

生物工程

Bioengineering Specialty

专业代码: 083001

学 制: 4 年

Program Code: 083001

Duration: 4 years

培养目标:

培养能坚持社会主义道路和适应经济、科技、社会发展需要, 具有扎实的生物学、工程学基础理论和专业知识, 掌握生物产品大规模制造的科学原理, 熟悉生物加工流程与工程设计等基础理论和技能, 具备熟练的实验操作技能与较强的工程应用能力, 能在生物工程领域从事设计、生产、管理和新技术研究、新产品开发的, 适应未来生物制造产业发展的高级工程科学技术人才。

Educational Objectives:

This major is to train senior engineering and science & technology talent who is upholding the socialist road and adapts himself to the development needs of economy, technology and society, possesses a solid biology, engineering basic theory and professional knowledge, as well as masters the scientific principle of large-scale production of biological products, and is also familiar with the theory and skills of the bioprocess and engineering design. The student is also expected to have specialized experimental skills and strong engineering application ability, and also can do design, production, management and new technology research, new product development in the field of biological engineering.

毕业要求:

№1.工程知识: 掌握扎实的生物学基础知识、专业基本原理、方法和手段, 能够将数学、自然科学、工程学和生物学专业用于解决生物工程领域的具体任务和具体问题。

№2.问题分析: 能够应用数学、自然科学、生物科学基本原理、方法和手段, 识别、表达、并通过文献研究分析生物领域的自然现象和复杂问题, 以获得有效结论。

№3.设计/开发解决方案: 能够针对生物领域的复杂问题和具体任务, 发现问题, 寻求途径, 设计满足特定需求的解决方案或工艺流程, 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: 能够基于生物科学原理并采用科学方法对生物工程领域的生产工艺、质量控制、技术革新等复杂问题进行研究, 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: 能够针对生物工程复杂问题, 开发、选择与使用恰当的网络资源、生物信息学技术、现代通讯工具, 对具体科学问题和工程的进行抽提和模拟, 并能够理解其局限性。

№6.工程与社会: 能够基于生物科学相关背景知识进行合理分析, 评价生物学科发展及解决方案对社会、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生物领域的加工过程或工程实践对环境、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，能够在工程实践中理解并遵守工程职业道德和规范，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：能够就生物领域复杂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：理解并掌握工程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. Engineering Knowledge: An ability to solid basic biological knowledge, specialized principles, methods and means, as well as to apply knowledge of mathematics, science, engineering fundamentals and biological specialization to the solution of the specific tasks and issues in the field of bioengineering.

№2. Problem Analysis: An ability to identify, formulate and analyze biological phenomena and complex problems in the biological field, reaching to substantiated conclusions using basic principles of mathematics, science, and basic biological principles, methods and means.

№3. Design / Development Solutions: An ability to design solutions or process for the complex biological problems and specific tasks, find problems and seek ways meeting specific demands, as well as innovatively design with social, health, safety, legal, cultural and environmental considerations.

№4. Research: An ability to conduct investigations of complex problems, such as process flow, quality control and technology innovation in biological engineering field based on scientific theories and methods, 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 bioinformatics and IT tools for the complex biological problem, including prediction and modeling to complex engineering activities with an understanding of the limitations.

№6. Engineering and Society: An ability to apply reasoning informed by biology-related background knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional biological practice.

№7. Environment and Sustainable Development: An ability to understand and evaluate the impact of professional biotechnical 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 biological problems with the engineering 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 engineering 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：

从 1958 年的“微生物工学”到 1997 年正式设立的“生物工程”，生物工程在华南理工大学有着悠久的历史 and 卓越的成就，2010 年生物工程进入高等学校特色专业建设点。现今，生物工程也是广东省名牌专业，特色课程“酶工程”被评为“国家精品课程”和“国家精品课程资源共享课”。学院现设有国家生物学一级学科博士点，广东省一级学科重点学科，轻工技术与工程博士后流动站，拥有广东省发酵与酶工程重点实验室、广东省生物酶与工业绿色加工工程技术研究中心、广东省教育厅工业生物技术重点实验室及校生物医药前孵化器研究中心，在重要蛋白质的结构与功能、工业酶的设计开发、传统发酵产品的升级改造与生物能源开发等研究方向形成了鲜明的研究特色与优势，部分研究达到国际前沿水平。生物工程所在的实验中心已成为广东省实验教学示范中心，98% 以上的教师具有博士学位，副高以上占任课教师比例达 85%。

Program Profile:

From the set-up of the major of microbial engineering in 1958 to the establishment of the major of bioengineering in 1997, bioengineering has a long history and outstanding achievements in South China University of Technology. Bioengineering profession became the Ministry of Education featured program construction in 2010. Now, Bioengineering profession is also famous brand major in Guangdong province; featured course "enzyme project" was rated as "national excellent course" and "national excellent course resource sharing class". Our school has the first-level discipline doctoral program of Biology, first-level key disciplines in Guangdong province, the post-doctoral station of Light Industry Technology and Engineering. Our school also has the provincial key laboratory in fermentation and enzyme engineering, bio-enzyme and industrial green processing technology research center in Guangdong province, the key laboratory of industrial biotechnology of Guangdong Educational Department and school biomedical incubator research center. Many research fields, such as the structure and function of important proteins, industrial enzyme design and development, the upgrading of traditional fermentation products and bio-energy development, has formed distinguished research characteristics and advantages. Among them,

some research has approached or being approaching the international frontier level. The experimental center which bioengineering profession belongs to, has become the experimental teaching demonstration center of Guangdong Province. More than 98% of the teachers have doctoral degree, and over 85% of teachers have been employed as associate professors and even higher.

专业特色：

秉承工科特色，加强理学研究，培养学生系统地掌握以现代生物制造为主要特征的工业生物技术知识体系，以传统发酵产业升级为主要导向，以生物催化剂构建和生物制造过程强化为特色，培养高级复合型工科专业人技术人才。

Program Features:

Adhering to the engineering characteristics, strengthen the science research, the students were trained to systematically master industrial biotechnology knowledge characterized by modern bio-manufacturing. With traditional fermentation industry upgrading as the main direction, with the construction of biological catalyst and the enhancement of bio-manufacturing process as features, the advanced composite engineering professionals are trained.

授予学位：工学学士学位

Degree Conferred: Bachelor of Engineering

主干课程：

生物化学、细胞生物学、化工原理、微生物学、基因工程、发酵工程原理、酶工程、细胞工程、生物工程设备。

Core Courses:

Biochemistry, Cell Biology, Chemical Engineering, Microbiology, Genetic Engineering, Principles of Fermentation Engineering, Enzyme Engineering, Cell Engineering, Bioengineering Equipment.

特色课程：

全英语教学课程：生物化学、微生物学

双语教学课程：酶工程、基因工程

研究型课程：自主科研训练

新生研讨课：生物科学与工程概论

专题研讨课：文献检索与实践、科技论文写作

本研贯通课：现代生物分析仪器原理与实验

创新实践课程：生物科学与工程综合实验

创业教育课程：生物技术创新与创业

Featured Courses:

Courses Taught in English: Biochemistry, Microbiology

Bilingual Courses: Enzyme Engineering, Genetic Engineering

Research Courses: Independent Research

Freshmen Seminars: Introduction to Biology and Biological Engineering

Special Topics: Literature Retrieval and Practice, Scientific Writing

Baccalaureate-Master's Integrated Courses: Principles and Experiments of Modern Bioanalytic Instruments

Innovation Practice: Integrated Experiment of Biological Science and Engineering

Entrepreneurship Courses: Innovation and Entrepreneurship of Biotechnology

一、教学计划总体安排表 (General Teaching Schedule)

学 年	学 期	教 学 进 度 安 排 (周)																			理	考	入	军	课	工	电	综	社	生	毕	中	毕	就	机	假	小			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	论	学	学	程	程	程	实	实	实	实	实	实	实	实	实	实	实	实	
																							学	试	教	教	教	作	训	习	习	习	习	习	习	习	习	习	习	习
																						A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
一	1		C	A	A	A	A	A	A	A	A	A	A	A	A	A	B	D	D	D	14	1	1	3														19		
	2	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Q	Q	B	B	16	2														2		20		
二	3	A	A	A	A	A	A	A	A	A	A	I	A	A	A	A	K	K	B	B	15	2					1		2									20		
	4	A	A	A	A	A	A	A	A	G	G	A	A	A	I	A	A	A	B	B	15	2				2	1												20	
三	5	A	A	A	A	A	A	A	A	H	A	A	A	I	I	A	A	A	B	B	15	2					1	2											20	
	6	A	A	A	A	A	A	A	A	A	A	A	A	I	I	E	E	B	B	13	2			2			3											20		
四	7	A	A	A	A	A	L	L	L	L	A	A	A	A	A	A	A	A	B	B	14	2								4									20	
	8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	Q	Q	Q	P	P													15	2	3				20	
		合 计 (周)																			102	13	1	3	2	0	2	1	7	0	2	4	0	0	15	2	5	0		159

二、各类课程学分登记表 (Registration Form of Curriculum Credits)

1. 学分统计表 (Credits Registration Form)

课程类别 Course Category	课程要求 Requirement	学分 Credits	学时 Academic Hours	备注 Remarks
公共基础课 General Basic Courses	必修 Compulsory	60.0	924	
	通识 General Education	10.0	160	
学科基础课 Disciplinary Basic Courses	必修 Compulsory	45.5	874	
	选修 Elective	0	0	
专业领域课 Specialty-related Courses	必修 Compulsory	14.0	224	
	选修 Elective	6.5	104	
合 计 Total		136.0	2286	
集中实践教学环节 (周) Practice Training (Weeks)	必修 Compulsory	42.0	42 周	
毕业学分要求 Credits Required for Graduation	136.0+42.0=178.0			

备注：学生在取得专业教学计划规定学分的同时，还必须取得第二课堂 2 个人文素质教育学分和 4 个创新能力培养学分。

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
2286	2022	264	1790	496	178	161.5	16.5	42	120.5	15.5	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	№8	
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	1	№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	№8	
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	3	№8	
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	7	№8	
	144001	大学英语 (一) College English(1)		64				4.0	1	№10	
	144002	大学英语 (二) College English(2)		64				4.0	2	№10	
	145223	大学计算机基础 Foundations of Computer		32				2.0	1	№5	
	145268	C++程序设计基础 C++ Programming Foudations		48				3.0	2	№5	
	152001	体育 (一) Physical Education (1)		32			32	1.0	1	№12	
	152002	体育 (二) Physical Education (2)		32			32	1.0	2	№12	
	152003	体育 (三) Physical Education (3)		32			32	1.0	3	№12	
	152004	体育 (四) Physical Education (4)		32			32	1.0	4	№12	
	106001	军事理论 Military Principle		(16)				1.0	2	№9	
	140189	微积分 I (一) Calculus (1)		80				5.0	1	№1	
	140190	微积分 I (二) Calculus (2)		64				4.0	2	№1	
	140197	线性代数与解析几何 Linear Algebra & Analytic Geometry		48				3.0	1	№1	
	140019	概率论与数理统计 Probability & Mathematical Statistics		48				3.0	2	№1	
	130139	工程制图 (一) Engineering Drawing (1)		48				3.0	1	№1	
	130140	工程制图 (二) Engineering Drawing (2)		32				2.0	2	№1	
	141001	大学物理 I (一) General Physics (1)		48				3.0	2	№1	
	141002	大学物理 I (二) General Physics (2)		48				3.0	3	№1	
	141007	大学物理实验 (一) Physics Experiment (1)		32		32		1.0	2	№1	
	141008	大学物理实验 (二) Physics Experiment (2)		32		32		1.0	3	№1	
		人文科学领域 Humanities		通	96				6.0		№8

	社会科学领域 Social Science	识 课 E	64				4.0		№8
	合 计 Total		1084		64	128	70.0		

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 Compute r-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 C	32				2.0	1	№1
	147034	无机化学实验（工科）（一） Experiment of Inorganic Chemistry(1)	必 C	16		16		0.5	1	№1
	147035	无机化学实验（工科）（二） Experiment of Inorganic Chemistry(2)	必 C	16		16		0.5	2	№1
	147020	有机化学 I Organic Chemistry	必 C	48				3.0	2	№1
	147007	有机化学实验 I Organic Chemistry Experiments	必 C	32		32		1.0	2	№1
	147008	分析化学 I Analytical Chemistry	必 C	32				2.0	3	№1
	147013	分析化学实验 II Analytical Chemistry Experiments	必 C	32		32		1.0	3	№1
	147058	物理化学 I Physical Chemistry	必 C	48				3.0	4	№1
	147055	物理化学实验 II Physical Chemistry Experiments	必 C	32		32		1.0	5	№1
	137036	流体力学与传热III Fluid Mechanics and Heat Transfer	必 C	56				3.5	5	№1
	170013	传质与分离工程III Mass Transfer and Separation Processes	必 C	48				3.0	6	№1
	137063	化工原理实验（一） Experiment of Chemical Engineering Principles(1)	必 C	16		16		0.5	5	№1
	137064	化工原理实验（二） Experiment of Chemical Engineering Principles(2)	必 C	16		16		0.5	6	№1
	130083	机械设计基础 Basis of Mechanical Design	必 C	48				3.0	5	№1
	130310	机械基础综合实验 I Poly-experiment of Mechanical Fundamentals	必 C	10		10		0.5	5	№1,3
	135092	电工与电子技术 II Electrical Engineering and Electrontechnics	必 C	64				4.0	3	№1
	135081	电工与电子技术实验 Experiment of Electrical Engineering and Electrontechnics	必 C	32		32		1.0	4	№1

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 Compute r-aided Class Hours	实验 Lab Hours	实践 Practice			
	170196	生物科学与工程概论 Introduction to biology and biological engineering	必 C	32				2.0	1	№1,6,7,12
	170205	生物化学 Biochemistry	必 C	48				3.0	3	№2-7
	170100	生物化学实验 Experiment of Biochemistry	必 C	32		32		1.0	3	№2-7
	170026	细胞生物学 Cell Biology	必 C	32				2.0	4	№1,2,12
	170203	细胞生物学实验 Experiment of Cell Biology	必 C	32		32		1.0	4	№1,2,8-10
	170103	微生物学 Microbiology	必 C	56				3.5	4	№1-7,
	170010	微生物学实验 Experiment of Microbiology	必 C	32		32		1.0	4	№1-4,8
	170017	基因工程 Genetic Engineering	必 C	32				2.0	5	№1-7
		合计 Total		必 C	874		298		45.5	
			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	170248	生物数据库应用 Application of Biological Database	必 C	32	6			2.0	3	№1-7
	170018	酶工程 Enzyme Engineering	必 C	32				2.0	4	№1-7
	170147	细胞工程 Cell Engineering	必 C	32				2.0	5	№1-4
	170249	发酵工程原理 Principles of Fermentation Engineering	必 C	48				3.0	5	№1-4
	170016	现代生化技术 Modern Biotechnology	必 C	32				2.0	5	№1
	170210	生物工程设备 Bioengineering Equipment	必 C	48				3.0	6	№1-5
	170098	普通生物学 General Biology	选 E	32				2.0	1	№1,6, 12
	170206	分子生物学 Molecular Biology	选 E	32				2.0	3	№1-6
	170031	免疫学 Immunology	选 E	32				2.0	3	№1-4
	170240	合成生物学导论 Introduction to Synthetic Biology	选 E	32				2.0	4	№1,2,3,5,6
	170250	微生物生态学 Microbial Ecology	选 E	32				2.0	4	№1-4

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 Compute r-aided Class Hours	实验 Lab Hours	实践 Practice			
170095	生物反应工程基础 Bioreaction Engineering Fundamentals	选 E	32				2.0	5	№1-7	
170110	基因组学 Genomics	选 E	32				2.0	5	№1,4,5	
170251	结构生物学 Structural Biology	选 E	32	2			2.0	5	№1-5	
170225	生物分离工程 Biological Separation engineering	选 E	32				2.0	6	№1-7	
170033	发酵工厂设计概论 Design Generality of Fermentation Factories	选 E	32				2.0	6	№1-7	
170251	氨基酸工艺学 Principle of Amino Acid Fermentation	选 E	32				2.0	6	№1-7	
170252	酿造酒工艺学 Process of Fermentation Wine	选 E	32				2.0	6	№1-7	
170253	蒸馏酒工艺学 Distilled Liquor Technology	选 E	32				2.0	6	№1-5	
170254	生物质能源 Bioenergy	选 E	32				2.0	6	№1-7	
170245	科技论文写作 Scientific Writting	选 E	16				1.0	6	№4,6,10,12	
170022	废水生化处理 The Biochemical Treatment of Wastewater	选 E	32				2.0	7	№1,3,6,7,9,	
170093	生物工程产品质量管理 Quality Management of Bioengineering Product	选 E	32				2.0	7	№1-7	
170255	糖生物学 Basic Glycobiology	选 E	32				2.0	7	№1	
170256	食用菌工艺学 Technology for Edible Mushrooms	选 E	32				2.0	7	№1-6	
170257	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	
170221	生物技术创新与创业 Innovation and entrepreneurship of Biotechnology	选 E	32				2.0	7	№1-4	
		必 C	224	6			14.0			
		选 E	选修课修读最低要求 6.5 学分 minimum elective course credits required:6.5							

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	№9
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	№8
170247	自主科研训练 Independent research	必 C	4 周		4.0	2-7	№1-4,9-11
170246	文献检索与实践 Literature search and practice	必 C	1 周		1.0	3	№2,4,5,8,12
170046	生产实习 Specialized Production Practice	必 C	2 周		2.0	3	№1-12
130356	工程训练 I Engineering Training	必 C	2 周		2.0	4	№1-6
170258	酶工程实验 Enzyme Engineering Experiment	必 C	1 周		1.0	4	№1-7
141075	电子工艺实习 I Practice of Electronic	必 C	1 周		1.0	5	№1-6
170259	基因工程实验 Genetic Engineering Experiment	必 C	1 周		1.0	5	№1-5
170260	生物科学与工程综合实验 Integrated Experiment of Biological Science and Engineering	必 C	1 周		1.0	5	№1-4,9-11
170222	现代生物分析仪器原理与实验 Principles and Experiments of Modern Bioanalytic Instruments	必 C	1 周		1.0	6	№1-6
170211	发酵工程与设备实验 Fermentation Engineering and Equipment Experiment	必 C	2 周		2.0	6	№1-5
147076	化工原理课程设计 Course Design for Chemical Engineering Principle	必 C	2 周		2.0	6	№3
170086	毕业实习 Graduation practice	必 C	4 周		4.0	7	№1-12
170087	毕业设计(论文) Graduation Project (Thesis)	必 C	15 周		15.0	8	№1-6,8-10,12
合计 Total		必 C	42 周		42.0		
		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.