武汉理工大学化学化工与生命科学学院

School of Chemistry, Chemical Engineering and Life Sciences of Wuhan University of Technology

本科专业培养方案

Undergraduate Program

（Grade 2013）

武汉理工大学教务处

Academic Affairs Office of Wuhan University of Technology

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化学工程与工艺专业本科培养方案
Undergraduate Program for Specialty in Chemical Engineering and Technology

一、业务培养目标

Ⅰ Educational Objectives

本专业培养具备化学工程与化学工艺方面知识，能在化工、炼油、冶金、能源、轻工、医药、环保和军工等部门从事工程设计、技术开发、生产技术管理和科学研究等方面的工程技术人才。

This program trains students to be professional engineers in chemical engineering and chemical technology. The specialized training gives them the expert knowledge and ability to apply on the engineering design, technology develop, project management and research in chemical industry, oil refinery, metallurgy, energy sources, light industry, medicines, environmental protection and military industry.

二、业务培养要求

Ⅱ Educational Requirement

本专业学生在学习人文知识和公共基础理论课的基础上主要学习化学工程学和化学工艺学等方面的基本理论和基本知识，受到化学与化工实验技能、工程实践、计算机应用、科学研究与工程设计方法的基本训练，具有对现有企业的生产过程进行模拟优化、技术改造，对新工艺过程进行开发设计和新产品研制的基本能力。

毕业生应获得以下几方面的知识和能力：

1. 掌握马克思主义、毛泽东思想基本原理、邓小平理论和“三个代表”的重要思想，品德高尚，身心健康；
2. 掌握化学工程、化学工艺、应用化学、工业催化、环境化工、新材料等学科的基本理论、基本知识；
3. 掌握化工装置与设备设计方法，掌握化工过程模拟优化方法；
4. 具有对化工新产品、新工艺、新技术和新设备进行研究、开发和设计的初步能力；
5. 熟悉国家对于化工生产、设计、研究与开发、环境保护等方面的方针、政策和法规；
6. 了解化学工程与技术学科的理论前沿，了解新工艺、新技术和新设备的发展动态；
7. 掌握文献检索、资料查询及运用现代信息技术获取相关信息的基本方法，具有一定的科学研究和实际工作能力；
8. 具有创新意识和独立获取新知识的能力；
9. 较好地掌握一门外国语，具有查阅文献的能力，具备熟悉阅读专业书刊和查阅相关专业文献的能力。

Students of the program will study the elementary theories and knowledge on chemical engineering and chemical technology. The experimental skills, engineering practice, computer application, and research and design methods will also be trained. Graduates of the course will be capable of simulation and optimization, technical reformation, research and development of new process and new product.

Students are expected to acquire：

1、Good personality, physical and psychological competence, mastery of the Marxism basic principle, Mao Zedong thought, Deng Xiaoping theory and the important thought of the "Three Represents";

2、Basic knowledge, theories and skills in chemical engineering, chemical technology, applied chemistry, industrial catalysis, environmental chemical engineering, new materials, etc.

3、Design methods of chemical technology and equipments, simulation and optimization of chemical process;

4、Capability in research and development of chemical products and process, design and magnification of chemical devices；

5、Skills to understand the policy and regulations on chemical production, design, research and development, environmental protection;

6、Skills to understand the development of chemical engineering and technology and the trend in new technology and devices;

7、Ability in document searching，data querying and information acquisition, skills of research and practical working;

8、Sense of creation and innovation, ability to acquire new knowledge;

9、Mastery of a foreign language and the ability to employ technical resources and literature in foreign text.

三、主干学科

Ⅲ Major Disciplines

主干学科：化学、化学工程与技术

Major Disciplines: Chemistry, Chemical Engineering and Technology

四、专业核心课程与专业特色课程

IV Core Courses and Characteristic Courses

专业核心课程：物理化学、化工原理、化工热力学、化学反应工程、化工过程分析与综合等

Core Courses: Physical Chemistry, Principle of Chemical Engineering, Thermal Dynamics of Chemical Engineering, Reaction Engineering of Chemistry, Analysis and Synthesis of Chemical Processes

专业特色课程：化工原理、化工过程分析与综合、化学反应工程、化工分离工程、化工设计

Characteristic Courses: Principle of Chemical Engineering, Analysis and Synthesis of Chemical Processes, Reaction Engineering of Chemistry, Chemical Separation Engineering, Chemical Process Design

五、计划学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration: Four years

授予学位：工学学士

Degree Granted: Bachelor of Engineer

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 / 课程性质	通识课程 Public Basic Courses	学科大类课程 Basic Disciplinary Courses	专业课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	35	51	33.5	\	27.5	\	190
选修课 Elective Courses	9	\	14	10	\	10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur			
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1050001130	心理健康教育 Psychological health education	1	16					2		
		1060003130	军事理论 Military Theory	1	32			16		1		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		
		程序设计语言课程组(三选一，3 学分)										
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design(C Language)	3	48		12			2		
		4120024110	计算机程序设计基础(FORTRAN 语言) Fundamentals of Computer Program Design(FORTRAN Language)	3	48		12			2		
		4120025110	计算机程序设计基础(VB 语言) Fundamentals of Computer Program Design(VB Language)	3	48		12			2		
		小 计 Subtotal		35	736							

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses	全校学生要求至少取得 9 学分，建议每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.									
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										
		科学技术类 Science and Technology Courses										
		艺术体育类 Art and Physical Education Courses										
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4200067110	专业导论 Introduction to Materials Physics	1	16					1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4050229110	线性代数 Linear Algebra	2.5	40					2		
		4050058110	概率论与数理统计 B Probability and Mathematical Statistics B	3	48					4	线性代数	
		4080041110	工程图学 B Engineering Cartography C	4	64					2		
		4050463130	大学物理 B Physics C	5	80					3		
		4050224110	物理实验 B Physics Lab. B	1	32	32				4	大学物理 B	
		4100012110	电工与电子技术基础 C Fundamentals of Electrical Engineering & Electric Technology D	4	64					4		
		4050211110	无机化学 C Inorganic Chemistry C	3.5	56					1		
		4050212110	无机化学 C 实验 Experiment in Inorganic Chemistry C	0.5	16	16				1		
		4050044110	分析化学 C Analysis Chemistry C	1.5	24					2		
		4050045110	分析化学 C 实验 Experiment of Analysis Chemistry C	1	32	32				2		
		4050249110	有机化学 B Organic Chemistry B	4.5	72					3		
		4050250110	有机化学 B 实验 Experiment in Organic Chemistry B	1.5	48	48				3		
		4050217110	物理化学 B 上 Physical Chemistry BⅠ	2.5	40					3		
		4050218110	物理化学 B 下 Physical Chemistry BⅡ	2.5	40					4	物理化学 B 上	
		4050219110	物理化学 B 实验 Experiment of Physical Chemistry B	1	32	32				4		
		4200023110	化工制图 Chemical Cartography	2	32					3	工程图学 B	
		小 计 Subtotal		51	896	160						

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur			
专业课程 Specialized Courses	必修课 Required Courses	4200021110	化工原理 1 Principles of Chemical Engineering Ⅰ	3	48					4		
		4200022110	化工原理 2 Principles of Chemical Engineering Ⅱ	3	48					5	化工原理 1	
		4200120120	化工原理实验 1 Experiments of Chemical Engineering PrincipleⅠ	1	32	32				4	化工原理 1	
		4200121120	化工原理实验 2 Experiments of Chemical Engineering PrincipleⅡ	1	32	32				5	化工原理 2	
		4200016110	化工热力学 Chemical Engineering Thermodynamics	2.5	40					5		
		4200025110	化学反应工程 A Chemical Reaction Engineering A	3	48					5		
		4200089110	化工设备机械基础 Mechanical Base For Chemical Equipment	2.5	40					5		
		4200113120	化工分离工程 Chemical Separation Engineering	2	32					6		
		4200112110	化工过程分析与综合 B Analysis and Synthesis for Process Engineering B	2	32					6		
		4200027110	化学工艺学 Chemical Technology	2.5	40					6		
		4200018110	化工设计 B Chemical Process Design B	2.5	40					6	化工制图	
		4200290130	化工基础实验 Basic Experiments for Chemical Engineering	0.5	16	16				6	化学反应工程 A	
		4200020110	化工仪表及自动化 Chemical Instruments and Automation	2	32					7		
		4200024110	化工专业英语 Specialized English of Chemical Engineering and Technology	2	32					7		
		4200133120	专业综合实验 Comprehensive Experiments	4	128	128				7		
		小 计 Subtotal		33.5	640	208						
	选修课 Elective Courses	化学工程方向 Chemical Engineering										
		4200092110	催化剂工程 Catalyst Engineering	2	32					6		
		4200011110	化工传递过程原理 B Theory of Transport Process in Chemical Engineering	2	32					7	化学反应工程 A	
		小 计 Subtotal		4	64							
		精细化工方向 Fine Chemical Engineering										

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
		4200124120	精细有机合成技术 Fine Organic Synthesis	2	32					6	有机化学 B	
		4200123120	精细化工工艺学 Fine Chemical Technology	2	32					7	化学工艺学	
		4200127120	涂料与涂装工艺学 Paint and Coating Technology	2	32					6		
		4200126120	涂料结构与功能设计 Paint Structure and Function Design	2	32					7		
		小 计 Subtotal		8	128							
		公共部分 Public Part										
		4200019110	化工实验设计与数据处理 Test Design and Chemical Engineering Data Processing of Chemical Process	2	32					4		
		4200007110	高分子化学 C Polymer Chemistry C	2	32					5		
		4200066110	助剂化学及应用 Additive Chemistry and Application	2	32					5		
		4200009110	化工安全工程 Safety Engineering in Chemical Engineering	2	32					5		
		4200008110	工业催化 Industrial Catalysis	2	32					5	化学反应工程 A	
		4200006110	腐蚀化学 Corrosion Chemistry	2	32					6		
		4200028110	精细高分子合成与工艺 Fine Macromolecule Synthesis and Technology	2	32					6	精细化工工艺学	
		4200002110	表面与界面化学 Surface and Interface Chemistry	2	32					6		
		4200001110	表面处理工艺与技术 Surface Treatment Technology	2	32					7		
		4200013110	化工过程模拟软件 Software Application for Chemical Process	2	32		20			7		
		4200015110	化工科技文献检索 Literature Searching for Chemical Engineering	1	16					7		
		小 计 Subtotal		21	336		20					
		修读说明：要求至少选修 14 学分。其中按方向模块选修一组，4 学分。 Note: Minimum subtotal credits: 14. (Students are required to take courses of complete module which matches their own orientation).										

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
个性课程 Personalized Course	选修课 Elective Courses	4200034110	生物工程概论 Basic Bioengineering	2	32					5		
		4200043110	现代仪器分析 Modern Instrumental Analysis	2	32					6		
		4200316120	高分子物理 C Polymer Physics C	2	32					6	高分子化学 C	
		4200033110	日用品化学 Applied Chemistry	2	32					6		
		4200031110	绿色化学与化工 Green Chemistry and Chemical Engineering	2	32					6	化学工艺学	
		4010175130	企业经济学 Enterprise Economics	2	32					7		
		4170131110	生产现场管理 Workshop Management	2	32					7		
		4060059110	环境质量评价 Environment Quality Assessment	2	32					7		
		小 计 Subtotal		16	256							
		修读说明：学生可跨专业自主选择修读全校其他专业的课程，建议修读以上课程。要求至少选修 10 学分。 NOTE：Students can choose any courses from the other specialties, and are especially suggested to choose the courses above. Minimum subtotal credits: 10.										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4080151110	机械制造工程实训 C Machinery Manufacturing Engineering Practice C	2	2	4	
4100069110	电工电子实习 B Practice in Electrical Engineering & Electronics B	1	1	5	
4200071110	化工原理仿真上机实践 1 Simulated Practice of Principles of Chemical Industry Ⅰ	1	1	4	
4200072110	化工原理仿真上机实践 2 Simulated Practice of Principles of Chemical Industry Ⅱ	1	1	5	
4200087110	化工原理课程设计 Course Design of Principles of Chemical Industry	2	2	5	
4200080110	专业实习 Practice of Specialty	4	4	6	
4200076110	能力拓展训练 Ability Development Training	1	1	6（暑期）	
42000094110	化工专业课程设计 Course Design of Chemical Engineering	3	3	7	
4200158130	毕业实习与毕业设计(毕业论文) Practice for Graduation &Graduation Design(Thesis)	17	11	8	
小 计 Subtotal		35	27.5		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term . The course will be arranged by the University Students' Affairs' Department in each school.

制药工程专业本科培养方案
Undergraduate Program for Specialty in Pharmaceutical Engineering

一、业务培养目标

Ⅰ Educational Objectives

本专业培养具备制药工程方面较宽的基础知识，能在医药、农药、精细化工和生物化工等行业从事相关产品的生产管理、技术开发、工艺和设备设计、技术改造和经营管理等方面的工作，适应社会主义市场经济发展的高层次、高素质、全面发展的科学研究与工程技术人才。

This program cultivates executives who possess the wide and basic knowledge of Pharmaceutical Engineering. They can engage in product management, technological development, technique process and equipment design, technological transformation and management of work in medicine, pesticides, chemical and biochemical and other industries. They can also adapt to the development of social market economy and have the high-quality, comprehensive development of scientific research and engineering technology.

二、业务培养要求

Ⅱ Educational Requirement

在较熟练和全面掌握化学基础知识的同时，主要学习制药工程方面的基本理论和基本知识，掌握化工单元操作、药物化学、生物化学、药理学、制药工艺学等专业理论知识，并接受化工制药实验技能、工程实践、计算机应用、科学研究与工程设计方法的基本训练，具有对医药产品的生产、工程设计、新药的研制与开发的能力。

毕业生应获得以下几方面的知识和能力：

1. 掌握化学制药、中药制药、生物制药、药物制剂工程的基本理论知识；
2. 掌握药物生产工艺、药厂车间设计，具有工程运算和设计能力；
3. 具有在医药、农药、精细化工等企业、研究院所、经营管理部门，从事教学、科研、开发及经营管理工作的能力；
4. 熟悉制药生产、环境保护等方面的法律和法规；
5. 了解制药工程的理论前沿、应用前景和最新发展动态；
6. 较好地掌握一门外国语，具有查阅文献的能力，具备熟悉阅读专业书刊和查阅相关专业文献能力；
7. 具有一定的计算机知识和应用能力；
8. 具有较强的自学能力和创新能力。

Students of this major mainly learn basic theories of Chemistry as well as basic theories and knowledge of Pharmaceutical Engineering. They must master professional theories knowledge of chemical units operation, medicinal chemistry, biochemistry, pharmacology and pharmaceutical technology, and have training on chemistry experiment technology, engineering practice, computer application, scientific research and engineering design methods. They have the ability on producing medicine, engineering design, exploiting and developing new drugs.

Knowledge and abilities must be acquired

1. Master basic knowledge of chemical pharmacy, traditional Chinese drug, biological pharmacy, pharmaceutical preparation engineering.

2. Master the technology of drug manufacturing, workshop design, the abilities of engineering calculation and design.

3. Have the abilities to engage in education, research, exploiting, business and administration, in the following units: medicine, pesticides and chemical enterprise, research academy, business and administration

department.

4. Become acquired with rules and laws of drug manufacturing, environmental protection.
5. Comprehend the on-the-edge theories, prospects of application and present progress situation.
6. Master a foreign language to look up scientific resources and read professional books and journals.
7. Possess the capabilities about computer knowledge and application.
8. Have good abilities to self-learning and innovation.

三、主干学科

Ⅲ Major Disciplines & Major Courses

主干学科：化学、药学、化学工程与技术

Major Disciplines: Chemistry, Pharmacy, Chemical Engineering and Technology

四、专业核心课程与专业特色课程

Ⅳ Core Courses and Characteristic Courses

专业核心课程：有机化学、分析化学、物理化学、生物化学、化工原理、药物合成反应、药物化学、药理学、药剂学、天然药物化学、药物分析、制药工艺学、制药工程

Core Courses: Organic Chemistry, Analytical Chemistry, Physics Chemistry, Biochemistry, The Principle of Chemical Engineering, Organic Reaction of Drug Synthesis, Medicinal Chemistry, Pharmacology, Pharmaceutics, Natural Medicinal Chemistry, Medicinal Analysis, Pharmaceutical technology, Pharmaceutical Engineering(Special Equipment for Pharmaceutical Company and Workshop Design)

专业选修课程：生物技术药物、药物设计学、中药学、制药设备与车间设计、药用高分子材料、制药工程专业外语、生药学、药品生产质量管理工程、药物合成设计、药事管理学与新药研究、制药过程安全与环保、医药知识产权与文献检索、制药工程前沿

Characteristic Elective Courses: Biological Medicine, Drug Design and Delivery, Traditional Chinese Medicine, Pharmaceutical Apparatus and Workshop Design, Polymeric Materials in Drugs, Specialized English of Pharmaceutical engineering, Pharmacognosy, Good Manufacturing Engineering, Design for Drug Synthesis, Pharmacy Administration and New Drug Research, Safety and Environment Protection in Pharmaceutical Process, Medicinal Knowledge Property and Literature Retrieval, Development of pharmaceutical engineering

五、学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration: 4 years

授予学位：工学学士

Degrees Conferred: Bachelor of Engineer

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 / 课程性质	通识课程 Public Basic Courses	学科大类课程 Basic Disciplinary Courses	专业课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	35	48	42.5	\	22.5	\	190
选修课 Elective Courses	9	\	13	10	\	10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1060003130	军事理论 Military Theory	1	32			16		1		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		1050001130	心理健康教育 Psychological health education	1	16					2		
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		
		程序设计语言课程组(三选一，3 学分)										
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design(C)	3	48		12			2		
		4120024110	计算机程序设计基础(FORTRAN 语言) Fundamentals of Computer Program Design(FORTRAN)	3	48		12			2		
		4120025110	计算机程序设计基础(VB 语言) Fundamentals of Computer Program Design(VB)	3	48		12			2		
		小　计 Subtotal		35	736							
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses	全校学生要求至少取得 9 学分，建议每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.									
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										
		科学技术类 Science and Technology Courses										

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extracur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		艺术体育类 Art and Physical Education Courses										
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4200067110	专业导论 Introduction to Materials Physics	1	16					1		
		4050211110	无机化学 C Inorganic Chemistry C	3.5	56					1		
		4050212110	无机化学 C 实验 Experiment in Inorganic Chemistry C	0.5	16	16				1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4080041110	工程图学 B Engineering Cartography B	4	64		4			2		
		4050044110	分析化学 C Analysis Chemistry C	1.5	24					2		
		4050045110	分析化学 C 实验 Experiment of Analysis Chemistry C	1	32	32				2		
		4200023110	化工制图 Chemical Cartography	2	32					3		
		4050229110	线性代数 Linear Algebra	2.5	40					3	高等数学 A 下	
		4050251110	有机化学 C Organic Chemistry C	3	48					3		
		4050821130	有机化学 C 实验 Experiment in Organic Chemistry C	1	32	32				3		
		4050463130	大学物理 B Physics C	5	80					3		
		4050224110	物理实验 B Physics Lab. B	1	32	32				4	大学物理 B	
		4050220110	物理化学 C Physical Chemistry C	4	64					4		
		4050219110	物理化学 B 实验 Experiment of Physical Chemistry C	1	32	32				4		
		4050058110	概率论与数理统计 B Probability and Mathematical Statistics B	3	48					4	线性代数	
		4100012110	电工与电子技术基础 C Fundamentals of Electrical Engineering & Electric Technology C	4	64	10				4		
		小 计 Subtotal		48	840	154	4					

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extracur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
专业课程 Specialized Courses	必修课 Required Courses	4200055110	医学基础 Medicine Basis	2	32					4		
		4200182130	药物合成基础 Basic of Drug Synthesis	2.5	40					4		
		4200021110	化工原理 1 Principles of Chemical Engineering Ⅰ	3	48					4		
		4200120120	化工原理实验 1 Experiments of Chemical Engineering	1	32	32				4	化工原理 1	
		4200022110	化工原理 2 Principles of Chemical Engineering Ⅱ	3	48					5	化工原理 1	
		4200121120	化工原理实验 2 Experiments of Chemical Engineering	1	32	32				5		
		4200049110	药物合成反应 B Organic Reaction of Drug Synthesis B	3	48					5		
		4200174130	生物化学 B Biochemistry B	2.5	40					5		
		4200110110	药剂学 Pharmaceutics	3	48					5		
		4200045110	药理学 B Pharmacology B	2.5	40					5		
		4200178130	天然药物化学 A Natural Medicinal Chemistry A	2.5	40					6		
		4200105110	药物分析 Medicinal Analysis	2.5	40					6		
		4200051110	药物化学 Medicinal Chemistry	3	48					6		
		4200130120	制药工程基础实验 Basic Experiment of Pharmaceutical	2	64	64				6		
		4200187130	制药工程 B Pharmaceutical Engineering B	4	96			64		7	化工原理 2	
		4200062110	制药工艺学 Pharmaceutical Technology	2	32					7		
		4200132120	专业综合实验 Specialized Integrated Experiment	3	96	96				7		
		小 计 Subtotal		42.5	824	224		128				
	选修课 Elective Courses	4200037110	生物药剂学与药物动力学 Biopharmaceutics and Pharmacokinetics	2	32					5		
		4200047110	药事管理学与新药研究 Pharmacy Administration and New Drug	2	32					5		
		4200064110	中药学 Traditional Chinese Medicine	2	32					5		
		4200054110	药用高分子材料 Polymeric Materials in Drugs	2	32					5		
		4200057110	仪器分析与波谱解析 B Spectroscopic and Instrumental Analysis B	2	32					5		
		4200036110	生物技术药物 Biological Medicine	2	32					6		
		4200038110	生药学 Pharmacognosy	2	32					6		

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		4200050110	药物合成设计 Design for Drug Synthesis	2	32					6		
		4200052110	药物设计学 Drug Design and Delivery	2	32					6		
		4200108110	药物制剂设计与工艺 Pharmaceutical Design and Technology	2	32					6		
		4200042110	微生物学 C Microbiology C	2	32					7		
		4200046110	药品生产质量管理工程 Good Manufacturing Engineering	2	32					7		
		4200104110	制药分离工程 Pharmaceutical Separation Engineering	2	32					7		
		4200063110	制药过程安全与环保 Safety and Environment Protection	2	32					7		
		4200065110	中药制剂分析 Analysis in Traditional Chinese Medicine	2	32					7		
		4200131120	制药设备与车间设计 Pharmaceutical Apparatus and Workshop Design	2	32					7		
		4200103110	医药知识产权与文献检索 Medicinal Knowledge Property and Literature Retrieval	2	32		12			7		
		4200060110	制药工程前沿 Development of pharmaceutical	2	32					7		
		4200061110	制药工程专业外语 Specialized English of Pharmaceutical engineering	2	32					7		
		小 计 Subtotal		38	608		12					
		修读说明：要求至少选修 13 学分。 NOTE：Minimum subtotal credits: 13										
个性课程 Personalized Course	选修课 Elective Courses	4200292120	分子药理与药效评价 Molecular Pharmacology and Efficacy Evaluation	2	32					5		
		4200170120	纳米药物学 Nano Materia Medica	2	32					6		
		4200293120	中药资源与分子鉴定 Traditional Chinese Medicine Resources and Molecular Identification	1.5	24					5		
		小 计 Subtotal		16	256							
		修读说明：学生需要修读以上课程至少 4 学分，余下学分可跨专业自主选择修读全校其他专业的课程。要求至少选修 10 学分。 NOTE：Students need to choose the courses above at least 4 credits. For the remaining credits, students can choose any courses from the other specialties. Minimum subtotal credits: 10.										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4080151110	机械制造工程实训 C Machinery Manufacturing Engineering Practice C	2	2	4	
4100069110	电工电子实习 B Practice in Electrical Engineering & Electronics B	1	1	5	
4200087110	化工原理课程设计 Course Design of Principles of Chemical Industry	2	2	5	
4200080110	专业实习 Practice of Specialty	4	4	6	
4200076110	能力拓展训练 Ability Development Training	1	1	6（暑期）	
4200156130	毕业设计(毕业论文) Graduation Design(Thesis)	17	11	8	
小　　计　Subtotal		30	22.5		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term . The course will be arranged by the University Students' Affairs' Department in each school.

应用化学专业本科培养方案
Undergraduate Program for Specialty in Applied Chemistry

一、业务培养目标

Ⅰ Educational Objectives

本专业培养热爱祖国，具有高度社会责任感和良好科学、文化素养，能较系统、扎实的掌握化学基础知识、基本理论和基本技能，富有创新意识和实践能力，胜任化学及相关领域科研、教学及其他工作的人才。

The specialty cultivates patriotic and highly responsible professionals who have nice scientific and cultural awareness，have innovative awareness and practical ability，master fundamental chemical theory and knowledge, have good experimental skills, and are capable of engaging in scientific research, teaching, and administration in scientific research institutions, universities, colleges, and enterprises.

二、业务培养要求

Ⅱ Educational Requirement

本专业学生按四年学制培养理学学士。毕业生应达到如下要求：

After four-year's study, the students could obtain the bachelor of science degree. The graduates should meet the requirements listed below:

1. 素质要求

1.Quality Requirement

具有正确的价值观和道德观，爱国、诚信、守法；具有高度的社会责任感和良好的协作精神；具备良好科学、文化素养；掌握科学的世界观和方法论，掌握认知世界、改造世界和保护世界的基本思路和方法；具有健康的体魄和良好的心理素质；适应科学和社会的发展。

Patriotic, honest and law-abiding, with the correct values and ethics; with highly social responsibility and team-work spirits; with good scientific and cultural awareness; have the evolving view of the world and the right methodology; grasp the basic method of recognizing, transforming and protecting the world; have good health and mental conditions; adapt to the developments of science and society.

2. 能力要求

2.Ability requirement

具有自主学习能力，具有较强的获取、加工和应用信息的能力；具有综合运用化学及相关学科的基本理论和技术方法进行教学、研究和开发的能力；具有交流、协调和合作的能力

With self-learning ability, with a strong ability of acquisitting, processing and using information; capable of applying the basic theory and techniques of chemistry or other related fields for teaching, researching and investigation; have the ability of communication, coordination and collaboration.

3. 知识要求

3.Knowledge requirements

（1）掌握数学、物理学等方面的基本理论和基本知识；

（2）掌握无机化学、分析化学（含仪器分析）、有机化学、物理化学（含结构化学）、化学工程及化工制图的基础知识、基本原理和基本实验技能；

（3）了解相近专业的一般原理和知识；

（4）了解国家关于科学技术、化学相关产业、知识产权等方面的政策、法规；

（5）了解化学的理论前沿、应用前景、最新发展动态，以及化学相关产业发展状况；

（6）掌握中外文资料、文献、信息的检索查阅方法及运用现代信息技术进行化学有关信息的查阅；具有一定的实验设计能力，创新能力和归纳、整理、分析实验结果的能力，同时具有良好的计算机化学

能力和撰写论文、参与学术交流的能力。

（1）Master basic theory and the knowledge of mathematics, physics, and so on;

（2）Master fundamentals and experimental skills of inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, instrumental analysis, structural chemistry, chemical engineering, chemical engineering cartography;

（3）Comprehend general principle and the knowledge of related specialties;

（4）Have the knowledge of policies and regularities of science and technology, chemistry-related industries, intellectual property and so on;

（5）Understand the latest theory, advancement and application prospects of chemistry and know the development of chemistry-related industries.

（6）Have the ability of obtaining information by modern technologies, and are competent for experimental design and innovation, experimental results analyzing and concluding, and possess the abilities of computer utility, thesis composition and academic communication.

三、主干学科

Ⅲ Major Disciplines

主干学科：化学、应用化学

Major Disciplines: Chemistry, Applied Chemistry

四、专业核心课程与专业特色课程

Ⅳ Core Courses and Characteristic Courses

专业核心课程：无机化学、分析化学、有机化学、物理化学、仪器分析原理与实验、结构化学、精细有机合成、精细无机合成、计算机与应用化学

Core Courses: Inorganic Chemistry, Analytical Chemistry, Organic Chemistry, Physical Chemistry, Principles and Experiments of Instrumental Analysis, Structural Chemistry, Fine Organic Syntheses, Fine Inorganic Syntheses, Computer and Applied Chemistry.

专业特色课程：精细有机合成、精细无机合成、仪器分析原理与实验、计算机与应用化学、高分子化学与物理、应用电化学基础

Characteristic Courses: Fine Organic Syntheses, Fine Inorganic Syntheses, Principles and Experiments of Instrumental Analysis, Computer and Applied Chemistry, Polymer Chemistry and Physics and Fundamentals of Applied Electrochemistry

五、计划学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration： Four Years

授予学位：理学学士

Degree Granted: Bachelor of Science

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 Course Classification / 课程性质 Course Nature	通识课程 Public Basic Courses	学科大类课程 Basic Courses in General Discipline	专业课程 Courses in Specialty	个性课程 Personalized Course	集中性实践 Practice Courses	课外学 Extracurricular Credits	总学分 Total Credits
必修课 Required Courses	35	53	31	\	31		190
选修课 Elective Courses	9	2	9	10		10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including						先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term		
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1060003130	军事理论 Military Theory	1	32			16		1-4		
		1050001130	心理健康教育 Mental Health Education	1	16					1-2		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design (C Language)	3	48		12			3		
		小　计　Subtotal		35	720		24	64	64			
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses	全校学生要求至少取得 9 学分，建议在每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.									
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										
		科学技术类 Science and Technology Courses										
		艺术体育类 Art and Physical Education Courses										
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4200278120	专业导论 Introduction to Materials Physics	1	16					1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4050021110	大学物理 A 上 Physics AⅠ	3.5	56					2	高等数学 A 上	
		4050022110	大学物理 A 下 Physics AⅡ	3.5	56					3	大学物理 A 上 高等数学 A 下	
		4050222110	物理实验 A 上 Physics Lab. AⅠ	1	28	28				3	大学物理 A 上	
		4050223110	物理实验 A 下 Physics Lab. AⅡ	1	28	28				4	大学物理 A 下	
		4200248120	无机化学 A 上 Inorganic Chemistry AⅠ	3.0	48					1		
		4200249120	无机化学 A 下 Inorganic Chemistry A Ⅱ	3.5	56					2	无机化学 A 上	
		4200252120	无机化学实验 A1 Inorganic Chemistry Lab. I	1.0	32	32				1	无机化学 A 上	
		4200253120	无机化学实验 A2 Inorganic Chemistry Lab. II	1.5	48	48				2	无机化学 A 下	
		4200198120	分析化学 A Analytical Chemistry A	4	64					2	无机化学 A 下	
		4200200120	分析化学 A 实验 Analytic Chemistry Lab.	2	64	64				2	分析化学 A	
		4200272120	有机化学 A 上 Organic Chemistry AⅠ	3.5	56					3		
		4200273120	有机化学 A 下 Organic Chemistry AⅡ	3	48					4	有机化学 A 上	
		4200276120	有机化学实验 A1 Organic Chemistry Lab. I	1.5	48	48				3	有机化学 A 上	
		4200277120	有机化学实验 A2 Organic Chemistry Lab. II	1.0	32	32				4	有机化学 A 下	

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		4200254120	物理化学 A 上 Physical Chemistry A Ⅰ	3.5	56					3	无机化学 A 上 有机化学 A 上	
		4200255120	物理化学 A 下 Physical Chemistry A Ⅱ	3	48					4	无机化学 A 下 有机化学 A 下	
		4200258120	物理化学实验 A1 Physical Chemistry Lab. I	1.5	48	48				3	物理化学 A 上	
		4200259120	物理化学实验 A2 Physical Chemistry Lab. II	1.0	32	32				4	物理化学 A 下	
		小 计 Subtotal		53	1024	360						
	选修课 Elective Courses	4200213120	环境化学 B Environmental Chemistry B	2	32					7		
		4200209120	化学发展前沿 Chemistry Frontier	1	16					7		
		4200225120	科技写作 Writing on Science and Technology	1	16					7		
		小 计 Subtotal		4	64							
		修读说明：要求至少选修 2 学分。 NOTE：Minimum subtotal credits:2.										
专业课程 Specialized Courses	必修课 Required Courses	4200223120	精细有机合成 Fine Organic Syntheses	3.5	56					5	有机化学 A 上 有机化学 A 下	
		4200221120	精细无机合成 Fine Inorganic Syntheses	3.5	56					5		
		4200218120	计算机与应用化学 Computer and Applied Chemistry	2.5	40		20			5	大学计算机基础	
		4200210120	化学工程基础 Elementary Chemistry Engineering	2	32					6	物理化学 A 上 物理化学 A 下	
		4200023110	化工制图 Chemical Engineering Cartography	2	32					7		
		4200219120	结构化学 A Structural Chemistry A	4	64					4	物理化学 A 上 物理化学 A 下	
		4200268120	仪器分析原理与实验 1 Principles and Experiment of Instrumental Analysis Ⅰ	4	64	24				5	分析化学 A	
		4200269120	仪器分析原理与实验 2 Principles and Experiment of Instrumental Analysis Ⅱ	4.5	72	24				6	有机化学 A 上 有机化学 A 下	
		4200026110	化学反应工程 B Chemical Reaction Engineering B	2	32					7		
		4200220120	精细化学品化学 Fine Chemicals Chemistry	3	48					6	有机化学 A 上 有机化学 A 下	
		小 计 Subtotal		31	496	48	20					

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
	选修课 Elective Courses	4200192120	材料化学导论 Introduction to Material Chemistry	2	32					6		
		4200197120	分离科学与技术导论 Introduction to Separation Science and Technology	2	32					6	分析化学 A	
		4200211120	化学计量学 Chemometrics	2	32					5	分析化学 A	
		4200260120	物性检测技术 Material Property Detection Technology	2	32					7	结构化学 A	
		4200208120	工业化学 Industrial Chemistry	2	32					5		
		4070060110	高分子材料导论 Introduction to Polymer Materials	2	32					7		
		4200271120	应用电化学基础 Fundamentals of Applied Electrochemistry	2	32					5	物理化学 A 上	
		4200216120	计算化学 B Computational Chemistry B	2	32					6	分析化学 A	
		4200193120	电化学测量 Eectrochemical Measurements	2	32					5	应用电化学基础	
		4200237120	生物化学 C Biochemistry C	2	32					6		
		4200282120	组合化学 Combinatorial Chemistry	2	32					7	物理化学 A 上 物理化学 A 下	
		4200217120	计算机化学辅助分子设计 Computer Chemistry and Molecular Design	2	32			16		6	结构化学 A	
		4200207120	工业催化 Industrial Catalysis	2	32					7	物理化学 A 下	
		4200205120	高分子化学及物理 Polymer Chemistry and Physics	4	64					5	有机化学 A 上 有机化学 A 下	
		4200202120	分析仪器 Analytical Instrumentation	2	32					7	大学物理 A 上 大学物理 A 上	
		4200155120	宝石鉴赏 Gem Appreciation	2	32					7		
		4200285120	配位化学 Coordination Chemistry	2	32					7		
		小 计 Subtotal		36	579			16				
		修读说明：要求至少选修 9 学分。 NOTE：Minimum subtotal credits: 9										
个性课程 Personalized Course	选修课 Elective Courses	4200172120	舌尖上的化学 A bite of Chemistry	2	32					3		
		4200177120	电化学实验 Electrochemical Experiments	2	32					6		
		小 计 Subtotal		4	64							
		修读说明：学生可跨专业自主选择修读全校其他专业的课程，建议修读以上课程。要求至少选修 10 学分。 NOTE：Students can choose any courses from the other specialties, and are especially suggested to choose the courses above. Minimum subtotal credits: 10.										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4200222120	精细无机合成实验 Fine Inorganic Syntheses Experiment	2	2	5	
4200224120	精细有机合成实验 Fine Organic Syntheses Experiment	2	2	5	
4080151110	机械制造工程实训 C Machinery Manufacturing Engineering Practice C	2	2	4	
4200230120	认识实习 Cognition Practice	1	1	5	
4200280120	综合实验 1 Comprehensive ExperimentⅠ	4	4	6	
4200281120	综合实验 2 Comprehensive ExperimentⅡ	4	4	7	
4200228120	能力拓展训练 Ability Development Training	3.5	3.5	6	
4200191120	毕业设计 Graduation Design	17	11	8	
小　　计　Subtotal		37.5	31		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term. The course will be arranged by the University Students' Affairs' Department in each school.

生物技术专业本科培养方案
Undergraduate Program for Specialty in Biotechnology

一、业务培养目标

Ⅰ Educational Objectives

本专业培养具备生命科学的基本理论和较系统的生物技术的基本理论、基本知识、基本技能，能在科研机构或高等学校从事科学研究或教学工作，能在工业、医药、食品、农、林、牧、渔、环保、园林等行业的企业、事业和行政管理部门从事与生物技术有关的应用研究、技术开发、生产管理和行政管理等工作的高级专门人才。

The program aims to provide advanced talents with fundamental theory, principle knowledge and basic techniques in life science and biotechnology. The graduates will have opportunity to develop their careers in scientific research organization, higher education institution, pharmaceutical industry, food industry, modern agriculture, environmental protection industry and horticulture as teacher, researcher, administrator, or manager.

二、业务培养要求

Ⅱ Educational Requirement

本专业学生主要学习生物技术方面的基本理论、基本知识，受到应用基础研究和技术开发方面的科学思维和科学实验训练，具有较好的科学素养及初步的教学、研究、开发与管理的基本能力。

毕业生应获得以下几方面的知识和能力：

1．掌握数学、物理、化学等方面的基本理论和基础知识；

2．掌握基础生物学、生物化学、分子生物学、微生物学、基因工程、发酵工程及细胞工程等方面的基本理论、基本知识和基本实验技能，以及生物技术及其产品开发的基本原理和基本方法；

3．了解相近专业的一般原理和知识；

4．熟悉国家生物技术产业政策、知识产权及生物工程安全条例等有关政策和法规；

5．了解生物技术的理论前沿、应用前景和最新发展动态，以及生物技术产业发展状况；

6．掌握资料查询、文献检索及运用现代信息技术获取相关信息的基本方法；具有一定的实验设计，创造实验条件，归纳、整理、分析实验结果，撰写论文，参与学术交流的能力。

7．具有较强的英语综合应用能力，特别是听说能力。在今后工作和社会交往中能用英语进行口头和书面的信息交流，能熟练地进行外文阅读，有一定的科技外语能力。

The program provides the students with fundamental theory and principle knowledge in biological technology, with emphasis on special training in the ability of practice and creation. The students will also develop their ability in teaching, scientific research, management.

Upon graduation, students can:

1.Have background knowledge in mathematics, physics, chemistry, etc；

2.Be familiar with the knowledge system of basic biology, biochemistry, molecular biology, genetic engineering, fermentation engineering and cell engineering technique and so on;

3.Be familiar with the principle and knowledge of biotechnology-related specialties;

4.Familiar with the national policy and law in biological technology, intellectual property right and biological safety;

5.Get to know theory front, application prospect, latest development trend and status of biotechnology;

6.Grasp the basic method for information inquiries, document retrieval and use of modern information technologies to obtain information; Have the ability to design experiments, create experimental conditions, summarize, collate and analyze experimental results, write thesis and participate in academic exchange.

7.Communicate with a foreign language, can understand biological documents in a foreign language.

三、主干学科

Ⅲ Major Disciplines & Major Courses

主干学科：生物学，医学，农学

Major Disciplines: Biology，Medicine, Agriculture

主要课程：微生物学、细胞生物学、遗传学、生物化学、分子生物学、基因工程、细胞工程、生物工程下游技术、发酵工程设备与技术等。

Major Courses: Microbiology, Cell Biology, Genetics, Biochemistry, Molecular Biology, Gene Engineering, Cell Engineering, Down-Stream Technology in Biological Engineering, Fermentation Engineering Equipment and Technology.

四、专业核心课程与专业特色课程

Ⅳ Core Courses and Characteristic Courses

专业核心课程：生物化学、微生物学、分子生物学，细胞工程，生物工程下游技术

Core Courses: Biochemistry, Microbiology, Molecular Biology, Cell Engineering, Down-Stream Technology in Bio-Engineering

专业特色课程：纳米生物技术及应用，发酵工程设备与技术

Characteristic Courses: Nano-Biotechnology and Applications, Fermentation Engineering Equipment and Technology.

五、计划学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration： Four Years

授予学位：理学学士

Degrees Conferred: Bachelor of Science

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 Course Classification / 课程性质 Course Nature	通识课程 Public Basic Courses	学科大类课程 Basic Courses in General Discipline	专业课程 Courses in Specialty	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Extracurricular Credits	总学分 Total Credits
必修课 Required Courses	35	42.5	42	\	24.5	\	190
选修课 Elective Courses	9	2	15	10	\	10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	6	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1060003130	军事理论 Military Theory	1	32			16		1-4		
		1050001130	心理健康教育 Mental Health Education	1	16					1-2		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design(C)	3	48		12			2		
		小 计 Subtotal		37	720		24	64	64			
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses	全校学生要求至少取得 9 学分，建议在每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.									
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										
		科学技术类 Science and Technology Courses										
		艺术体育类 Art and Physical Education Courses										

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4200279120	专业导论 Introduction to Specialty	1	16					1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4200250120	无机化学 C Inorganic Chemistry C	3.5	56					1		
		4200251120	无机化学 C 实验 Inorganic Chemistry Experiment C	0.5	16	16				1		
		4200199120	分析化学 B Analytical Chemistry B	2	32					2		
		4200201120	分析化学 B 实验 Analytical Chemistry Experiment B	1.5	48	48				2		
		4200284120	基础生物学 General Biology	3	48					2		
		4200299120	基础生物学实验 General Biology Experiment	1	32	32				2		
		4200274120	有机化学 C Organic Chemistry C	3	48					2		
		4200275120	有机化学 C 实验 Experiments of Organic Chemistry C	0.5	16	16				2		
		4050023110	大学物理 B Physics B	5.5	88					3		
		4050224110	物理实验 B Physics Lab B	1	32	32				3		
		4200236120	生物化学 A Biochemistry A	4	64					3		
		4200238120	生物化学实验 Biochemistry Experiments	1.5	48	48				3		
		4200256120	物理化学 C Physical Chemistry C	4	64					4		
		4200257120	物理化学 C 实验 Physical Chemistry Experiment C	0.5	16	16				4		
		小 计 Subtotal		42.5	784	208						
	选修课 Elective Courses	4200241120	生物统计学 Biostatistics	2	32					5		
		4200169120	环境生物技术 Environmental Biotechnology	2	32					4		
		4200175120	生物信息技术及应用 Bioinformatics Technology and Applications	2	32		8			4		
		小 计 Subtotal		6	96		8					

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
		修读说明：要求至少选修 2 学分。 NOTE：Minimum subtotal credits: 2.										
专业课程 Specialized Courses	必修课 Required Courses	4200194120	动物生物学及生理学 Animal Biology and Physiology	3	48					3		
		4200195120	动物生物学及生理学实验 Experiment on Animal Biology and Physiology	1	32	32				3		
		4200263120	细胞生物学 Cell Biology	3	48					4		
		4200264120	细胞生物学实验 Cell Biology Experiments	1	32	32				4		
		4200246120	微生物学 A Microbiology A	3	48					4		
		4200247120	微生物学实验 Microbiology Experiments	1	32	32				4		
		4200186120	植物生物学及生理学 Plant Biology and Physiology	3	48	16				4		
		4200203120	分子生物学 Molecular Biology	3	48					5		
		4200204120	分子生物学实验 Molecular Biology Experiments	1	32	32				5		
		4200270120	遗传学 Genetics	2	32					5		
		4200184120	遗传学实验 Genetics Experiments	1	32	32				5		
		4200261120	细胞工程 Cell Engineering	2	32					5		
		4200244120	微生物工程 Microbial Engineering	2	32					5		
		4200245120	微生物工程综合实验 Microbial Engineering Experiments	1	32	32				5		
		4200214120	基因工程 Gene Engineering	2	32					6		
		4200161120	发酵工程设备与技术 Ferment Engineering Equipment and Technology	3.5	56	24				6		
		4200226120	免疫学及免疫检测技术 Immunology and Immune Assay Technology	3	48	16				6		
		4200227120	纳米生物技术及应用 Nano-Biotechnology and Applications	2	32					6		
		4200173120	生物工程下游技术及应用 Down-stream Technology and Applications	3.5	72	32				6		
		4200179120	现代生物技术综合实验 Modern Biotechnology Experiments	1	32	32				7		

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		小 计 Subtotal		42	800	312						
	选修课 Elective Courses	4200232120	生化工程 Biochemical Engineering	2	32					5		
		4200242120	生物仪器分析及应用 Analytic Biological Instruments and Applications	2.5	40	12				5		
		4200212120	化学生物学 Chemical Biology	2	32					6		
		4200265120	新药开发原理与方法 Research Principle and Method of New Medicine	2	32					6		
		4200196120	发育生物学 Development Biology	2	32					6		
		4200298120	高新技术生物企业组织与管理 Hi-tech Biological Industrial Organizations and Management.	1.5	24					7		
		4200233120	生命科学前沿讲座 Frontiers of Life Sciences	1.5	24					7		
		4200235120	生物分子固定化技术与示踪技术 Immobilizing and Tracing Techniques of Biological Molecules	2	32					7		
		4200266120	药事管理学 Pharmacy Administration	2	32					7		
		4200239120	生物技术制药 Biotechnological Pharmaceutics	2	32					7		
		4200171120	基因组学与蛋白质组学 Genomics and Proteomics	2	32					7		
		4200283120	组织学 Histology	2	32					7		
		4200162120	仿生生物技术 Biomimics Biotechnology	2	32					7		
		小 计 Subtotal		25.5	408	12						
		修读说明：要求至少选修 15 学分。 NOTE：Minimum subtotal credits: 15.										
个性课程 Personalized Course	选修课 Elective Courses	4200243120	天然产物提取分离与鉴定技术 Extraction, Preparation and Identification Technology	2.5	40	12				5	生物化学 A	
		4200234120	生物催化技术及应用 Biological Catalytic Technology and Applications	1.5	24					6		
		4200176120	生物医学工程与技术 Biomedical Engineering and Technology	2	32					7		
		小 计 Subtotal		6	96	12						
		修读说明：学生需要修读以上课程至少 4 学分，余下学分可跨专业自主选择修读全校其他专业的课程。要求至少选修 10 学分。 NOTE：Students need to choose the courses above at least 4 credits. For the remaining credits, students can choose any courses from the other specialties. Minimum subtotal credits: 10.										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4200267120	野外实习 Field Practice in Biology	1	1	2(暑期)	
4200240120	生物实验室基本能力培训 Basic Skills Training in Biological Laboratory	1	1	3(分散)	
4200231120	认识实习 Cognition Practice	1	1	3	
4100069110	电工电子实习 B Practice of Electrical Engineering & Electronics B	1	1	4	
4200160120	创新能力训练 Innovative Skills Training	1	1	4(暑期)	
4200262120	细胞工程综合实验 Cell Engineering Experiments	2	2	5	
4200215120	基因工程综合实验 Gene Engineering Experiments	2	2	6	
4200229120	能力拓展训练 Ability Development Training	1	1	6(暑期)	
4200157120	毕业实习 Graduation Practice	2	2	7	
4200190120	毕业设计 Graduation Thesis	17	11	8	
小　　计　Subtotal		32	24.5		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term. The course will be arranged by the University Students' Affairs' Department in each school.

化学工程与工艺专业（卓越工程师班）本科培养方案
Undergraduate Program for Specialty in Chemical Engineering and Technology (Excellent Engineer Class)

一、业务培养目标

Ⅰ Educational Objectives

培养具有扎实的自然科学、人文社会科学和化学工程专业基础，较强的工程实践能力和创新意识，良好的交流、组织能力和团队合作精神，能从事化学工程领域的技术开发、工程设计、生产技术管理等方面的应用型工程师。

The aim is to train application-oriented engineers who have solid foundation on natural science, social science and chemical engineering, strong engineering ability and innovative consciousness, and good communication skills, organizational capacity and teamwork spirit, and can engage in technology develop, engineering design and project management, etc. in the field of chemical engineering.

二、业务培养要求

Ⅱ Educational Requirement

1. 掌握化学工程和化学工艺学科基本理论、基础技术知识、操作技能和工程方法；
2. 掌握化工装置与设备设计方法，掌握化工过程模拟优化方法；
3. 具有对化工新产品、新工艺、新技术和新设备进行研究、开发和设计的初步能力；
4. 熟悉国家对于化工生产、设计、研究与开发、环境保护等方面的方针、政策和法规；
5. 了解化学工程与技术学科的理论前沿，了解新工艺、新技术和新设备的发展动态；
6. 具有创新意识和独立获取新知识的能力；
7. 具有初步的项目和工程管理能力，能运用经济管理和生产管理知识，进行项目预算、生成成本核算，制定生产计划和资源调度等；
8. 具有团队协作精神，参与团队管理、协调团队工作，确保工作进度；
9. 掌握文献检索、资料查询及运用现代信息技术获取相关信息的基本方法；
10. 较好地掌握一门外国语，具有查阅文献的能力，具备熟悉阅读专业书刊和查阅相关专业文献的能力。

1. Students will master basic technical knowledge, skills and engineering methods of chemical engineering and chemical technology.

2. Students will master design methods of chemical technology and equipments, simulation and optimization of chemical process.

3. Students will possess the capability in research and development of chemical products and process, design and magnification of chemical devices.

4. Students will be familiar with the policy and regulations on chemical production, design, research and development, environmental protection.

5. Students will understand the development of chemical engineering and technology and the trend in new technology and devices.

6. Students will possess the sense of creation and innovation and the ability to acquire new knowledge.

7. Students will possess preliminary abilities of project and engineering management and can employ the knowledge of economic management and production management knowledge in project budget, cost accounting of chemical products, drafting production planning and scheduling of resources.

8. Students will possess teamwork spirit to participate in team management and coordinate team work and ensure the work schedule.

9. Students will possess the capability in document searching，data querying and information acquisition, skills of research and practical working.

10. Students will master a foreign language and possess the ability to employ technical resources and literature in foreign text.

三、主干学科

Ⅲ Major Disciplines

主干学科：化学、化学工程与技术

Major Disciplines: Chemistry, Chemical Engineering and Technology

四、专业核心课程与专业特色课程

Ⅳ Core Courses and Characteristic Courses

专业核心课程：物理化学、化工原理、化工热力学、化学反应工程、化工过程分析与综合、化工设计

Core Courses: Physical Chemistry, Principle of Chemical Engineering, Thermal Dynamics of Chemical Engineering, Reaction Engineering of Chemistry, Analysis and Synthesis of Chemical Processes, Chemical Process Design

专业特色课程：化工原理、化学反应工程、化工过程分析与综合、化学工艺学、化工设计

Characteristic Courses: Principle of Chemical Engineering, Reaction Engineering of Chemistry, Analysis and Synthesis of Chemical Processes, Chemical Technology, Chemical Process Design

五、学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration： Four Years

授予学位：工学学士

Degree Granted: Bachelor of Engineer

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 课程性质	通识课程 Public Basic Courses	学科大类课程 Basic Disciplinary Courses	专业课程 Specialized Courses	个性课程 Personalized Course	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	35	49	40	\	31	\	190
选修课 Elective Courses	9	2	14	\	\	10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1050001130	心理健康教育 Psychological health education	1	16					1-2		
		1060003130	军事理论 Military Theory	1	32			16		1-4		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		
		程序设计语言课程组(三选一，3 学分)										
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design(C)	3	48		12			2	大学计算机基础	
		4120024110	计算机程序设计基础(FORTRAN 语言) Fundamentals of Computer Program Design(FORTRAN)	3	48		12			2	大学计算机基础	
		4120025110	计算机程序设计基础(VB 语言) Fundamentals of Computer Program Design(VB)	3	48		12			2	大学计算机基础	
		小　计 Subtotal		35	736		24	64	64			
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses	全校学生要求至少取得 9 学分，建议每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.									
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										
		科学技术类 Science and Technology Courses										

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extracur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		艺术体育类 Art and Physical Education Courses										
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4070234110	专业导论	1	16					1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4080041110	工程图学 B Engineering Graphics B	4	64		4			2		
		4050229110	线性代数 Linear Algebra	2.5	40					2	高等数学 A 下	
		4050058110	概率论与数理统计 B Probability and Mathematics Statistic B	3	48					4	线性代数	
		4050463130	大学物理 B Physics C	5	80					3		
		4050224110	物理实验 B Physics Lab. B	1	32	32				4	物理实验 B	
		4100012110	电工与电子技术基础 C Electrical Engineering C	4	64	10				4		
		4050211110	无机化学 C Inorganic Chemistry C	3.5	56					1		
		4050212110	无机化学 C 实验 Experiment in Inorganic Chemistry C	0.5	16	16				1		
		4050211110	分析化学 C Analysis Chemistry C	1.5	24					2		
		4050212110	分析化学 C 实验 Experiment of Analysis Chemistry C	1	32	32				2		
		4050249110	有机化学 B Organic Chemistry B	4.5	72					3		
		4050250110	有机化学 B 实验 Experiment in Organic Chemistry B	1.5	48	48				3		
		4050217110	物理化学 B 上 Physical Chemistry BⅠ	2.5	40					3		
		4050218110	物理化学 B 下 Physical Chemistry BⅡ	2.5	40					4	物理化学 B 上	
		4050219110	物理化学 B 实验 Experiment of Physical Chemistry B	1	32	32				4		
		小计 Subtotal		49	864	170	4					
	选修课 Elective Courses	4200019110	化工实验设计与数据处理 Test Design and Chemical Engineering Data Processing of Chemical Process	2	32					4		
		4200034110	生物工程概论 Basic Bioengineering	2	32					5		
		4200043110	现代仪器分析 Modern Instrumental Analysis	2	32					6		
		小计 Subtotal		6	96							
		修读说明：要求至少选修 2 学分。 NOTE: Minimum subtotal credits:2										

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
专业课程 Specialized Courses	必修课 Required Courses	4200023110	化工制图 Chemical Cartography	2	32					3	工程图学 B	
		4200021110	化工原理 1 Principles of Chemical Engineering Ⅰ	3	48					4		
		4200022110	化工原理 2 Principles of Chemical Engineering Ⅱ	3	48					5	化工原理 1	
		4200120120	化工原理实验 1 Experiments of Chemical Engineering Principle Ⅰ	1	32	32				4	化工原理 1	
		4200121120	化工原理实验 2 Experiments of Chemical Engineering Principle Ⅱ	1	32	32				5	化工原理 2	
		4200016110	化工热力学 Chemical Engineering Thermodynamics	2.5	40					5		
		4200025110	化学反应工程 A Chemical Reaction Engineering A	3	48					5		
		4200115120	化工设备机械基础 Mechanical Base For Chemical Equipment	3	48					5		
		4200009110	化工安全工程 Safety Engineering in Chemical Engineering	2	32					5		
		4200007110	高分子化学 C Polymer Chemistry C	2	32					5		
		4200088110	化工分离工程 Chemical Separation Engineering	2.5	40					6		
		4200122120	化学工艺学 Chemical Technology	3	48					6		
		4200116110	化工过程分析与综合 A Analysis and Synthesis for Process Engineering A	2.5	40					6		
		4200015110	化工科技文献检索 Literature Searching for Chemical	1	16					6		
		4200138120	专业综合实验 Comprehensive Experiments	2	64	64				7		
		4200291130	化工设计 A Chemical Process Design A	2.5	40					7		
		4200020110	化工仪表及自动化 Chemical Instruments and Automation	2	32					7		
		4200091110	典型化学品生产工艺 Representative Chemical Production Processes	2	32					7 (企业)		
		小 计 Subtotal		40	640	64						
	选修课 Elective Courses	4200093110	企业自主选修课程 Self-elective Courses in Enterprises	2	32					6 (企业)		
		4200004110	反应器设计原理 B Principle of the Reactor Design B	2	32					6	化工设计 A	
		4200008110	工业催化 Industrial Catalysis	2	32					6	化学反应工程 A	
		4200011110	化工传递过程原理 B Theory of Transport Process in Chemical Engineering	2	32					6	化学反应工程 A	
		4200066110	助剂化学及应用 Additive Chemistry and Application	2	32					6		

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including					建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur			
		4200024110	化工专业英语 Specialized English of Chemical Engineering and Technology	2	32					6		
		4200092110	催化剂工程 Catalyst Engineering	2	32					6		
		4200013110	化工过程模拟软件 Software Application for Chemical Process	2	32		20			7		
		4200003110	产品与过程设计原理 Principle of Products and Process Design	2	32					7		
		4200031110	绿色化学与化工 Green Chemistry and Chemical Engineering	2	32					7	化学工艺学	
		4200032110	企业能源管理 Plant Energy Management	2	32					7 (企业)		
		4170075110	技术经济及企业管理 Enterprise Management	2	32					7		
		4200090110	工程项目管理 B Engineering Project Management B	2	32					7 (企业)		
			小 计 Subtotal	26.5	416		20					
		修读说明：要求至少选修 14 学分。 NOTE: Minimum subtotal credits:14.										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4080151110	机械制造工程实训 C Machinery Manufacturing Engineering Practice C	2	2	4	
4200095110	专业实习 Profession Practice	3	3	4（暑期） （企业）	
4200087110	化工原理课程设计 Course Design of Principles of Chemical Industry	2	2	5	化工原理 2
4100069110	电工电子实习 B Practice in Electrical Engineering & Electronics B	1	1	5	
4200113110	工艺流程仿真训练 Simulated Practice of Technological Process	1	1	6（企业）	
4200098110	化工设备机械设计 Mechanical Design of Chemical Equipment	1.5	1.5	6（企业）	
42000971100	工程设计训练 1 Engineering Design Training Ⅰ	2	2	6（企业）	
4200099110	工程设计训练 2 Engineering Design Training Ⅱ	2	2	7（企业）	
4200100110	岗位实习 Job Training	4	4	7（企业）	
4200134120	毕业实习与毕业设计 Practice for Graduation &Graduation Design	17	11	8（企业）	
小 计 Subtotal		38.5	31		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term . The course will be arranged by the University Students' Affairs' Department in each school.

制药工程专业（卓越工程师班）本科培养方案
Undergraduate Program for Specialty in Pharmaceutical Engineering (Excellence Engineer Class)

一、业务培养目标

Ⅰ Educational Objectives

培养能够适应国家经济、科技、社会发展对高素质工程技术人才的要求，满足制药工程领域，特别是医药、农药、精细化工等行业的生产实践需求，具有扎实的专业基础知识，较强的工程能力和创新意识，良好的团队合作精神， 能从事制药工程领域内的生产管理、技术开发、工艺和设备设计、技术改造、经营管理等方面工作的应用型和设计型工程师。

The aim is to train application-oriented engineers who can adapt to the requirements of high-quality engineering and technical personnel due to the development of the national economy, science technology, and society, to satisfy the production practice demands in pharmaceutical engineering, especially in the medicine，pesticides, fine chemical engineering and other industries and have solid professional knowledge, strong engineering ability and innovative consciousness, and good teamwork spirit, and can engage in production management，technology development，process and equipment design，technological innovation and operating management, etc in the field of pharmaceutical engineering.

二、业务培养要求

Ⅱ Educational Requirement

在较熟练和全面掌握化学基础知识的同时，主要学习制药工程方面的基本理论和基本知识，掌握化工单元操作、药物化学、生物化学、药理学、制药工艺学等专业理论知识，并接受化工制药实验技能、工程实践、计算机应用与工程设计方法的基本训练，具有对医药产品的生产、工程设计、新药的研制与开发的能力。

毕业生应获得以下几方面的知识和能力：

1．掌握制药工程基础技术知识、操作技能和工程方法，了解制药工程领域的新产品、新技术、新工艺以及技术发展趋势。

1.1 具有从事制药工程工作所需的工程科学技术知识以及一定的人文和社会科学知识。

1.2 掌握扎实的制药工程的基本理论知识，了解本专业的发展现状和趋势。

1.3 熟悉制药工程领域的技术标准，了解制药行业的相关政策、法律和法规。.

2．具备运用适当的理论和实践方法解决制药工程实际问题的能力，在医药产品设计、药厂车间设计、技术开发、工艺和设备设计、技术改造方面得到系统化训练。

2.1 了解市场、用户的需求变化以及技术发展，具备初步的医药产品开发的策划能力。

2.2 具有较强的医药产品设计和技术革新能力，具有较强的创新意识和初步的技术开发及工艺和设备创新设计的能力。

3．3 具有初步的项目和工程管理能力。

3.1 具有较强的质量、环境、职业健康安全和法律意识，能在法律法规规定的范畴内，按确定的相关标准和程序要求开展工作。

3.2 能运用经济管理知识，具有项目预算和医药产品成本核算的初步能力。

3.3 能运用生产管理知识，具有制定机械产品生产计划和进行生产管理的初步能力。

3.3 具有一定的组织管理能力和进行项目任务分解、人力和资源调度的初步能力。

3.5 具有团队协作精神，参与团队管理、协调团队工作，确保工作进度。

3.6 具备应对危机与突发事件的初步能力。

4．有效的沟通与交流能力和较强的获取知识、终身学习的能力。

4.1 具有较强的表达和沟通能力。

4.2 具有较强的交流能力。

4.3 具有较强的获取知识、终身学习的能力。

5．具备良好道德和较强的责任感。

Students of this major mainly learn basic theories of Chemistry as well as basic theories and knowledge of Pharmaceutical Engineering. They must master professional theories knowledge of chemical units operation, medicinal chemistry, biochemistry, pharmacology and pharmaceutical technology, and have training on chemistry experiment technology, engineering practice, computer application and engineering design methods. They have the ability on producing medicine, engineering design, exploiting and developing new drugs.

Knowledge and abilities must be acquired

1. Students will master basic technical knowledge, skills and engineering methods of pharmaceutical engineering; understanding new products, new technologies, new processes and the developing trend of the technology in the field of pharmaceutical engineering.

1.1 Students will possess knowledge of engineering science required to engage in pharmaceutical engineering and technology and certain knowledge of the humanities and social sciences.

1.2 Students will master solid pharmaceutical engineering basic theoretical knowledge; understanding the development status and trends of this profession.

1.3 Students will familiar with technical standards in the field of pharmaceutical engineering; understand the relevant policies, laws and regulations.

2. Students will possess the ability to solve practical problems in pharmaceutical engineering by employing appropriate theories and practice methods, and acquire systematic training in the area of technology of drug manufacturing, workshop design, technology development, process and equipment design， technological innovation.

2.1 Students will understand the change of the market and customers' requirements and the development of technology, and possess the planning ability of developing the initial pharmaceutical products.

2.2 Students will possess strong pharmaceutical product design and technology innovation ability, and strong innovative consciousness and a preliminary ability of technology development and innovative design of process and equipment

3. Students will possess preliminary abilities of project and engineering management.

3.1 Students will possess strong consciousness of quality, environment, occupational health and safety, and law; and can work according to the relevant standards and procedures within the specified scope of laws and regulations.

3.2 Students can employ knowledge of economic management and possess preliminary abilities of project budget and cost accounting of pharmaceutical products.

3.3 Students can employ production management knowledge and possess preliminary abilities of drafting production planning of mechanical products and production management.

3.4 Students will possess certain organization management skills and preliminary abilities of project task decomposition, scheduling of personnel and resources.

3.5 Students will possess teamwork spirit to participate in team management and coordinate team work and ensure the work schedule.

3.6 Students will possess preliminary abilities to deal with crises and emergencies.

4. Students will possess effective communication skills and strong ability of knowledge acquiring and lifelong learning.

4.1 Students will possess strong expression and communication skills.

4.2 Students will possess strong communication skills.

4.3 Students will possess strong ability of knowledge acquiring and lifelong learning.

5. Students will possess good morals and strong sense of responsibility.

三、主干学科

Ⅲ Major Disciplines & Major Courses

主干学科:化学、药学、制药工程与技术

Major Disciplines: chemistry, pharmaceutical, pharmaceutical engineering and technology

四、专业核心课程及专业特色课程

IV Core Courses and Characteristic Courses

专业核心课程：有机化学、分析化学、物理化学、生物化学、化工原理、药物合成反应、药物化学、药理学、药剂学、天然药物化学、药物分析、制药工艺学、制药工程（药厂专用设备与车间设计）。

Core Courses: Organic chemistry, analytical chemistry, physical chemistry, biochemistry, chemical engineering principles, drug synthesis reaction, medicinal chemistry, pharmacology, pharmacy, natural medicine, chemistry, pharmaceutical analysis, pharmaceutical technology, pharmaceutical engineering(special equipment and plant design for pharmaceutical factory).

专业特色课程：药物化学、制药工艺学、制药工程、药物制剂车间设计与专用设备、药剂学、生物药剂学与药物动力学、药用高分子材料、天然药物化学。

Characteristic Courses：Medicinal Chemistry，pharmaceutical technology，pharmaceutical engineering，pharmaceutical plant design and special equipment，pharmacy，bio-pharmaceutics and pharmacokinetics, medical polymer materials, natural products chemistry.

特色实践环节：能力拓展训练、工程设计训练、生产实习、岗位实习。

Practice characteristics: Ability training, Engineering Design Training, production practice, job internship.

五、计划学制与学位

Ⅴ Length of School and Degree

修业年限：四年

Duration： Four Years

授予学位：工学学士

Degree Granted: Bachelor of Engineer

六、最低毕业学分规定

Ⅵ Graduation Credit Criteria

课程类别 课程性质	通识课程 Public Basic Courses	学科大类课程 Basic Disciplinary Courses	专业课程 Specialized Courses	集中性实践 Practice Courses	课外学分 Study Credit after Class	总学分 Total Credits
必修课 Required Courses	35	48	40.5	33.5	\	190
选修课 Elective Courses	9		14	\	10	

七、课程修读指导建议

Ⅶ Recommendations on Course Studies

八、理论教学建议进程表

Ⅷ Theory Course Schedule

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
通识课程 Public Basic Courses	必修课 Required Courses	4220001110	思想道德修养与法律基础 Morals, Ethics and Fundamentals of Law	3	48			8		1-6		
		4220002110	中国近现代史纲要 Outline of Contemporary and Modern Chinese History	2	32					1-6		
		4220003110	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Zedong Thought and Socialism with Chinese Characteristics	4	96			32		1-6		
		4220005110	马克思主义基本原理 Marxism Philosophy	3	48			8		1-6		
		1060003130	军事理论 Military Theory	1	32			16		1		
		4210001110	体育 1 Physical Education Ⅰ	1	32					1		
		4210002110	体育 2 Physical Education Ⅱ	1	32					2	体育 1	
		4210003110	体育 3 Physical Education Ⅲ	1	32					3	体育 2	
		4210004110	体育 4 Physical Education Ⅳ	1	32					4	体育 3	
		4030002110	大学英语 A1 College English A 1	3	64				16	1		
		4030003110	大学英语 A2 College English A Ⅱ	3	64				16	2	大学英语 A1	
		4030004110	大学英语 A3 College English A Ⅲ	3	64				16	3	大学英语 A2	
		4030005110	大学英语 A4 College English A Ⅳ	3	64				16	4	大学英语 A3	
		4120017110	大学计算机基础 Foundation of Computer	2	32		12			1		
		1050001130	心理健康教育 Mental Health Education	1	16					2		
		程序设计语言课程组(三选一，3 学分)										
		4120023110	计算机程序设计基础(C 语言) Fundamentals of Computer Program Design(C)	3	48		12			2	大学计算机基础	
		4120024110	计算机程序设计基础(FORTRAN 语言) Fundamentals of Computer Program Design(FORTRAN)	3	48		12			2	大学计算机基础	
		4120025110	计算机程序设计基础(VB 语言) Fundamentals of Computer Program Design(VB)	3	48		12			2	大学计算机基础	
		小　计 Subtotal		35	736		24	64	64			
	选修课 Elective Courses	创新创业类 Innovation and Entrepreneurship Courses		全校学生要求至少取得 9 学分，建议每个类别中分别至少选修一门课程。 All students are required to obtain at least nine credits, and suggested to select at least one course in five categories respectively.								
		人文社科类 Arts and Social Science Courses										
		经济管理类 Economy and Management Courses										

课程类别 Course Classification	课程性质 Course Nature	课程编号 Course Number	课程名称 Course Title	学分 Crs	学时分配 Including 总学时 Tot hrs.	实验 Exp.	上机 Operation	实践 Practice	课外 Extra-cur	建议修读学期 Suggested Term	先修课程 Prerequisite Course	第二专业 Second Major
		科学技术类 Science and Technology Courses										
		艺术体育类 Art and Physical Education Courses										
学科大类课程 Basic Disciplinary Courses	必修课 Required Courses	4070234110	专业导论	1	16					1		
		4050063110	高等数学 A 上 Advanced Mathematics AⅠ	5	80					1		
		4050064110	高等数学 A 下 Advanced Mathematics AⅡ	5	80					2	高等数学 A 上	
		4080041110	工程图学 B Engineering Graphics B	4	64		4			2		
		4050229110	线性代数 Linear Algebra	2.5	40					2	高等数学 A 下	
		4050058110	概率论与数理统计 B Probability and Mathematics Statistic B	3	48					4	线性代数	
		4050463130	大学物理 B Physics C	5	80					3		
		4050224110	物理实验 B Physics Lab. B	1	32	32				4	大学物理 B	
		4100012110	电工与电子技术基础 C Electrical Engineering C	4	64	10				4		
		4050211110	无机化学 C Inorganic Chemistry C	3.5	56					1		
		4050212110	无机化学 C 实验 Experiment in Inorganic Chemistry C	0.5	16	16				1		
		4050044110	分析化学 C Analysis Chemistry C	1.5	24					2		
		4050045110	分析化学 C 实验 Experiment of Analysis Chemistry C	1	32	32				2		
		4050251110	有机化学 C Organic Chemistry C	3	48					3		
		4050821130	有机化学 C 实验 Experiment in Organic Chemistry C	1	32	32				3		
		4050220110	物理化学 C Physical Chemistry C	4	64					4		
		4050219110	物理化学 B 实验 Experiment of Physical Chemistry C	1	32	32				4		
		4200023110	化工制图 Chemical Cartography	2	32					3	工程图学 B	
		小 计 Subtotal		48	840	154	4					
专业课程 Specialized Courses	必修课 Required Courses	4200055110	医学基础 Basic Medical	2	32					4		
		4200182130	药物合成基础 Basic of Drug Synthesis	2.5	40					4		
		4200021110	化工原理 1 Principles of Chemical Engineering Ⅰ	3	48					4		
		4200073110	化工原理实验 1 Experiments of Chemical Engineering Principle I	1	32	32				4	化工原理 1	

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including						先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur	建议修读学期 Suggested Term		
		4200022110	化工原理 2 Principles of Chemical Engineering Ⅱ	3	48					5	化工原理 1	
		4200074110	化工原理实验 2 Experiments of Chemical Engineering Principle II	1	32	32				5		
		4200045110	药理学 B Pharmacology B	2.5	40					5		
		4200174130	生物化学 B Biochemistry B	2.5	40					5		
		4200110110	药剂学 Pharmacy	3	48					5		
		4200049110	药物合成反应 B Drug Synthesis Reaction B	3	48					5		
		4200105110	药物分析 Pharmaceutical Analysis	2.5	40					6		
		4200051110	药物化学 Medicinal Chemistry	3	48					6		
		4200040110	天然药物化学 B Medicinal Chemistry of Natural Products A	2.5	40					6		
		4200130120	制药工程基础实验 Basic Experiment of Pharmaceutical	2	64	64				6		
		4200059110	制药工程 B Pharmaceutical Engineering B	2	32					7		
		4200062110	制药工艺学 Pharmaceutical Technology	2	32					7		
		4200138120	专业综合实验 Specialized Integrated Experiment	3	96	96				7		
		小 计 Subtotal		40.5	760							
	选修课 Elective Course	4200064110	中药学 Traditional Chinese Pharmacology	2	32					5		
		4200054110	药用高分子材料 Medical Polymer Materials	2	32					5		
		4200037110	生物药剂学与药物动力学 Biopharmaceutics and pharmacokinetics	2	32					5		
		4200047110	药事管理学与新药研究 Pharmacy Administration & Drug Research	2	32					5		
		4200057110	仪器分析与波谱解析 B Instrument Analysis and Spectrum Analysis B	2	32					5		
		4200052110	药物设计学 The Principle of Drug Design	2	32					6		
		4200108110	药物制剂设计与工艺 Pharmaceutical Design and Technology	2	32					6		
		4200050110	药物合成设计 Drug Synthesis Design	2	32					6		
		4200038110	生药学 Raw Pharmacognostics	2	32					6		
		4200036110	生物技术药物 Biotech Drugs	2	32					6		

课程类别 Course Classifi-cation	课程性质 Course Nature	课程编号 Course Number	课 程 名 称 Course Title	学分 Crs	学时分配 Including						先修课程 Prerequisite Course	第二专业 Second Major
					总学时 Tot hrs.	实验 Exp.	上机 Ope-ration	实践 Prac-tice	课外 Extra-cur	建议修读学期 Suggested Term		
		4200168130	化工仪表与自动化 Chemical Instrumentation & Automation	2	32					6 (企业)		
		4200288130	生产计划与控制 Production Planning and Control	2	32					6 (企业)		
		4200104110	制药分离工程 Pharmaceutical Separation Engineering	2	32					7		
		4200065110	中药制剂分析 Traditional Chinese Medicine Analysis	2	32					7		
		4200042110	微生物学 C Microbiology C	2	32					7		
		4200060110	制药工程前沿 Pharmaceutical Engineering Frontier	2	32					7		
		4200061110	制药工程专业外语 Pharmaceutical Engineering Foreign Languages	2	32					7		
		4200063110	制药过程安全与环保 Pharmaceutical Process Safety and Environment Protection	2	32					7 (企业)		
		4200289130	医药企业管理 Pharmaceutical Enterprise Management	2	32					7 (企业)		
		4200053110	药物制剂车间设计与专用设备 Pharmaceutical Apparatus and Worksho	2	32					7 (企业)		
		4200046110	药品生产质量管理工程 Good Manufacturing Engineering	2	32					7 (企业)		
		小 计 Subtotal		42	672							
		修读说明：要求至少选修 14 学分。 NOTE: Minimum subtotal credits:14										

九、集中性实践教学环节建议进程表

Ⅸ Practice Schedule

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
1060002110	军事训练 Military Training	3	1.5	1	
4080151110	机械制造工程实训 C（金工实训） Machinery Manufacturing Engineering Practice C	2	2	4	
4200106110	生产实习 Productive Practice	3	3	4 暑期（企业）	
4100069110	电工电子实习 B Practice in Electrical Engineering & Electronics B	1	1	5	
4200087110	化工原理课程设计 Chemical Principles of Curriculum Design	2	2	5	
4200113110	工艺流程仿真训练 Simulated Practice of Technological Process	2	1	6（企业）	

课程编号 Course Number	实践环节名称 Practice Courses Name	周数 Weeks	学分 Crs	建议修读学期 Suggested Term	第二专业 Second Major
4200136120	制药工程车间设计 Pharmaceutical Engineering Workshop Design	1	1	6（企业）	
4200012110	岗位实习 Job Training	7	7	6 暑期（3 周）+7（4 周）（企业）	
4200143110	工程设计训练 1 Engineering Design Training （I）	2	2	6 (企业)	
4200145110	工程设计训练 2 Engineering Design Training （II）	2	2	7（企业）	
4200159130	毕业实习与毕业设计（毕业论文） Graduation Practice and Graduation Project (thesis)	17	11	8 (企业)	
小　　计　Subtotal		42	33.5		

十、其它要求

Ⅹ Other Demands

《形势与政策》课程，平均每学期 16 学时，一般按专题进行，在第七学期末考核，计 2 个课外学分，具体由学校学生发展指导中心负责组织落实。

Situation & Policy, a 16 hours/term with 2 credits course, is taught according to topics and tested at the end of the 7th term . The course will be arranged by the University Students' Affairs' Department in each school.