

应用化学

专业代码： 070302

学 制： 4 年

培养目标：

瞄准适应社会发展和满足国家现代化建设的需求，本专业培养具有健全人格、高尚道德品质和社会责任感，具备扎实化学基础理论知识和技能，系统掌握化学及相关领域的专业知识，具有思想力、学习力、行动力核心素养、家国情怀、国际化视野以及遵循学术与科技伦理的“三创型”（创新、创造、创业）应用化学精英人才。毕业生能在应用化学及相关领域/行业（化学、化工、能源、材料、医药和环境）胜任科学研究、技术开发、生产与管理和产品营销管理等方面工作或进一步深造，毕业五年左右成为应用化学及相关领域的技术骨干或优秀的管理人员。

具体目标如下：

- （1）瞄准化学学科发展前沿和面向国家经济和粤港澳大湾区建设需求，培养遵循学术与科技伦理和具有家国情怀、全球视野与“三力（思想力、学习力、行动力）”核心素养的化学人才。
- （2）培养具有厚实的基础知识和化学专业知识的“三创型”（创新、创造、创业）人才。
- （3）毕业生能在应用化学及相关领域/行业（化学、化工、能源、材料、医药和环境）胜任科学研究、技术开发、生产与管理和产品营销管理等方面工作或进一步深造。
- （4）毕业五年左右成为应用化学及相关领域的技术骨干或优秀的管理人员，或进一步深造。

毕业要求：

№1.基础知识：掌握化学基础知识、基本理论和实验技能，掌握一定的化学工程技术知识。

№1.1 掌握化学学科的基础知识和基本理论。

№1.2 掌握一定的化学工程技术，理解化学工程本质。

№1.3 掌握化学实验方法和技能，并能应用于化学相关工程领域。

№2.工程知识：能够将数学、物理、化学、化学工程基础和专业知用于解决研究成果转化。

№2.1 能够掌握并运用数学、物理科学的基本概念和知识解释和表述化学相关的工程问题。

№2.2 能够掌握并运用化学的基本概念和知识解释和表述化学相关的工程问题。

№2.3 能够掌握并运用化学工程基础和专业知解决研究成果转化。

№3.分析解决问题：能够应用化学和化学工程的基本原理和实验技能，并通过文献调研，解决应用研究、技术开发、科技管理和一般生产技术方面遇到的问题。

№3.1 能够根据化学及相关工程问题的对象特点，基于科学原理、采用科学方法，并通过文献调研分析，制定化学及相关工程的研究内容，设计实验路线，提出解决方案，体现创新意识。

№3.2 能够应用化学和化学工程的基本原理，并通过调研分析，制定满足特定需求的全周期、全流程的技术开发方案，考虑社会、健康、安全、法律、文化以及环境等因素的影响。

№4.研究：掌握化学或化工设计、开发、检验和生产等的基本方法和手段，具备发现、提出、分析和解决化学、化工及相关学科问题的能力。

№4.1 掌握基本的实验技能及分析测试方法，能够基于科学原理并采用科学方法选用或搭建基本实验装置，安全、合理、有效地开展实验。

№4.2 能够基于科学原理并采用科学方法对来自科学研究的实验数据进行归纳、分析和解释，通过信息综合得到合理有效的结论。

№5. 工具的使用：能够针对复杂化学及相关工程（科学和工程问题）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，包括对复杂科学和工程问题的预测与模拟，并能够理解其局限性。

№5.1 能够针对化学及相关工程问题，开发、选择或使用恰当的网络信息资源和信息技术工具，获取相关信息，并能理解其局限性。

№5.2 能够使用化学计算和化工模拟软件与现代工程工具，对复杂化学及相关工程问题进行表达、分析、预测与模拟，并能理解其局限性。

№6.科学技术与社会：能够基于化学及相关（科学和工程问题）背景知识进行合理分析，评价专业工程实践和复杂化学及相关工程（科学和工程问题）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。

№6.1 了解化学和化工生产、设计、研究与开发等方面的技术标准、知识产权、法律法规和企业 HSE 管理体系。

№6.2 能识别、量化和评价专业工程实践和复杂化学及相关工程问题解决方案对社会、健康、安全、法律、文化的影响，以及相关科研人员和技术工作者对社会应承担的责任。

№7.环境和可持续发展：能够理解和评价针对复杂化学及相关工程（科学和工程问题）问题的专业工程实践对环境、社会可持续发展的影响。

№7.1 能正确理解化学及相关工程技术对经济、环境及社会可持续发展的影响，并提出改进措施。

№8.职业规范：具有人文社会科学素养、社会责任感，能够在化学及相关工程（科学和工程问题）实践中理解并遵守职业道德和规范，履行责任。

№8.1 树立正确的人生观、世界观、价值观，具备良好的思想道德修养、人文社会科学素养以及民族复兴和社会进步的责任感。

№8.2 理解化学及相关工程的职业性质与社会责任，能够在实践中自觉遵守法律法规和职业道德规范。

№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。

№9.1 能够在多学科背景团队中理解个人与团队的关系，明晰个人职责，完成团队分配的任务。

№9.2 能够作为团队成员与其他团队或个体进行高效交流沟通和展示。

№9.3 能够组织团队、协调多学科背景团队成员意见，并与团队成员有效地开展工作。

№10.沟通交流：能够就复杂化学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。

№10.1 能够通过文字形式就复杂化学问题与业界同行及社会公众进行表达和有效沟通，能够规范撰写化学专业研究报告和设计文稿。

№10.2 能够通过语言形式就复杂化学问题与业界同行及社会公众进行有效地沟通和交流，能够在跨文化背景下使用英语进行有效沟通和交流，包括陈述发言、清晰表达和回应指令。

№11.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。

№11.1 了解化学和化学工程前沿技术和发展趋势，能认识不断探索和学习的必要性，具有自主学习和终身学习的意识。

№11.2 具有强健的体魄，能自主持续学习和适应发展的素质与能力。

专业简介：

应用化学专业创办于 1981 年，历史悠久。该专业 2005 和 2019 年分别获批广东省名牌专业和国家级一流本科专业建设点。本专业培养具有扎实的知识基础、良好的综合素质、竞争意识和具有思想力、学习力、行动力核心素养、以及家国情怀和国际化视野以及遵循学术与科技伦理的“三创型”（创新、创造、创业）应用化学精英人才。本专业毕业的学生就业率高，可在新能源、精细化工、新材料、环保和医药相关的企事业单位和行政部门从事技术开发、生产和管理工作，还可以到相关单位从事科学研究和教学工作，也可以选择在国内外高校继续深造，攻读硕士和博士学位。目前，应用化学专业已经跟英国的爱丁堡大学、美国罗格斯大学和加拿大西安大略大学签订了联合培养协议，为本专业学生的继续深造创造了很好的条件。

应用化学专业充分利用丰硕的科研成果，依托“化学（国家一流学科）”和“化学工程（国家重点学科）”2个一级学科，采用理工结合、教学与科研相结合的人才培养模式。该专业所拥有博士点博士后流动站，师资力量雄厚，现有教师70多人，其中正高级职称45人，博士生导师40名（其中国家杰出青年科学基金获得者3人、国家四青计划人才10名、南粤优秀教师2人），拥有省级实验教学示范中心和一大批先进专业仪器。

专业特色：

本专业依托学校和学院工科平台优势，在理工结合、重视实践的培养模式下发挥理科优势。强调化学理论知识和实验技能培养，重视科学伦理、安全观念教育和创新能力塑造。毕业生能很好地适应交叉学科方向，读研深造与就业选择范围广且很受欢迎。

授予学位：理学学士学位

核心课程：无机化学、现代无机化学、化学分析、有机化学、仪器分析、物理化学、结构化学、电化学储能技术、流体力学与传热、传质与分离工程、仪器分析实验、综合化学实验

特色课程：

化类新生研讨课：现代化学功能材料研讨、改变世界的分子、生物质化妆品新材料、走进神奇的药物世界、化学工程导论

学科前沿课：学科前沿讲座、功能分子材料前沿

科教融合课：未来化工产品技术，分子合成与功能

校企合作课：产业模式与创业

本研贯通课：电化学储能技术、胶体与界面化学

创业教育课：化妆品设计、制备及产业化（“三个一”课程）

劳动教育课：生产实习

一、各类课程学分登记表

1. 学分统计表

课程类别	课程要求			学分		学时		备注
公共基础课	必修			55.0		1068		
	通识			10.0		160		
专业基础课	必修			52.0		1072		
选修课	选修			17.0		272		
合 计				134.0		2572		
集中实践教学环节	必修			31.0		38 周		
	选修					周		
毕业学分要求	134.0 + 31.0 = 165.0							
建议每学期修读学分	1	2	3	4	5	6	7	8
	22.5	25.5	26.5	23	23.5	23	11	10

备注：学生毕业时须修满专业教学计划规定学分，并取得第二课堂 5 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

学时					学分						
总学时数	其中		其中		总学分数	其中		其中			其中
	必修学时	选修学时	理论教学学时	实验教学学时		必修学分	选修学分	集中实践教学环节学分	理论教学学分	实验教学学分	创新创业教育学分
2732	2300	432	1958	774	165	138	27	31	117.5	16.5	4

注：1. 通识课计入选修一项中；

2. 实验教学包括“专业教学计划表”中的实验、实习和其它；

3. 创新创业教育学分：培养计划中的课程，由各院系教学指导委员会认定，包括竞教结合课程、创新实践课程、创业教育课程等学分；

4. 必修学时+选修学时=总学时数；理论教学学时+实验教学学时=总学时数；必修学分+选修学分=总学分数；集中实践教学环节学分+理论教学学分+实验教学学分=总学分数。

二、课程设置表

类别	课 程 代 码	课 程 名 称		是否必修	学 时 数					学分数	开课 学期	
					总学时	理论	实验	实习	其它			
公 共 基 础 课	031101661	思想道德与法治		必修 课	40	36			4	2.5	1	
	031101761	习近平新时代中国特色社会主义思想概论			48	36			12	3.0	2	
	031101371	中国近现代史纲要			40	36			4	2.5	4	
	031101424	毛泽东思想和中国特色社会主义理论体系概论			40	36			4	2.5	3	
	031101522	马克思主义基本原理			40	36			4	2.5	3	
	031101331	形势与政策			64	64				2.0	1-8	
	044101382	学术英语（一）	英语 A 班修读		48	48				3.0	1	
	044102453	学术英语（二）			48	48				3.0	2	
	044103681	大学英语（一）	英语 B、C 班修读		48	48				3.0	1	
	044103691	大学英语（二）			48	48				3.0	2	
	045101644	大学计算机基础			32				32	0	1	
	052100332	体育（一）			36				36	1.0	1	
	052100012	体育（二）			36				36	1.0	2	
	052100842	体育（三）			36				36	1.0	3	
	052100062	体育（四）			36				36	1.0	4	
	006100112	军事理论			36	18			18	2.0	2	
	045102811	Python 语言程序设计			40	32			8	2.0	1	
	040100591	微积分 I（一）			80	80				5.0	1	
	040100662	微积分 I（二）			64	64				4.0	2	
	040100401	线性代数与解析几何			48	48				3.0	1	
	040100023	概率论与数理统计			48	48				3.0	2	
	041100582	大学物理 I（一）			48	48				3.0	2	
	041101391	大学物理 I（二）			48	48				3.0	3	
	041100671	大学物理实验（一）			32		32			1.0	3	
	041101051	大学物理实验（二）			32		32			1.0	4	
	074102992	工程制图			48	48				3.0	2	
			人文科学、社会科学领域		通识 课	128	128			8.0		
			科学技术领域			32	32			2.0		
			合 计			1228	934	64		230	65.0	

备注：学时中其它可以为上机和实践学时。

二、课程设置表（续）

类别	课 程 代 码	课 程 名 称	是否必修	学 时 数					学分数	开课学期
				总学时	理论	实验	实习	其它		
专业基础课	037102732	无机化学	必	40	40				2.5	1
	047101111	现代无机化学	必	40	40				2.5	3
	047101161	无机化学实验（一）	必	16		16			0.5	1
	047101201	无机化学实验（二）	必	16		16			0.5	2
	047101181	现代无机化学实验	必	64		64			2.0	3
	037102631	化学分析	必	32	32				2.0	3
	037102511	化学分析实验	必	48		48			1.5	3
	037102551	有机化学Ⅲ（一）	必	40	40				2.5	3
	037102561	有机化学Ⅲ（二）	必	40	40				2.5	4
	037102092	有机化学实验Ⅲ（一）	必	32		32			1.0	3
	037102191	有机化学实验Ⅲ（二）	必	64		64			2.0	4
	037101982	仪器分析	必	56	56				3.5	4
	037102431	仪器分析实验	必	48		48			1.5	4
	047101761	生物化学	必	32	32				2.0	4
	037101521	物理化学Ⅲ（一）	必	48	48				3.0	4
	037102592	物理化学Ⅲ（二）	必	40	40				2.5	5
	037102261	物理化学实验Ⅲ（一）	必	32		32			1.0	5
	047101093	物理化学实验Ⅲ（二）	必	48		48			1.5	6
	037100073	流体力学与传热Ⅲ	必	56	56				3.5	5
	037100271	传质与分离工程Ⅲ	必	48	48				3.0	6
	047101721	流体力学与传热实验	必	16		16			0.5	5
	047101731	传质与分离工程实验	必	16		16			0.5	6
	047101132	电化学储能技术	必	48	48				3.0	6
	037101551	结构化学	必	72	56			16	4.0	5
	047101211	综合化学实验	必	64		64			2.0	6

	047101771	化学实验安全教育	必	16	16				1.0	1
	合 计		必	1072	592	464		16	52.0	
选修课	能源/材料类课程									
	017101881	电催化与氢电转换技术	选	32	32				2.0	6
	037101071	能源化学工程	选	32	32				2.0	6
	037102491	高分子材料概论	选	32	32				2.0	6
	037102471	胶体与界面化学	选	32	32				2.0	6
	047101451	功能分子材料前沿	选	32	32				2.0	6
	化学/生物/环境类课程									
	037102911	重要人名反应在天然药物分子中的合成应用	选	32	32				2.0	5
	037102451	高等有机化学	选	32	32				2.0	6
	047101891	传感器研究导论	选	32	32				2	5
	037101761	生物有机化学	选	48	32				3.0	6
	037102351	生物化学分析	选	48	48				2.5	6
	037100681	生化工程基础	选	32	32				2.0	5
	047101901	化工环保与治理	选	32	32				2.0	5
	现代测试方法/人工智能类课程									
	037102151	谱图综合解析	选	48	48				3.0	5
	037102461	商品理化检验	选	32	32				2.0	5
	047101221	商品理化分析实验	选	32	32				1.0	6
	037100152	计算机辅助设计	选	40	40			16	2.5	4
	化工和精细化学品类课程									
	047101821	化学工程导论	选	32	32				2	2
	037100471	化工过程安全	选	32	32				2.0	7
	037101121	工业催化	选	32	32				2.0	5
	037102201	精细化学品概论	选	48	48				3.0	5
	037102441	精细化学品制备实验	选	48		48			1.5	5
	学科前沿和研讨课程									

	047100612	学科前沿讲座	选	32	32				2.0	2
	037102832	走进神奇的药物世界	选	32	32				2.0	2
	037100291	现代化学功能材料研讨	选	32	32				2.0	2
	047101172	改变世界的分子	选	32	32				2.0	2
	047101931	生物质化妆品新材料	选	16	16				1.0	2
	047101961	分子合成与功能	选	32	24	8			2.0	6
创新创业相关课程										
	047101231	化妆品设计、制备及产业化	选	32	8	24			2.0	7
	020100051	创新研究训练	选	32				32	2.0	7
	020100041	创新研究实践 I	选	32				32	2.0	7
	020100031	创新研究实践 II	选	32				32	2.0	7
	020100061	创业实践	选	32				32	2.0	7
	合 计		选	选修课修读最低要求 17 学分，创新课程 4.0 学分						

备注：建议本专业学生修读《小白学人工智能之机器学习》通识课。

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。

三、集中实践教学环节

课 程 代 码	课 程 名 称	是否必修	学 时 数		学分数	开课学期
			实践	授课		
006100151	军事技能	必	2 周		2.0	1
037100081	文献检索与实践	必	1 周		1.0	2
031101551	马克思主义理论与实践	必	2 周		2.0	3
047101301	认识实习	必	1 周		1.0	3-6
047101281	无机化学实验课程设计	必	2 周		2.0	3
047101291	化学分析实验课程设计	必	2 周		2.0	4
030100702	工程训练 I	必	2 周		2.0	4
047101321	有机化学实验课程设计	必	2 周		2.0	5
047101431	物理化学实验课程设计	必	2 周		2.0	6
037100311	生产实习	必	3 周		3.0	7
037101301	仿真实习	必	2 周		2.0	7
037100973	毕业设计（论文）	必	17 周		10.0	7-8
合 计		必	38 周		31.0	

四、课程体系与毕业要求关系矩阵

[illegible]

[illegible]

[illegible]

75	走进神奇的药物世界						●									●									●	
76	现代化学功能材料研讨						●									●									●	
77	改变世界的分子						●									●									●	
78	生物质化妆品新材料						●									●									●	
79	分子合成与功能	●			●																				●	●
80	化妆品设计、制备及产业化						●								●	●			●							
81	创新研究训练						●		●		●															
82	创新研究实践 I						●		●		●															
83	创新研究实践 II						●		●		●															
84	创业实践						●		●		●															
85	军事技能																		●							
86	文献检索与实践						●					●													●	
87	马克思主义理论与实践															●										
88	认识实习													●				●	●		●	●				
89	无机化学实验课程设计							●			●	●														
90	化学分析实验课程设计							●			●	●														
91	工程训练 I													●												
92	有机化学实验课程设计							●			●	●														
93	物理化学实验课程设计							●			●	●														
94	生产实习								●	●								●	●	●	●	●			●	
95	仿真实习												●					●								
96	毕业设计（论文）							●			●	●						●	●	●	●				●	

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。

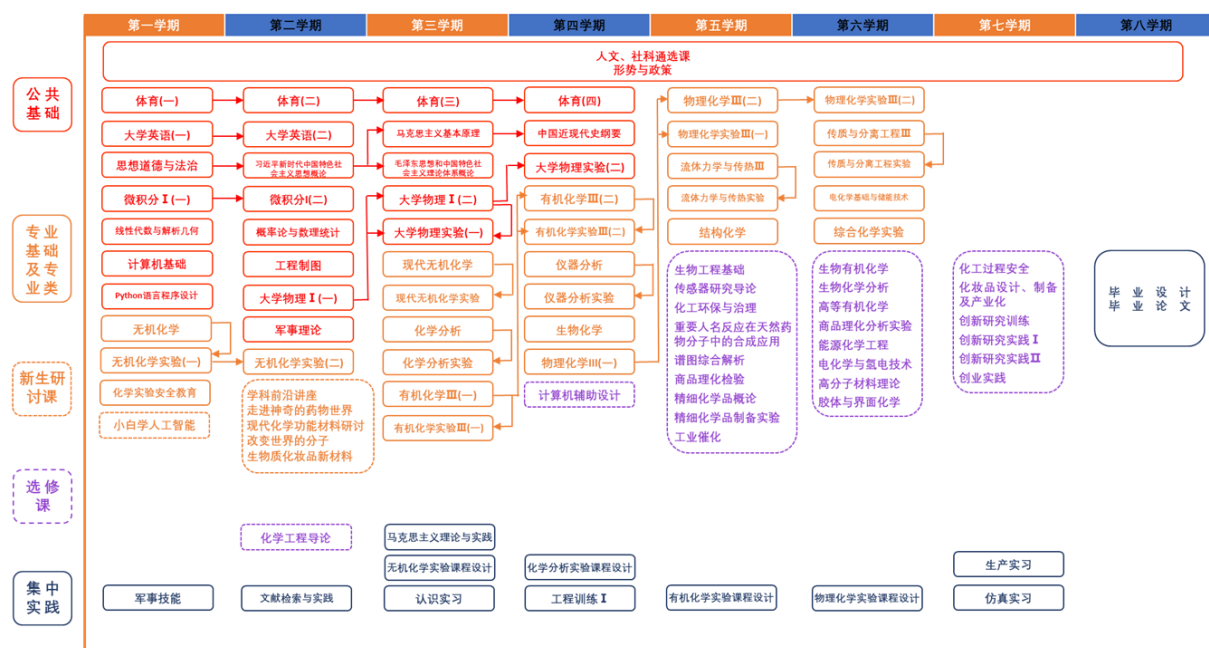
1.人文素质教育基本要求

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 5 个学分。其中，大学体育教学团队开设课外体育课程，高年级本科生必修，72 学时，1 学分，纳入第二课堂人文素质教育学分。大学生心理健康教育，2 学分，虚拟第三学期开设，纳入第二课堂人文素质教育学分。

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、广东省创新创业训练计划、SRP（学生研究计划）、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。

课程拓扑图



英文版

Applied Chemistry

Program Code: 070302 Duration: Four years

Educational Objectives:

Overview of educational objectives

The education objects of Applied Chemistry are aimed at social development to satisfy the demands of our country, and the undergraduate students will own a healthy personality, excellent morality with good social responsibility. They will learn the fundamental chemical theories and skills, systematically master the chemistry-related knowledge, and possess three key capabilities of initiative thinking, deep learning as well as affirmative action. Moreover, the undergraduate students will be educated to obey academic and scientific ethics with the cultivation of international vision, family, and country feelings. The undergraduates will have the ability to do scientific research, develop new technologies, produce new products, and manage companies, and some of them may continue their graduate studies, and they will become applied chemistry-related specialists and good managers after graduation for five years.

The detailed objectives are as followings:

- (1) Aiming at the frontier of chemistry subject and the construction demands of the Greater Bay Area, they will become chemistry-related specialists possessing three key capabilities of initiative thinking, deep learning, and affirmative action.
- (2) They will learn fundamental science and chemistry-related knowledge with the abilities of innovation, creation, and entrepreneurship.
- (3) The undergraduates will have the ability to do scientific research, develop new technologies, produce new products, and manage companies, and some of them may continue their graduate studies.
- (4) They will become applied chemistry-related specialists and good managers five years after graduation.

Student Outcomes:

№1. Fundamental knowledge: Master the chemistry-related basic knowledge, basic theories, and experimental skills as well as some chemical engineering technologies.

№1.1. Master the chemistry-related basic knowledge and theories.

№1.2. Learn some basic chemical engineering skills and understand the original principles of chemical Engineering.

№1.3. Master the methods and skills of chemistry experiments and apply these skills in chemical engineering-related fields.

№2. Engineering knowledge: Be able to apply mathematics, physics, chemistry, and chemical engineering knowledge for the commercialization of scientific and research findings.

№2.1. Be able to utilize mathematical and physical concepts and knowledge to explain and define chemistry-related engineering problems.

№2.2 Be able to utilize chemical concepts and knowledge to explain and define chemistry-related engineering problems.

№2.3 Be able to apply chemical engineering knowledge for the commercialization of scientific and research findings.

№3. Analyzing and solving the problems: Be able to apply chemical and chemical engineering principles and experimental skills to solve the problems in the practical study, development of new technologies, and scientific management through bibliographic retrieval.

№3.1. According to the features of chemistry and the relevant engineering problems, able to plan chemistry-related engineering research, design the experimental scheme, find the solution to problems, and innovative ideas based on scientific principles, methods, and bibliographic retrieval.

№3.2 Be able to apply chemical and chemical engineering principles to satisfy the whole-term, whole-process technological scheme through bibliographic retrieval, considering the effects of society, healthy, safety, law, culture, and environment.

№4. Research: Master the basic methods and means of chemistry, or the design, development, determination, and production of chemical engineering, able to find, analyze and solve chemistry and chemical engineering-related problems.

№4.1. Master the basic experimental skills and the characterization methods, able to select or set up the basic experimental apparatus, and safely, and effectively conduct the experiments.

№4.2. Be able to summarize, analyze and explain the collected data according to the basic scientific principle, and eventually draw effective and reasonable conclusions.

№5. Application of new tools: Be able to develop, choose and apply the correct techniques, resources, modern engineering, and informational tools to satisfy complicated chemistry or chemical engineering-related problems, including the prediction and simulation, understanding their limitations.

№5.1 Aiming at the chemistry or chemical engineering-related problems, develop, choose, and apply the correct internet information and techniques to collect the relevant information,

understanding their limitations.

№5.2. Be able to apply chemical calculation, chemical simulation software, and modern engineering tools to express, analyze, predict, or simulate complicated chemistry or chemical engineering-related problems, understanding their limitations.

№6. Scientific technology and society: Be able to analyze and evaluate the effect of chemistry or chemical engineering-related solutions on society, healthy, safety, law, and culture, understanding the corresponding responsibilities.

№6.1. Understand the chemistry and chemical engineering-related technological standards, intellectual property, law, and HSE management system during the chemistry and chemical engineering-related production, design, research, and development.

№6.2. Be able to identify, quantify and evaluate the effects of solutions on society, health, safety, and culture, as well as the corresponding responsibilities of research staff.

№7. Environmental and sustainable development: Be able to understand and evaluate the effects of complicated chemical or chemical engineering problems on the environment and social sustainability.

№7.1. Be able to understand the effects of chemicals and their relevant engineering techniques on the economy, Environment, and sustainable development of society and figure out the possible improvement measure.

№8. Profession regulations: Possessing the Literacy of Humanities and Social Sciences, social responsibility, and able to understand and obey the professional morality and regulations in chemistry-related engineering.

№8.1. Establish a correct outlook on life, world outlook, and values, have good ideological and moral cultivation, humanities and social sciences, and a sense of responsibility for national rejuvenation and social progress.

№8.2 Understand the professional nature and social responsibilities of chemical engineers, and be able to consciously abide by laws and regulations and the professional ethics of honesty, justice, and integrity in chemical engineering practice.

№9. Individuals and teams: Able to assume the roles of individuals, team members, and leaders in teams in a multidisciplinary setting.

№9.1 Be able to communicate effectively and work together in a multidisciplinary team.

№9.2 Be able to work independently or cooperatively in a team.

№9.3 Be able to organize a team, coordinate the opinions of team members with multidisciplinary backgrounds, and work with team members.

№10. Communication: Be able to communicate effectively with industry peers and the public on complex chemical engineering issues, including writing reports and design drafts, making

statements, expressing clearly, or responding to instructions. And have a certain international perspective, able to communicate and communicate in a cross-cultural background.

№10.1 Be able to express and communicate with industry peers and the public on chemical industry issues orally, in writing, in diagrams, etc., respond to questions, and understand the differences in communication with industry peers and the public.

№10.2 Understand the international development trends and research hotspots in the field of chemical engineering, understand and respect the differences and diversity of different cultures in the world, and be able to communicate and communicate on professional issues under cross-cultural backgrounds.

№11. Lifelong learning: have the awareness of independent learning and lifelong learning, and have the ability to learn continuously and adapt to development.

№11.1 Understand the cutting-edge technology and development trend of chemical engineering and technology, be able to recognize the necessity of continuous exploration and learning, and have an awareness of independent learning and lifelong learning.

№11.2 Have the quality and ability to learn independently and adapt to development, understand and summarize technical problems related to the chemical industry, and have the ability to ask questions.

Program Profile:

The major of Applied Chemistry has a long history since 1981 and was awarded as a famous brand major in Guangdong Province in 2005, and the first-class major of the nation in 2019. This major will educate undergraduate students with good fundamental knowledge of science, excellent comprehensive capability, competitive sense, and the abilities of initiative thinking, deep learning as well as affirmative action. The students will be easily recruited by the government department or the entrepreneurs in the fields of new energy, fine chemical engineering, new materials, environmental protection, and medicine. They will do technique development, production, management, scientific research, teaching, and even study for master's and Ph.D. degrees overseas. Currently, this major has signed a joint training agreement with the University of Edinburgh, Rutgers University, and University of Western Ontario.

This major will utilize the compressive model containing science and engineering, teaching, and research based on the national first-class major of chemistry and the national key major of chemical engineering. This major has a doctoral program and a post-doctoral research station. Currently, it has over 70 teachers, among them, there are 45 full professors with three of them awarded as Distinguished Young Scholars, 10 Young Talents Scholars, and 1 Excellent

Teacher of Guangdong Province. This major has a province-level experimental center and excessively advanced equipment.

Program Features:

This major has the advantages of the combination of science and engineering based on the platform of university and school. It will focus on the education of chemistry theories and experimental skills, emphasizing scientific ethics, safety, creation, and innovation. The students will be recruited for interdisciplinary projects for graduate study and job positions.

Degree Conferred: bachelor's degree of science.

Core Courses:

Inorganic Chemistry, Modern inorganic Chemistry, Chemical Analysis, Organic Chemistry, Instrumental Analysis, Physical Chemistry, Structural Chemistry, Electrochemical Energy Storage Technique, Fluid Mechanics and Heat Transfer IV, Mass Transfer and Separation Engineering, Instrumental Analytical Experiment, Comprehensive Chemical Experiment

Featured Courses:

Freshmen Seminars : Seminar on Modern Chemical Functional Materials, Molecules Changing the World, New Biomass-Based Cosmetic Materials, Walking into the Magical World of Drugs, Introduction to Chemical Engineering

Subject Frontiers Courses: Discipline Frontier Lectures, Frontier of Functional Molecules

Integration Course of Science and Education: Future Chemical Product Technology , Molecular Synthesis and Function

Cooperative Courses with Enterprises: Industry Model and Entrepreneurship

Baccalaureate-Master's Sharing Courses: Electrochemical Energy Storage Technique, Colloid, and Interface Chemistry

Entrepreneurship Courses: Product Engineering and Entrepreneurship Practice

Labor education class (required): Production Practice

1. Registration Form of Curriculum Credits

1.1 Credits Registration Form

Course Category	Requirement			Credits		Academic Hours		Remarks
General Basic Courses	Compulsory			55.0		1068		
	General Education			10.0		160		
Specialty Basic Courses	Compulsory			52.0		1072		
Elective Courses	Elective			17.0		272		
Total				134.0		2572		
Practice Training	Compulsory			31.0		38 weeks		
	Elective					weeks		
Credits Required for Graduation								
Suggested Credits for Each Semester	1	2	3	4	5	6	7	8
	22.5	25.5	26.5	23	23.5	23	11	10

1.2 Category Registration Form

Academic Hours					Credits						
Total	Include		Include		Total	Include		Include			Include
	Compulsory	Elective	Theory Course	Lab		Compulsory	Elective	Practice-concentrated Training	Theory Course Credits	Lab	Innovation and Entrepreneurship Education
2732	2300	432	1958	774	165	138	27	31	117.5	16.5	4

2. Courses Schedule

Course Category	Course No.	Course Title		C/E	Total Curriculum Hours					Credits	Semester	
					Class Hours	Theoretical class hours	Lab Hours	Practice Hours	Other Hours			
General Basic Courses	031101661	Ethics and Rule of Law		C	40	36			4	2.5	1	
	031101761	The Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era			48	36			12	3.0	2	
	031101371	Skeleton of Chinese Modern History			40	36			4	2.5	4	
	031101424	Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics			40	36			4	2.5	3	
	031101522	Fundamentals of Marxism Principle			40	36			4	2.5	3	
	031101331	Analysis of the Situation & Policy			64	64				2.0	1-8	
	044101382	English for Academic Purposes (1)	for English Class A		48	48				3.0	1	
	044102453	English for Academic Purposes (2)			48	48				3.0	2	
	044103681	College English (1)	for English Class B、C		48	48				3.0	1	
	044103691	College English (2)			48	48				3.0	2	
	045101644	Foundations of Computer			32				32	0	1	
	052100332	Physical Education (1)			36				36	1.0	1	
	052100012	Physical Education (2)			36				36	1.0	2	
	052100842	Physical Education (3)			36				36	1.0	3	
	052100062	Physical Education (4)			36				36	1.0	4	
	006100112	Military Principle			36	18			18	2.0	2	
	045102811	Python Language Programming			40	32			8	2.0	1	
	040100591	Calculus I (1)			80	80				5.0	1	
	040100662	Calculus I (2)			64	64				4.0	2	
	040100401	Linear Algebra and Analytic Geometry			48	48				3.0	1	
	040100023	Probability Theory and Mathematical Statistics			48	48				3.0	2	
	041100582	College Physics I (1)			48	48				3.0	2	
	041101391	College Physics I (2)			48	48				3.0	3	
	041100671	College Physics Experiment (1)			32		32			1.0	3	
	041101051	College Physics Experiment (2)			32		32			1.0	4	
	074102992	Engineering Drafting			48	48				3.0	2	
		Humanities, Social Science		E	128	128				8.0		
		Science and Technology			32	32				2.0		
		Total				1228	934	64		230	65.0	

2. Courses Schedule

Course Category	Course No.	Course Title	C/E	Total Curriculum Hours					Credits	Semester
				Class Hours	Theoretical class hours	Lab Hours	Practice Hours	Other Hours		
Specialty Basic Courses	037102732	Inorganic Chemistry	C	40	40				2.5	1
	047101111	Modern Inorganic Chemistry	C	40	40				2.5	3
	047101161	Inorganic Chemistry Experiment (1)	C	16		16			0.5	1
	047101201	Inorganic Chemistry Experiment (2)	C	16		16			0.5	2
	047101181	Modern Inorganic Chemistry Experiment	C	64		64			2.0	3
	037102631	Chemical Analysis	C	32	32				2.0	3
	037102511	Chemical Analysis Experiment	C	48		48			1.5	3
	037102551	Organic Chemistry III (1)	C	40	40				2.5	3
	037102561	Organic Chemistry III (2)	C	40	40				2.5	4
	037102092	Organic Chemistry Experiment III (1)	C	32		32			1.0	3
	037102191	Organic Chemistry Experiment III (2)	C	64		64			2.0	4
	037101981	Instrumental Analysis	C	56	56				3.5	4
	037102431	Instrumental Analysis Experiment	C	48		48			1.5	4
	047101761	Biochemistry	C	32	32				2.0	4
	037101521	Physical Chemistry III (1)	C	48	48				3.0	4
	037102592	Physical Chemistry III (2)	C	40	40				2.5	5
	037102261	Physical Chemistry Experiment III (1)	C	32		32			1.0	5
	047101093	Physical Chemistry Experiment III (2)	C	48		48			1.5	6
	037100073	Fluid Mechanics and Heat Transfer III	C	56	56				3.5	5
	037100271	Mass Transfer and Separation Engineering III	C	48	48				3.0	6
	047101721	Fluid Mechanics and Heat Transfer Experiment	C	16		16			0.5	5
	047101731	Mass Transfer and Separation Engineering Experiment	C	16		16			0.5	6
	047101132	Electrochemical Energy Storage Technology	C	48	48				3.0	6
	037101551	Structural Chemistry	C	72	56			16	4.0	5
	047101211	Comprehensive Chemistry Experiment	C	64		64			2.0	6
	047101771	Chemical Experiment Safety Education	C	16	16				1.0	1
	Total		C	1072	592	464		16	52.0	
Selective Courses	Energy/Materials Courses									
	047101881	Electrocatalysis and Hydrogen-to-Electric Conversion Technology	E	32	32				2.0	6
	047101401	Energy Chemical Engineering	E	32	32				2.0	6
	037102491	Introduction to Polymer Materials	E	32	32				2.0	6
	037102471	Colloid and Interface Chemistry	E	32	32				2.0	6
	047101451	Frontiers of Functional Molecular Materials	E	32	32				2.0	6
	Chemistry/Biology/Environmental Courses									

037102911	Synthetic Applications of Important Human Reactions in Natural Drug Molecules	E	32	32				2.0	5
037102451	Advanced Organic Chemistry	E	32	32				2.0	6
047101891	Introduction to Sensor Research	E	32	32				2	5
037101761	Bioorganic Chemistry	E	48	48				3.0	6
037102351	Biochemical Analysis	E	48	48				2.5	6
037100681	Fundamentals of Biochemical Engineering	E	32	32				2.0	5
047101901	Chemical Engineering Protection and Treatment	E	32	32				2.0	5
Modern Testing Methods / Artificial Intelligence Courses									
037102151	Comprehensive Analysis of the Spectrum	E	48	48				3.0	5
037102461	Physical and Chemical Inspection of Commodities	E	32	32				2.0	5
047101221	Physical and Chemical Analysis of Commodities	E	32	32				1.0	6
037100152	Computer Aided Design	E	40	24			16	2.0	4
Chemical and Fine Chemical Courses									
047101821	Introduction to Chemical Engineering	E	32	32				2	2
037100471	Chemical Process Safety	E	32	32				2.0	7
037101121	Industrial Catalysis	E	32	32				2.0	5
037102201	Introduction to Fine Chemicals	E	48	48				3.0	5
037102441	Fine Chemical Preparation Experiment	E	48		48			1.5	5
Academic Frontiers and Seminar Courses									
047100612	Academic Frontier Lectures	E	32	32				2.0	2
037102832	Enter the Magical World of Drugs	E	32	32				2.0	2
037100291	Modern Chemistry Functional Materials Seminar	E	32	32				2.0	2
047101172	Molecules that Change the World	E	32	32				2.0	2
047101931	New Biomass-Based Cosmetic Materials	E	16	16				1.0	2
047101961	Molecular Synthesis and Function	E	32	24	8			2.0	6
Innovation and Entrepreneurship Related Courses									
047101231	Cosmetic Design, Preparation and Industrialization	E	32	8	24			2.0	7
020100051	Innovation Research Training	E	32				32	2.0	7
020100041	Innovation Research Practice I	E	32				32	2.0	7
020100031	Innovation Research Practice II	E	32				32	2.0	7
020100061	Entrepreneurial Practice	E	32				32	2.0	7

	Total		E	Minimum elective course credits required: 17.0 credits Innovative courses: 4.0 credits
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3. Practice-concentrated Training

Course No	Course Title	C/E	Total Curriculum Hours		Credits	Semester
			Practice weeks	Lecture Hours		
006100151	Military Training	C	2 weeks		2.0	1
031101551	Marxism Theory and Practice	C	2 weeks		2.0	3
031101551	Marxist Theory and Practice	C	2 weeks		2.0	3
047101301	Awareness Internship	C	1 week		1.0	3-6
047101281	Inorganic Chemistry Experimental Course Design	C	2 weeks		2.0	3
047101291	Chemical Analysis Experimental Course Design	C	2 weeks		2.0	4
030100702	Engineering Training I	C	2 weeks		2.0	4
047101321	Organic Chemistry Experimental Course Design	C	2 weeks		2.0	5
047101431	Physical Chemistry Experimental Course Design	C	2 weeks		2.0	6
037100311	Production Internship	C	3 weeks		3.0	7
037101301	Simulation Internship	C	2 weeks		2.0	7
037100973	Graduation Design (Thesis)	C	17 weeks		10.0	7-8
Total		C	38 weeks		31.0	
		E	Minimum elective course credits required: 0			

4.Relation Matrix between Curriculum System and Student Outcomes

Serial No	Course Title	Applied Chemistry Major Student Outcomes																							
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2
1	Ethics and Rule of Law																●								
2	The Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era																●								
3	Skeleton of Chinese Modern History																●								
4	Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics																●								
5	Fundamentals of Marxism Principle																●								
6	Analysis of the Situation & Policy																●								
7	English for Academic Purposes (1)																						●		
8	English for Academic Purposes (2)																						●		
9	College English (1)																						●		
10	College English (2)																						●		
11	Foundations of Computer											●													
12	Physical Education (1)																								●
13	Physical Education (2)																								●
14	Physical Education (3)																								●
15	Physical Education (4)																								●
16	Military Principle																		●	●	●				
17	Python Language Programming											●													
18	Calculus I (1)				●							●													

Serial No	Course Title	Applied Chemistry Major Student Outcomes																									
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2		
19	Calculus I (2)				●							●															
20	Linear Algebra and Analytic Geometry				●							●															
21	Probability Theory and Mathematical Statistics				●							●															
22	College Physics I (1)				●							●															
23	College Physics I (2)				●							●															
24	College Physics Experiment (1)											●															
25	College Physics Experiment (2)											●															
26	Engineering Drafting												●														
27	Inorganic Chemistry	●								●																	
28	Modern Inorganic Chemistry	●								●																	
29	Inorganic Chemistry Experiment (1)	●								●																	
30	Inorganic Chemistry Experiment (2)	●								●																	
31	Modern Inorganic Chemistry Experiment	●		●						●																	
32	Chemical Analysis	●								●																	
33	Chemical Analysis Experiment			●						●																	
34	Organic Chemistry III (1)	●								●																	
35	Organic Chemistry III (2)	●								●																	
36	Organic Chemistry Experiment III (1)			●						●																	
37	Organic Chemistry Experiment III (2)			●						●																	
38	Instrumental Analysis	●								●																	
39	Instrumental Analysis Experiment			●						●																	
40	Biochemistry	●								●																	
41	Physical Chemistry III (1)	●								●																	
42	Physical Chemistry III (2)	●								●																	

Serial No	Course Title	Applied Chemistry Major Student Outcomes																									
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2		
43	Physical Chemistry Experiment III (1)			●						●																	
44	Physical Chemistry Experiment III (2)			●						●																	
45	Fluid Mechanics and Heat Transfer III		●			●		●		●		●															
46	Mass Transfer and Separation Engineering III		●			●		●		●		●															
47	Fluid Mechanics and Heat Transfer Experiment			●		●				●																	
48	Mass Transfer and Separation Engineering Experiment			●		●				●																	
49	Electrochemical Energy Storage Technology															●											
50	Structural Chemistry	●								●																	
51	Comprehensive Chemistry Experiment	●						●			●																
52	Chemical Experiment Safety Education	●								●																	
53	Electrocatalysis and Hydrogen-to-Electric Conversion Technology	●						●				●															
54	Energy Chemical Engineering					●										●											
55	Introduction to Polymer Materials	●								●																	
56	Colloid and Interface Chemistry		●			●																		●			
57	Frontiers of Functional Molecular Materials					●						●															
58	Synthetic Applications of Important Human Reactions in Natural Drug Molecules							●																●			
59	Advanced Organic Chemistry	●					●	●																			
60	Introduction to Sensor Research	●																									

Serial No	Course Title	Applied Chemistry Major Student Outcomes																									
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2		
61	Bioorganic Chemistry	●								●																	
62	Biochemical Analysis	●								●																	
63	Fundamentals of Biochemical Engineering					●				●																	
64	Chemical Engineering Protection and Treatment					●				●						●											
65	Comprehensive Analysis of the Spectrum	●						●			●																
66	Physical and chemical inspection of commodities	●								●				●													
67	Physical and chemical analysis of commodities									●				●													
68	Computer Aided Design	●						●			●		●														
69	Introduction to Chemical Engineering																●	●									
70	Chemical Process Safety							●							●	●		●									
71	Industrial Catalysis					●				●																	
72	Introduction to Fine Chemicals	●								●				●													
73	Fine Chemical Preparation Experiment			●				●		●				●													
74	Academic Frontier Lectures	●									●																
75	Enter the Magical World of Drugs						●									●								●			
76	Modern Chemistry Functional Materials Seminar						●									●								●			
77	Molecules that Change the World						●									●								●			
78	New Biomass-Based Cosmetic Materials						●									●								●			
79	Molecular Synthesis and Function	●		●																				●	●		
80	Cosmetic Design, Preparation and						●								●	●		●									

Serial No	Course Title	Applied Chemistry Major Student Outcomes																									
		1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	4.1	4.2	5.1	5.2	6.1	6.2	7.1	8.1	8.2	9.1	9.2	9.3	10.1	10.2	11.1	11.2		
	Industrialization																										
81	Innovation Research Training						●		●		●																
82	Innovation Research Practice I						●		●		●																
83	Innovation Research Practice II						●		●		●																
84	Entrepreneurial Practice						●		●		●																
85	Military Training																			●							
86	Marxism Theory and Practice						●					●												●			
87	Marxist Theory and Practice																●										
88	Awareness Internship													●				●	●		●	●					
89	Inorganic Chemistry Experimental Course Design							●			●	●															
90	Chemical Analysis Experimental Course Design							●			●	●															
91	Engineering Training I														●												
92	Organic Chemistry Experimental Course Design							●			●	●															
93	Physical Chemistry Experimental Course Design							●			●	●															
94	Production Internship								●	●								●	●	●	●	●		●			
95	Simulation Internship												●					●									
96	Graduation Design (Thesis)							●			●	●						●	●	●	●			●			

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 five credits. The advanced undergraduates must complete one of courses of Humanities Quality Education which has seventy two class hours (it's equivalent to one credit which belongs to Humanities Quality Education Credit of Extracurricular Class) offered by the College Physical Education Teaching Group.Mental Health Education for College Students (2 credits) is opened in virtual third semester which belongs to Humanities Quality Education Credit of Extracurricular Class.

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.