours				
公共基础课 General Basic Courses	143093	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law	必修 课 C	(40) (36)				2.5	2	N <sub>0</sub> 8	
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	1	N <sub>0</sub> 8	
	143106	毛泽东思想和中国特色社会主义理论体系概论 Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics		(80) 48				5.0	4	N <sub>0</sub> 8	
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	3	N <sub>0</sub> 8	
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	7	N <sub>0</sub> 8	
	144001	大学英语 (一) College English(1)		64				4.0	1	N <sub>0</sub> 10	
	144002	大学英语 (二) College English(2)		64				4.0	2	N <sub>0</sub> 10	
	145223	大学计算机基础 Foundations of Computer		32				2.0	1	N <sub>0</sub> 5	
	145268	C++程序设计基础 C++ Programming Foundations		48				3.0	2	N <sub>0</sub> 5	
	152001	体育 (一) Physical Education (1)		32			32	1.0	1	N <sub>0</sub> 12	
	152002	体育 (二) Physical Education (2)		32			32	1.0	2	N <sub>0</sub> 12	
	152003	体育 (三) Physical Education (3)		32			32	1.0	3	N <sub>0</sub> 12	
	152004	体育 (四) Physical Education (4)		32			32	1.0	4	N <sub>0</sub> 12	
	106001	军事理论 Military Principle		(16)				1.0	2	N <sub>0</sub> 9	
	140189	微积分 I (一) Calculus (1)		80				5.0	1	N <sub>0</sub> 1	
	140190	微积分 I (二) Calculus (2)		64				4.0	2	N <sub>0</sub> 1	
	141001	大学物理 I (一) General Physics (1)		48				3.0	2	N <sub>0</sub> 1	
	141002	大学物理 I (二) General Physics (2)		48				3.0	3	N <sub>0</sub> 1	
	141007	大学物理实验 (一) Physics Experiment (1)		32		32		1.0	2	N <sub>0</sub> 1	
	141008	大学物理实验 (二) Physics Experiment (2)		32		32		1.0	3	N <sub>0</sub> 1	
	140197	线性代数与解析几何 Linear Algebra & Analytic Geometry		48				3.0	1	N <sub>0</sub> 1	
	140019	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	N <sub>0</sub> 1	
		人文科学领域 Humanities		96	通识 课 E				6.0		N <sub>0</sub> 8
		社会科学领域 Social Science		64					4.0		N <sub>0</sub> 8

合 计 Total				1004		64	128	65.0		
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### 三、专业教学计划表（续）（Teaching Schedule）

类别 Course Category	课程 代码 Course No.	课 程 名 称 Course Title	是 否 必 修 C/E	学 时 数 Total Curriculum Hours				学 分 数 Credits	开 课 学 期 Semester	毕 业 要 求 Student Outcomes
				总学时 Class Hours	上机 Computer -aided Class Hours	实 验 Lab Hours	实 践 Practice			
学科基础课 Disciplinary Basic Courses	147001	无机化学 I Inorganic Chemistry	必	32				2.0	1	№1
	147034	无机化学实验（工科）（一） Experiment of Inorganic Chemistry(1)	必	16		16		0.5	1	№1
	147035	无机化学实验（工科）（二） Experiment of Inorganic Chemistry(1)	必	16		16		0.5	2	№1
	147020	有机化学 I Organic Chemistry	必	48				3.0	2	№1
	147007	有机化学实验 I Organic Chemistry Experiments	必	32		32		1.0	3	№1
	147008	分析化学 I Analytical Chemistry	必	32				2.0	3	№1
	147013	分析化学实验 II Analytical Chemistry Experiments	必	32		32		1.0	3	№1
	147058	物理化学 I Physical Chemistry	必	48				3.0	4	№1
	147055	物理化学实验 II Physical Chemistry Experiments	必	32		32		1.0	5	№1
	170196	生物科学与工程概论 Introduction to biology and biological engineering	必	32				2.0	1	№1,6,7,12
	170098	普通生物学 General Biology	必	32				2.0	1	№1,6,12
	170197	生物化学 Biochemistry	必	64				4.0	3	№1-5
	170009	微生物学 Microbiology	必	56				3.5	4	№1-7
	170010	微生物学实验 Microbiological Experiment	必	32		32		1.0	4	№1-4,8
	170104	细胞生物学 Cell Biology	必	64				4.0	4	№1,2,12
	170203	细胞生物学实验 Experiment of Cell Biology	必	32		32		1.0	4	№1,2,8-10
	170206	分子生物学 Molecular Biology	必	64				4.0	5	№1-4,9,12
	170102	分子生物学实验 Experiment of Molecular Biology	必	64		64		2.0	5	№1-4,9
	170199	遗传学 Essentials of Genetics	必	48				3.0	5	№1-8
	170213	生物信息学 Bioinformatics	必	64				4.0	4	№1-5
	170200	生理学 Physiology	必	32				2.0	5	№1-4
	170177	基因组学 Genomics	必	32				2.0	5	№1,4,5
	170239	生物统计学 Biostatistics	必	32				2.0	6	№1-5



类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer -aided Class Hours	实验 Lab Hours	实践 Practice			
<b>合计 Total</b>			必 C	936		256		50.5		
			选 E	选修课修读最低要求 0 学分 minimum elective course credits required:						
专业领域课 Specialty-related Courses	170117	免疫学 Immunology	必 C	32				2.0	6	№1,2,4,5
	170116	发育生物学 Developmental Biology	必 C	32				2.0	4	№1-4
	170120	生态学 Ecology	必 C	32				2.0	5	№1-5
	170240	合成生物学导论 Introduction to synthetic biology	必 C	32				2.0	5	№1-3,5,6,10,12
	170018	酶工程 Enzyme Engineering	必 C	32				2.0	6	№1-7
	170147	细胞工程 Cell engineering	必 C	32				2.0	6	№1-4
	170016	现代生化技术 Modern Biotechnology	必 C	32				2.0	6	№1
	170097	生物数据库应用 Application of Biological database	选 E	32				2.0	5	№1-7
	170221	生物技术创新与创业 Biotechnology innovation and start up business	选 E	32				2.0	3	№8,9,11,12
	170220	发酵工程原理 Principles of fermentation engineering	选 E	32				2.0	5	№1,2,4,5
	170210	生物工程设备 Equipment of Bioengineering	选 E	32				2.0	6	№1-5
	137009	新药研究与开发 Research and Development of New Drugs	选 E	32				2.0	7	№1-7,11,12
	170094	保健食品研发及生物技术应用 Research and Development of Functional Food and Relative Biotechnologies	选 E	32				2.0	7	№1-7
	170177	系统生物学 Systems biology	选 E	16				1.0	6	№1,4,5
	170034	药事管理学 Pharmaceutical Administration	选 E	16				1.0	7	№1,2,4,5
	170241	结构生物学 Structural biology	选 E	32				2.0	5	№1-5
	170242	癌症生物学 The biology of Cancer	选 E	32				2.0	6	№1,2,4,6,12
	170243	干细胞生物学 Stem Cell Biology	选 E	16				1.0	6	№1,2,4,6,12
	170244	生物制药技术 Bio-Pharmaceutical Technology	选 E	32				2.0	6	№1-4, 6, 10, 12
	170095	生物反应工程基础 Bioreaction Engineering Fundamentals	选 E	32				2.0	5	№1-7
170245	科技论文写作 Scientific writing	选 E	16				1.0	6	№4,6,10,12	
<b>合计 Total</b>			必 C	224				14.0		

类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer -aided Class Hours	实验 Lab Hours	实践 Practice			
				选修课修读最低要求 8.5 学分 minimum elective course credits required:						

#### 四、集中实践教学环节(Practice-concentrated Training)

课程 代码 Course No	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours		学分数 Credits	开课 学期 Semester	毕业要求 Student Outcomes
			实践 Practice weeks	授课 Lecture Hours			
106002	军训 Military Training	必 C	3 周		3.0	1	No8
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	No7
170246	文献检索与实践 Literature search and practice	必 C	1 周		1.0	3	No2,4,5,8,12
170100	生物化学实验 Biochemical Experiment	必 C	1 周		1.0	3	No2-7
170201	生理学实验 Experiment of Physiology	必 C	1 周		1.0	5	No1-5
170224	生物科学与工程综合实验 Integrated Experiment of Biotechnolgy and Biological Engineering	必 C	1 周		1.0	5	No1-4,9-11
170247	自主科研训练 Independent research and training	必 C	4 周		4.0	2-7	No1-4,9-11
170222	现代生物科学分析仪器原理与实验 Principle and Experiment of Modern Bioscientific instruments	必 C	1 周		1.0	6	No1-6
170046	生产实习 Production Practice	必	2 周		2.0	3	No1-12
170047	毕业实习 Graduation practice	必	4 周		4.0	7	No1-12
170087	毕业论文 graduation project (thesis)	必	15 周		15.0	8	No1-12
<b>合计 Total</b>		必 C	35 周		35.0		
		选 E	选修课修读最低要求 0 学分 minimum elective course credits required:				

备注：自主科研训练课程的修读及学分获得可以采用两种方式，1) 参考本课程大纲，选取模块进入本科导师实验室开展科研训练，按大纲要求考核合格获得 4 学分；2) 学生根据自己开展科研训练项目、学科竞赛、发表论文、获得专利和自主创业等情况申请折算 4 学分自主科研训练课程（具体方法依据学校对创新研究训练（120003）、创新研究实践 I（120004）、创新研究实践 II（120005）、创业实践（120006）等创新创业课程的学分获得规定）。学生此部分获得的学分不得再计入第二课堂学分。

#### 五、第二课堂

第二课堂由人文素质教育和创新能力培养两部分组成。

##### 1.人文素质教育基本要求

学生在取得专业教学计划规定学分的同时，还应结合自己的兴趣适当参加课外人文素质教育活动，参加活动的学分累计不少于 2 个学分。

## 2.创新能力培养基本要求

学生在取得本专业教学计划规定学分的同时，还必须参加国家创新创业训练计划或广东省创新创业训练计划或 SRP（学生研究计划）或百步梯攀登计划或一定时间的各类课外创新能力培养活动（如学科竞赛、学术讲座等），参加活动的学分累计不少于 4 个学分。

## 5.“Second Classroom” Activities

“Second Classroom” Activities are comprised of two parts, Humanities Quality Education and Innovative Ability Cultivation.

### 1)Basic Requirements of Humanities Quality Education

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in extracurricular activities of Humanities Quality Education based on one’s interest, acquiring no less than two credits.

### 2)Basic Requirements of Innovative Ability Cultivation

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in any one of the following activities: National Undergraduate Training Programs for Innovation and Entrepreneurship, Guangdong Undergraduate Training Programs for Innovation and Entrepreneurship, Student Research Program (SRP), One-hundred-steps Innovative Program, or any other extracurricular activities of Innovative Ability Cultivation that last a certain period of time (e.g. subject contests, academic lectures), acquiring no less than four credits.