

化学工程与工艺

Chemical Engineering and Technology

专业代码：081301

学 制：4 年

Program Code: 081301

Duration: 4 years

培养目标：

培养立足华南，面向全国，培养适应社会、经济、科技发展需要，具备化学工程与工艺方面的专业知识，能在化工、冶金、能源、材料、轻工、医药、食品、环保和军事部门从事工程设计、技术开发、工厂操作与管理、科学研究、产品营销等方面工作的工程技术人才。

Educational Objectives:

The Specialty foster modern high-level chemical talents, who adapt the social development in the twenty-first century, meet the demands of national modernization, with high moral character, generous knowledge base, highlight potential, excellent overall quality, broaden international perspective and innovative spirit and competition sense.

毕业要求：

№1. 工程知识：能够将数学、自然科学、工程基础和专业知用于解决复杂化工工程问题。

№2. 问题分析：能够应用数学、自然科学和工程科学的基本原理，识别、表达、并通过文献研究分析复杂化工工程问题，以获得有效结论。

№3. 设计/开发解决方案：能够设计针对复杂化工工程问题的解决方案，设计满足特定需求的系统、单元（部件）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：能够基于科学原理并采用科学方法对复杂化工工程问题进行研究，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：能够针对复杂化工工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对复杂化工工程问题的预测与模拟，并能够理解其局限性。

№6. 工程与社会：能够基于工程相关背景知识进行合理分析，评价专业工程实践和复杂化工工程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化工工程问题的专业工程实践对环境、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：能够就复杂化工工程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 apply knowledge of mathematics, science, engineering fundamentals and engineering specialization to the solution of complex chemical engineering problems.

№2.Problem Analysis: An ability to identify, formulate and analyze complex chemical engineering problems, reaching to substantiated conclusions using basic principles of mathematics, science, and engineering.

№3.Design / Development Solutions: An ability to design solutions for complex chemical engineering 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 chemical engineering 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, including prediction and modeling, to complex chemical engineering activities, with an understanding of the limitations.

№6.Engineering 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 engineering practice.

№7.Environment and Sustainable Development: An ability to understand and evaluate the impact of professional engineering 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 chemical engineering 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:

化学工程与工艺专业渊源于 1931 年的中山大学化工专业，办学历史悠久，是国家级特色专业、教育部“卓越工程师教育培养计划”专业和广东省名牌专业。该专业所依托的化学工程与技术学科拥有一级学科博士授予权，化学工程学科为全国重点学科，并设有“化学工程与技术”博士后流动站。本专业以化学工程与化学工艺为知识结构的两大支撑点，并将两者有机的结合在一起。化学工程主要研究化工过程工程及设备的开发、设计、优化和管理，依托我校化学工程等领域的学科优势，解决过程工业的共性问题。化学工艺则研究通过过程工程技术制取各种化工产品。这些工程技术不仅涉及化工领域，也涉及医药，材料，食品，生物工程等众多相关领域。本专业培养的学生具有较强的工程设计能力和工作能力。

Program Profile:

Chemical Engineering and Technology was formerly originated from the chemical engineering and technology specialty of Sun Yat-sen University, which was first founded in 1931. Chemical Engineering and Technology has been rank in national level as feature major and “Excellence engineers education program” of Education Ministry, and also named as well-known brand specialties of Guangdong Province. At present, Chemical Engineering and Technology has 78 full-time faculty members and staff, including 28 professors and 29 associate professors.

The Chemical Engineering and Technology has two major features. Firstly, the specialty has wide coverage. Secondly, the engineering features are significant, and the migration of knowledge is strong. Chemical Engineering, supported by the advantages in chemical engineering fields of our university, majorly focuses on chemical process and process equipments’ development, design, optimization and management, and to solve the common problems in process industry. Chemical Technology studies the process technologies to produce all kinds of chemical products. These process technologies include chemical engineering field, and pharmacy, materials, food and biochemical engineering fields. So the students, graduated from Chemical Engineering and Technology, have good service and engineering design ability in chemical engineering.

专业特色:

厚基础、宽口径和突出工程意识培养是专业特色。知识领域覆盖面广，涉及有机化工、无机化工、精细化工、材料化工、能源化工和生物化工等。以化学工程与化学工艺为两大支撑点，突出工程意识培养，知识的可迁移性强。

Speciality Features:

The speciality has two major features. Firstly, the speciality has wide coverage. Secondly, the engineering features are significant, and the migration of knowledge is strong. Research fields relate to organic chemicals, inorganic chemicals, fine chemicals, household chemicals, materials chemicals, energy chemicals, biology chemicals, microelectronics chemicals, etc. The Speciality acts chemical engineering and chemical technology as the two supporting points of the knowledge structure, and combine both sweetly.

授予学位：工学学士学位

Degree Conferred: Bachelor of Engineering

主干课程：

物理化学、流体力学与传热、传质与分离工程、化学反应工程、化工热力学、化学工艺学、化工设计、化工设备设计基础、现代分离技术、化工安全与环保。

Core Courses:

Physical Chemistry, Fluid Mechanics and Heat Transfer, Mass Transfer and separation process, Chemical Reaction Engineering, Chemical Thermodynamics, Chemical Technology, Chemical Engineering Design, Chemical Equipment Design Basis, Modern separation techniques, Chemical Process Safety and Environment.

特色课程：

全英语教学课程：世界名企讲座

双语教学课程：流体力学与传热、传质与分离工程、能源工程、生物化学

研究型课程：化工热力学、化学反应工程

研讨类课程：化工设计导论、世界名企讲座

专题设计课：化工设计实训

创业教育课程：工程设计、产业模式与创业

Featured Courses:

Courses Taught in English: Lecture of World Famous Enterprises

Bilingual Courses: Fluid Mechanics and Heat Transfer, Mass Transfer and Separation Process, Energy Engineering, Biochemistry

Research Courses: Chemical Thermodynamics, Chemical Reaction Engineering

Freshmen Seminars: Introduction to Chemical Engineering Design, Lecture of World Famous Enterprises (English)

Special Designs: Chemical Engineering Design Training, Simulation Training

Contest-Teaching Integrated Courses:

Innovation Practice:

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 论 教 学	考 试	入 学 教 育	军 训	课 程 设 计	大 作 业	工 程 训 练	电 子 实 习	综 合 实 验	社 会 实 践	生 产 实 习	毕 业 实 习	其 它 合 作 项 目	中 外 合 作 项 目	毕 业 设 计	就 业 安 排	机 动	假 期	小 计	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19																				20
		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	A	B	B	B	18	2													20					
二	3	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	18	2													20						
	4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	G	G	16	2			2									20						
三	5	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	E	E	E	H	14	2		3		1								20						
	6	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	I	I	16	2					2								20						
四	7	K	K	K	A	A	A	A	A	A	A	B	B	G	G	G	A	A	A	12	2						3						20							
	8	L	L	G	G	O	O	O	O	O	O	O	O	O	O	O	O	O	O	P							2				2		15	1	20					
合 计 (周)																			108	13	1	3	3		7	1	2		3	2			15	1				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	57.0	876	
	通识 General Education	10.0	160	
学科基础课 Disciplinary Basic Courses	必修 Compulsory	49.0	920	
	选修 Elective	0.0	0	
专业领域课 Specialty-related Courses	必修 Compulsory	6.0	96	
	选修 Elective	15.0	240	
合 计 Total		137.0	2292	
集中实践教学环节 (周) Practice Training (Weeks)	必修 Compulsory	39.0	39 周	
毕业学分要求 Credits Required for Graduation	137.0+39.0=176.0			

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
2292	1892	400	1812	480	176	151	25	39	122	15	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-ai ded 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	1	№8	
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	2	№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	3	№8	
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	4	№8	
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	1-8	№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	
	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	
	141001	大学物理 I (一) General Physics (1)		48				3.0	2	№1	
	141007	大学物理实验 (一) Physics Experiment (1)		32		32		1.0	2	№1	
	141002	大学物理 I (二) General Physics (2)		48				3.0	3	№1	
	141008	大学物理实验 (二) Physics Experiment (2)		32		32		1.0	3	№1	
	130139	工程制图 (一) Engineering Drawing (1)		48				3.0	1	№3	
	130140	工程制图 (二) Engineering Drawing (2)		32				2.0	2	№3	
				人文科学领域 Humanities	通识 课 E	96				6.0	
			社会科学领域 Social Science		64				4.0		№8
			合计 Total		1036		64	128	67.0		

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 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice			
学科基础课 Disciplinary Basic Courses	147002	无机化学 II Inorganic Chemistry	必 C	40				2.5	1	No1
	147034	无机化学实验（工科）（一） Experiment of Inorganic Chemistry(1)	必 C	16		16		0.5	1	No1
	147035	无机化学实验（工科）（二） Experiment of Inorganic Chemistry(2)	必 C	16		16		0.5	2	No1
	147021	有机化学 II Organic Chemistry	必 C	64				4.0	2	No1
	147016	有机化学实验 II Organic Chemistry Experiments	必 C	48		48		1.5	3	No1
	147009	分析化学 II Analytical Chemistry	必 C	40				2.5	3	No1
	147013	分析化学实验 II Analytical Chemistry Experiment	必 C	32		32		1.0	3	No1
	147059	物理化学 II Physical Chemistry	必 C	64				4.0	3	No1
	169011	物理化学实验IV Physical Chemistry Experiment	必 C	40		40		1.0	4	No1
	137094	生物化学（双语） Biochemistry	必 C	48		8		3.0	4	No1
	135092	电工与电子技术 II Electrical Engineering and Electrontechnics	必 C	64				4.0	4	No1
	137066	流体力学与传热IV Fluid Mechanics and Heat Transfer	必 C	64				4.0	3	No1
	137063	化工原理实验（一） Experiment of Chemical Engineering Principles(1)	必 C	16	4	12		0.5	3	No1
	135081	电工与电子技术实验 Experiment of Electrical Engineering and Electrontechnics	必 C	24		24		1.0	5	No1
	137029	化工设备设计基础 Basic Design of Chemical Equipment	必 C	32				2.0	5	No3,6
	137065	传质与分离工程III Mass Transfer and Separation Process	必 C	48				3.0	4	No1
	137064	化工原理实验（二） Experiment of Chemical Engineering Principles(2)	必 C	16	4	12		0.5	4	No1
	137058	化学反应工程 Chemical Reaction Engineering	必 C	48				3.0	5	No1
	137028	化工热力学 Chemical Thermodynamics	必 C	48				3.0	5	No1

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-ai ded Class Hours	实验 Lab Hours	实践 Practice			
	137030	化工设计 Chemical Engineering Design	必 C	40				2.5	7	№3,6
	137041	微机化工应用 Personal Computer Application in Chemical engineering	必 C	48	8			3.0	5	№3,5
	137033	化工专业实验 Experiment of Chemical Engineering	必 C	64		64		2.0	6	№8
	合 计 Total		必 C	920	16	272		49.0		
			选 E	选修课修读最低要求 学分 minimum elective course credits required:						
专业领域课 Specialty-related Courses	137042	现代分离技术 Modern Separation Technology	必 C	32				2.0	6	№1
	137034	化学工艺学 Chemical Technology	必 C	32				2.0	6	№1,2
	137129	化工安全与环保 Chemical Engineering Safety and Environment	必 C	32				2.0	7	№3,6,7,8
	137126	化工设计导论 Introduction to Chemical Engineering Design	选 E	16				1.0	2	№3,6
	137045	学科前沿讲座 Chemical Engineering Progress	选 E	16				1.0	4	№1
	137087	现代化物流技术 Modern Chemical Logistics Technology	选 E	32				2.0	7	№1
	137043	现代化工商务 Modern Chemicals Commerce	选 E	32				2.0	7	№1
	137128	工程设计、产业模式与创业 Introduction to engineering design, industrial model and entrepreneurship	选 E	16				1.0	4	№3,9,10
	137026	化工技术经济学 Chemical Industry Technical Economy	选 E	32				2.0	6	№6
	147060	生化工程基础 Foundation of Biochemistry Engineering	选 E	32				2.0	4	№8
	137073	纳米科学与技术导论 Introduction of Nanometer Science and Technology	选 E	32				2.0	6	№1
	137120	世界名企讲座 Lecture of World Famous Enterprises (English)	选 E	16				1.0	4	№1
	137039	能源化学工程 Energy Engineering	选 E	32				2.0	4	№3,6

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-ai ded Class Hours	实验 Lab Hours	实践 Practice			
	137023	化工过程分析与合成 Chemical Process Analysis and Synthesis	选 E	32				2.0	6	№2,3,5
	137035	精细化学工艺学 Fine Chemicals Technology	选 E	32				2.0	6	№1,2,4
	137024	化工过程控制原理与仪表 Chemical Process Control Principle and Instrument	选 E	32				2.0	5	№1,5
	137044	新材料科学导论 Introduction of New Materials Science	选 E	32				2.0	7	№1
	137022	工业催化 Industrial Catalysis	选 E	32				2.0	5	№1,2,4
	137027	化工企业管理 Management of the chemical enterprise	选 E	32				2.0	7	№11
	137098	化工过程模拟软件及其应用 Chemical Process Simulation Software and Its Application	选 E	32	10			2.0	6	№2,3,5
	137101	石油加工 Petroleum Processing	选 E	48				3.0	6	№1,2,4
	137133	生物质资源与能源 Biomass resources and bio-energy	选 E	32				2.0	6	№1,2,4
	137095	高效换热器原理与设计 High-efficiency Heat Exchanger: Principle and Design	选 E	32				2.0	5	№1,2,4
	137099	能源材料 Energy Materials	选 E	32				2.0	7	№1,2,4
	147063	胶体与界面化学 Colloid and Interface Chemistry	选 E	32				2.0	6	№1,3,4
	120003	创新研究训练 Train on creativity	选 E	32				2.0		№2,3,4
	120004	创新研究实践 I Practice on creative I	选 E	32				2.0		№2,3,4
	120005	创新研究实践 II Practice on creative II	选 E	32				2.0		№2,3,4
	120006	创业实践 Practice on Entrepreneurship	选 E	32				2.0		№2,3,4
	合计 Total		必 C	96				6.0		
			选 E	选修课修读最低要求 15.0 学分 minimum elective course credits required:15						

备注：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为一定的专业选修课学分（创新研究训练、创新研究实践 I、创新研究实践 II、创业实践等创新创

业课程)。每个学生累计申请为专业选修课总学分不超过 4 个学分。经学校批准认定为选修课学分的项目、竞赛等不再获得对应第二课堂的创新学分。

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	№8
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	№9
130356	工程训练 I Engineering Training I	必 C	2 周		2.0	4	№6
137137	化工课程设计 Chemical Engineering (course) Design	必 C	3 周		3.0	4	№3
141075	电子工艺实习 I Electrical Engineering Training	必 C	1 周		1.0	5	№3
137057	化学工程与工艺综合性实验 Composite Experiment of Chemical Engineering	必 C	2 周		2.0	6	№8
137053	生产实习 Industrial Practice	必 C	3 周		3.0	7	№8
137056	文献检索与实践 Literature Retrieval and Survey	必 C	1 周		1.0	7	№2,5
137136	化工设计实训 Chemical Engineering Design Training	必 C	3+2 周		5.0	7 和 8	№3,8
137075	毕业实习 Practice on Diploma Project	必 C	2 周	8	2.0	8	№8
137149	毕业设计(论文) Graduation Project (Thesis)	必 C	15 周		15.0	8	№3,4
合计 Total		必 C	39 周	8	39.0		

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.