

# Applied Chemistry

(Grade 2022)

**Course code: 070302**

## **I. Cultivation Objectives**

### 1. General cultivation objective

This program is based on the university's positioning of "Cultivating technically proficient, responsible, international and innovative application-oriented talents", with a focus on building moral values and cultivating talents, adhering to the harmonization of value-oriented, knowledge transfer and capability development. It focuses on analysis and testing, safety and certification, and covers industries such as chemical, food, pharmaceutical, customs, commodity inspection, environmental protection, textile, cosmetics, building materials and petroleum. The Program of Applied Chemistry is dedicated to cultivating theoretical and practical talents with the ability to solve practical problems, and to training graduates with solid theoretical knowledge of chemistry and experimental skills to work in chemistry, chemical engineering and related fields, or to pursue postgraduate studies in chemistry, chemical engineering or other related fields.

- (1). Have the basic theory and strong practical skills required in the field of analysis and testing, safety and certification, and to be able to independently apply professional knowledge to solve practical production problems encountered during the work.
- (2). Be familiar with trends in the chemical and chemical field and have the ability to work in research, development and management in the fields of analysis and testing, safety and certification.
- (3). Be able to continuously update the system of knowledge and improve abilities based on new technologies and methods in chemistry, chemical engineering and other related fields.

### 2. Objective of value guidance

This program takes the spirit of the model worker and the spirit of craftsmanship as values to cultivate the spirit of craftsmanship and nurture people with this spirit. It integrates craftsmanship, engineer values and Ethics in Engineering education into the implementation process of education and teaching, cultivates students to develop a rigorous, meticulous, focused and responsible work attitude, and a philosophy of refinement and perfection. In the process of education will students be cultivated to love the motherland, develop morality, intellect, physique, aesthetics and labour comprehensively, in order to build students good scientific literacy, correct world perspective and values and a strong consciousness of environmental protection. Students will have the ability to adhere to the principles of integrity, quality standards and evaluation norms in their positions of analytical testing and chemical and chemical production, as well as master the necessary information and management techniques, have good information literacy and management skills, and promote the informatization process in China with a broad system perspective on important laws and regulations, supervision, society, environment, industrial safety and economy.

### 3. Five years after graduation, students in this program should achieve the following objectives:

- (1) Have competent in analytical testing, safety and certification, engineering design, operation and maintenance, research and development, and management consultancy related to the field of Applied Chemistry, and have

strong career competencies.

(2) Demonstrate commitment and progress in professional development, have international perspective and lifelong learning skills.

(3) Have the ability to communicate effectively with peers both domestically and internationally and adapt to working independently and in a team environment.

(4) Have good humanistic, socially responsible and ethical qualities.

## **II. Graduation requirements**

According to the 12 basic requirements of the General Standard of China Engineering Education Accreditation Association (CEEAA), the graduation requirements of this program have been formulated in conjunction with the training objectives of the program, and the indicators of each graduation requirement are listed as follows:

1. Engineering knowledge: Have the ability to apply mathematical, natural science, engineering fundamentals and professional knowledge to solve engineering problems in chemistry, chemical and related fields.

2. Analysis of the Problem: Have the ability to apply basic principles of mathematics, natural sciences, and chemical engineering sciences to identify, represent, and analyze engineering problems in the fields of testing, safety and certification, chemical chemistry, and related fields through literature research in order to reach valid conclusions.

3. Design/develop of solutions: Have the ability to design solutions to complex engineering problems in the fields of analytical testing, safety and certification and related areas, to design systems, units (components) or processes to meet specific needs, and to demonstrate innovation in the design process, taking into account social, health, safety, legal, cultural and environmental considerations.

4. Research: Have the ability to apply scientific principles and methods to complex engineering problems in analytical testing, safety and certification and related fields, including the design of experiments, analysis and interpretation of data, and the synthesis of information to reach sound and valid conclusions.

5. Use of modern tools: Have the ability to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for the analysis of complex engineering problems in testing, safety and certification and related areas, including the prediction and simulation of complex engineering problems, and to understand their limitations.

6. Engineering and Society: Be able to undertake sound analysis based on background knowledge of engineering and evaluate the social, health, safety, legal and cultural impacts of professional engineering practice and solutions to complex engineering problems, and understand the responsibilities involved.

7. Environment and Sustainable Development: Be able to understand and evaluate the environmental and social sustainability impacts of engineering practice for complex engineering problems in analytical testing, safety and certification and related fields.

8. Professional Codes: Have good humanities and scientific literacy, social responsibility, and the ability to understand and comply with engineering ethics and codes of practice and responsibilities in the practice of engineering.
9. Individual and team: Demonstrate organizational, presentation, interpersonal and teamwork skills, with the ability to take on the role of individual, team member and leader in a multidisciplinary team context.
10. Communication: Have the ability to communicate effectively with industry peers and the public on complex engineering issues in the chemical, chemical and related fields, including writing reports, briefs design, making presentations, and articulating or responding to instructions. Have an international perspective and the ability to communicate and interact in a cross-cultural context.
11. Project Management: Be able to conduct technical and economic analysis of analytical testing projects, safety and certification projects, propose reasonable solutions, and have certain organizational, management and leadership skills.
12. Spirit and ability of lifelong learning: Have a sense of independent and lifelong learning, with the ability to learn and adapt to development.

### **III. Schooling System**

Four years.

### **IV. Length of Study**

Flexible study period, generally four years, the minimum length of flexibility is not less than three years, the longest not more than six years.

### **V. Requirements for Graduation and Degree Conferring**

In order to graduate, students must complete the minimum number of credits required by the Instructive Cultivation Plan and complete the corresponding extra-curricular arrangements, with a total of at least 164 credits, and will be awarded a Bachelor of Engineering degree if they meet the requirements for the award of a Bachelor's degree.

### **VI. Discipline**

Discipline: chemistry.

### **VII. Core Courses**

Inorganic chemistry, analytical chemistry, organic chemistry, physical chemistry, inorganic chemistry laboratory, analytical chemistry laboratory, organic chemistry laboratory, physical chemistry laboratory, instrumental analysis, principles of chemical engineering, modern separation and analytical techniques, modern synthetic techniques, integrated chemistry laboratory

### **VIII. Course Structure and Course Hours (excluding Extracurricular Class)**

<b>Category</b>	<b>Total Credit</b>	<b>%</b>	<b>Total Course Hours</b>	<b>Theory Learning</b>	<b>Practical Training</b>
Public Fundamental Course	51.5	31	960	880	80
General Education	10	6	160	160	0
Engineering Fundamental Course	11	7	176	160	16
Professional Fundamental Course	26	16	416	416	0
Professional Course	24	15	384	384	0
Professional Practice	40.5	25	1120	0	1120
Total	163	100	3216	2000	1216
<b>Theory: Practical (%)</b>	<b>62:38</b>				

## IX. Teaching schedule (1)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester	
Public Fundamental Course	required	School of Marxism	b1080001	Basic Principles of Marxism	test	3	48	42	6	Autumn 1	
	required	School of Marxism	b1080009	Ethics and the Rule of Law	non-test	3	48	42	6	Autumn 1	
	required	Others	b1110004	Mental Health Education for University Students	non-test	2	32	16	16	Autumn 1	
	required	School of Marxism	b1080006	Outline of Modern Chinese History	non-test	3	48	42	6	Spring 1	
	required	School of Marxism	b1080004	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics I	test	3	48	42	6	Autumn 2	
	required	School of Marxism	b1080007	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics II	test	2	32	28	4	Spring 2	
	required	School of Marxism	----	Situation and Policy (Modules 1 to 4)	non-test	2	32	28	4	Autumn 1 to Spring 2	
	required	School of Marxism	b1080008	Labour Education A	non-test	0.5	16	16		Spring 1	
	required	College of Arts and Sciences	b1020080	Advanced Mathematics A1	test	4	64	64		Autumn 1	
	required	College of Arts and Sciences	b1020081	Advanced Mathematics A2	test	4	64	64		Spring 1	
	required	College of Arts and Sciences	b1020012	Linear Algebra	test	2	32	32		Autumn 2	
	required	College of Arts and Sciences	b1020063	Academic Physics A (Module 2)	test	3	48	48		Spring 1	
	required	College of Arts and Sciences	b1020065	Academic Physics B	test	2	32	32		Autumn 2	
	required	College of Arts and Sciences	b1020111	Academic Physics C	non-test	2	32	0	32	Autumn 2	
	required	College of Arts and Sciences	b1020018	Academic Chinese	non-test	2	32	32		Autumn 1	
	required	Others	b1110003	Military skills	non-test	0.5	2W			Autumn 1	
	required	College of Arts and Sciences	b1110002	Military theory	non-test	0.5	32	32		Spring 1	
	required	College of Physical Education	----	Physical Education I to VI	non-test	3	160	160		Autumn 1 to Autumn 4	
	★ Academic English(Select 1 Module for 10 Credits)	Module A		b1020003	General English III	test	3	48	48		Autumn 1
				b1020004	General English IV	test	3	48	48		Spring 1
				b1020005	General Academic English A	test	2	32	32		Autumn 2
				---	English Knowledge Expansion	non-test	2	32	32		Spring 2
		Module B		b1020002	General English II	test	3	48	48		Autumn 1
				b1020003	General English III	test	3	48	48		Spring 1
				b1020006	General Academic English B	test	2	32	32		Autumn 2
			---	English Knowledge Expansion	non-test	2	32	32		Spring 2	
		Module C		b1020001	General English I	test	4	64	64		Autumn 1
				b1020002	General English II	test	3	48	48		Spring 1
				b1020003	General English III	test	3	48	48		Autumn 2
		★ Academic German	College of Arts and Sciences	b1020040	Academic German I	test	3	48	48		Autumn 1
College of Arts and Sciences			b1020041	Academic German II	test	3	48	48		Spring 1	
College of Arts and Sciences			b1020042	Academic German III	test	4	64	64		Autumn 2	
★ Academic Japanese		College of Arts and Sciences	b1020077	Academic Japanese I	test	3	48	48		Autumn 1	
	College of Arts and Sciences	b1020078	Academic Japanese II	test	3	48	48		Spring 1		
	College of Arts and Sciences	b1020079	Academic Japanese III	test	4	64	64		Autumn 2		
<b>Subtotal (Public Fundamental Course)</b>						<b>51.5</b>	<b>960</b>	<b>880</b>	<b>80</b>		
General Education	selective	Art Education Center	b0----	Aesthetic Education	non-test	2	32	32		Autumn, Spring	
	selective	Each College	b0----	Social Sciences and Humanistic Qualities	non-test	4	64	64		Autumn, Spring	
				Natural Sciences and Technology Innovation	non-test	4	64	64		Autumn, Spring	
<b>Subtotal (General Education)</b>						<b>10</b>	<b>160</b>	<b>160</b>			

(★Note: The first foreign language is 10 credits in total, including 3 languages: Academic English, Academic German and Academic Japanese, choose the appropriate language as required; when Academic English is chosen, please choose the appropriate module in Module A, B, C)

## IX. Teaching schedule (2)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester	
Engineering Fundamental Course	required	Engineering Training	b2013127	Fundamentals of Computer and Information Technology	non-test	2	32	32		Autumn 1	
	required	School of Resources and Environment	b2013192	Chemical Drawing	non-test	2	32	24	8	Spring 2	
	required	School of Resources and Environment	b2013193	Principles of Chemical Engineering (1)	test	3	48	48		Autumn 3	
	required	School of Resources and Environment	b2013194	Principles of Chemical Engineering (2)	test	2	32	32		Spring 3	
	required	School of Resources and Environment	b2022094	Chemical and Chemical Software Fundamentals	non-test	2	32	24	8	Autumn 3	
<b>Subtotal (Engineering Fundamental Course)</b>						<b>11</b>	<b>176</b>	<b>160</b>	<b>16</b>		
Professional Fundamental Course	required	School of Resources and Environment	b2022078	Inorganic Chemistry (1)	test	4	64	64		Autumn 1	
	required	School of Resources and Environment	b2022079	Inorganic Chemistry (2)	test	2	32	32		Spring 1	
	required	School of Resources and Environment	b2022080	Organic Chemistry (1)	test	4	64	64		Autumn 2	
	required	School of Resources and Environment	b2022081	Organic Chemistry (2)	test	2	32	32		Spring 2	
	required	School of Resources and Environment	b2022082	Analytical Chemistry	test	3	48	48		Spring 1	
	required	School of Resources and Environment	b2022083	Physical Chemistry (1)	test	4	64	64		Autumn 2	
	required	School of Resources and Environment	b2022084	Physical Chemistry (2)	test	2	32	32		Spring 2	
	required	School of Resources and Environment	b2022085	Instrumental analysis	test	2	32	32		Autumn 3	
	required	School of Resources and Environment	b2022087	Introduction to the Program of Applied Chemistry	non-test	1	16	16		Autumn 1	
required	School of Resources and Environment	b2013024	Scientific and Technical Paper Writing and Literature Search	non-test	2	32	32		Spring 1		
<b>Subtotal (Professional Fundamental Course)</b>						<b>26</b>	<b>416</b>	<b>416</b>			
Professional Course	required	School of Resources and Environment	b2022090	Modern synthesis technology	test	2	32	32		Autumn 3	
	required	School of Resources and Environment	b2022091	Biochemistry	test	3	48	48		Spring 2	
	required	School of Resources and Environment	b2022092	Modern separation and analysis techniques	test	2	32	32		Spring 3	
	required	School of Resources and Environment	b2013206	Fine-goods chemistry	test	2	32	32		Spring 2	
	required	School of Resources and Environment	b2013207	Sample pre-treatment techniques	test	2	32	32		Autumn 3	
	required	School of Resources and Environment	b2013191	Laboratory Safety and Emergency Management	test	1	16	16		Autumn 1	
	<b>Subtotal (Required Professional Course)</b>						<b>12</b>	<b>192</b>	<b>192</b>		
	Selective 8 credits	Featured professional course A	b2013195		Chemical regulation and safety evaluation	non-test	2	32	32		Autumn 3
			b2013196		Laboratory Accreditation	non-test	2	32	32		Autumn 3
			b2013197		Safe management of hazardous chemicals	non-test	2	32	32		Spring 3
			b2013198		Environmental, Health & Safety Management Systems	non-test	2	32	32		Spring 3
			b2013199		Chemical Process Safety Management	non-test	2	32	32		Autumn 4
		Featured professional course B	b2013208		Food and pharmaceutical analysis and testing	non-test	2	32	32		Autumn 3
			b2013209		Analytical instrument maintenance	non-test	2	32	32		Autumn 3
			b2013200		Environmental monitoring and analysis	non-test	2	32	32		Spring 3
			b2022072		Industrial Analysis	non-test	2	32	32		Spring 3
			b2013210		Analysis and testing of fine chemicals	non-test	2	32	32		Autumn 4
	<b>Subtotal (Featured Professional Course)</b>						<b>8</b>	<b>128</b>	<b>128</b>		
	Selective 4 credits	Expansion professional course	b2022109		Introduction to Environmental Protection and Sustainability	non-test	2	32	32		Spring 3
			b2013201		Cleaner Production and Green Chemistry	non-test	2	32	32		Spring 3
b2013202			Solid waste treatment and disposal	non-test	2	32	32		Autumn 4		
b2013203			Materials Chemistry	non-test	2	32	32		Spring 3		
b2013204			New Energy Technology and Applications	non-test	2	32	32		Autumn 4		
b2013205		Composite materials	non-test	2	32	32		Autumn 4			
<b>Subtotal (Expansion Professional Course)</b>						<b>4</b>	<b>64</b>	<b>64</b>			
<b>Subtotal (Selective Professional Course)</b>						<b>12</b>	<b>192</b>	<b>192</b>			
<b>Subtotal (Professional Course)</b>						<b>24</b>	<b>384</b>	<b>384</b>			

### IX. Teaching schedule (3)

Category	Type	Provided by	Course Code	Course Name	Assessment	Credit	Course Hours	Theory Learning	Practical Training	Recommended semester
Professional Practice	required	School of Resources and Environment	b4000037	the Program of Applied Chemistry Innovation and Entrepreneurship	non-test	2	48		48	Spring 3
	required	Engineering Training	b4090003	Basic Engineering Training C	non-test	2	48		48	Autumn 1
	required	School of Resources and Environment	b4013095	Integrated Chemistry Experiment (1)	non-test	2	48		48	Summer 1
	required	School of Resources and Environment	b4013096	Integrated Chemistry Experiment (2)	non-test	2	48		48	Summer 2
	required	School of Resources and Environment	b4022031	Chemical engineering and process design experiments	non-test	2	48		48	Spring 3
	required	School of Resources and Environment	b4013097	Instrumental Analysis Experiment (1)	non-test	2	48		48	Autumn 3
	required	School of Resources and Environment	b4013098	Instrumental analysis experiments (2)	non-test	1	24		24	Summer 3
	required	School of Resources and Environment	b4013044	Professional Consciousnesses Placement	non-test	1	24		24	Summer 1
	required	School of Resources and Environment	b4013099	Professional Practice for Testing and Certification	non-test	2	48		48	Summer 3
	required	School of Resources and Environment	b4022036	Choice of analysis method and solution design	non-test	2	48		48	Spring 3
	required	School of Resources and Environment	b4022037	Inorganic Chemistry Experiment (1)	non-test	2	48		48	Autumn 1
	required	School of Resources and Environment	b4022038	Inorganic Chemistry Experiment (2)	non-test	1	24		24	Spring 1
	required	School of Resources and Environment	b4022039	Analytical chemistry experiments	non-test	2	48		48	Spring 1
	required	School of Resources and Environment	b4022040	Organic Chemistry Experiment (1)	non-test	2	48		48	Autumn 2
	required	School of Resources and Environment	b4022041	Organic Chemistry Experiment (2)	non-test	1	24		24	Spring 2
	required	School of Resources and Environment	b4022042	Physical Chemistry Experiment (1)	non-test	2	48		48	Autumn 2
	required	School of Resources and Environment	b4022043	Physical Chemistry Experiment (2)	non-test	1	24		24	Spring 2
	required	School of Resources and Environment	b4022044	Chemical Principles Experiment	non-test	2	48		48	Autumn 3
required	School of Resources and Environment	b4022046	Production internships	non-test	3	72		72	Autumn 4	
required	School of Resources and Environment	b4013088	Labour Education B	non-test	0.5	16		16	Spring 1	
required	School of Resources and Environment	b4022027	Applied Chemistry Graduation Internship and Final Design (Thesis)	non-test	6	288		288	Spring 4	
<b>Subtotal (Professional Practice)</b>						<b>40.5</b>	<b>1120</b>		<b>1120</b>	
Extracurricular Class	required	Others	b5110001	Extracurricular Class	non-test	1	-	-	-	Autumn, Spring, Summer
<b>Total</b>						<b>164</b>	<b>3216</b>	<b>2000</b>	<b>1216</b>	

#### \* Explanation of the relevance of professional certificates to the course:

To obtain a professional qualification as a chemical analysis engineer, you need to be familiar with conventional chemical analysis methods, master relevant chemical analysis standards, be proficient in the use of various chemical analysis testing instruments, be able to conduct data analysis and related graphical analysis; have a high degree of responsibility and good communication skills, and have strong learning ability and hands-on skills. Therefore, in the course of teaching, emphasis is placed on teaching key courses such as inorganic chemistry (and experiments), analytical chemistry (and experiments), organic chemistry (and experiments), physical chemistry (and experiments), instrumental analysis (and experiments) and modern instrumental analysis, which will provide students with a solid theoretical and practical foundation for obtaining the junior chemical analysis engineer vocational qualification and effectively improve the employability and vocational ability of graduates of this program.

### X. Credit of Extracurricular Class

Through taking extracurricular classes, students are encouraged to take part in academic lectures, social practice activities, campus cultural and sports activities, innovative and entrepreneurial activities, voluntary activities, etc. to improve their social adaptability and enhance the competitiveness in the job market. Details are specified in Students' Manual.