For entrants in FY 2023

Appended Form 1

Specifications for Major Program

Name of School (Program)

School of Engineering Cluster 3(Applied Chemistry, Biotechnology and Chemical Engineering)

Program name (Japanese)	
(English)	Program of Applied Chemistry

1. Academic degree to be acquired

Bachelor's degree in engineering

2.Outline

While the purpose of science is "pursuit of truth," the purpose of Engineering lies in "pursuit of realization." Applied chemistry is an academic field that deals with systems to realize, by exploiting the power of chemical reactions, new substances with excellent properties and functions, that are desired to be created based on the dreams (ideas) of humankind and social needs.

In the Program of Applied Chemistry, the primary learning & educational goal is to surely acquire the basic sciences, involving chemistry, mathematics, physics, and biology, as well as to develop problem-solving abilities for creating new substances. The above mentioned problem-solving abilities include:

1) Ability to carry out molecular design (design of molecular structures) of new target substances, using full knowledge of chemical reactions, taking into account their influences on society and nature,

2) Ability to actually synthesize new target substances utilizing a knowledge of chemical reactions and experimental methods,

3) Ability to look into the structure of the acquired substances and to analyze their molecular structures, and

4) Ability to accurately assess the physical and chemical properties and influence on the environment of the acquired substances.

The learning & educational goals of this Program also include developing the ability to understand the social responsibilities of engineers, English ability, reading comprehension, the ability to write good texts, the ability to give a presentation, communication skills such as negotiating skills, the ability to consider things multilaterally from a global perspective, the ability to pursue self-development, and creative powers beyond the above knowledge frameworks so that the graduates of this Program can play an full active role in the real world. With many graduates going on to the Pre-doctoral (Master's) Course, the connection of this Program to graduate school education is fully taken into account.

Graduates from this Program are employed mainly by chemicals manufacturers, in such fields as chemistry, fibers, and pharmaceuticals, as well as industrial fields related to electricity, machines, metal, and the environment, and are playing an active role inside and outside of Japan, utilizing the abilities they acquired in this Program.

3.Diploma policies (degree conferment policy & program attainment goals)

The Program of Applied Chemistry shall develop human resources who have acquired basic knowledge, skills, and attitude as professional chemical engineers, and who can demonstrate scientific thinking and creative power.

This Program shall confer a bachelor degree (engineering) on students who have acquired the standard number of credits prescribed in the curriculum and attained the goals described below.

This Program adopts (Ka) ~ (Ko) as attainment goal. The goal of this Program from program registration to graduation is for students to cultivate the basic essentials required of an engineer/researcher, including creative powers and communication skills, as well as expertise related to applied chemistry.

(Ka) To acquire reliable basic knowledge,
(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer,
(Ku) To acquire creative power and design ability,
(Ke) To become independent as a researcher & engineer through continuous self-development, and
(Ko) To acquire communication skills and an international outlook.

Attainment goals from (Ka) to (Ko) shall be achieved by completing the class subjects set for each goal. The content of each attainment goal is as follows:

(Ka) To acquire reliable basic knowledge

Students will acquire a broad basic knowledge and basic specialized knowledge of chemistry in the Liberal Arts Education and Specialized Education as well as advanced expertise in applied chemistry, and will acquire conceptual skills based on logical thinking supported by their acquired knowledge.

(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer

To contribute to society through research and technologies, students will acquire the maturity required to fulfill their responsibilities as a researcher/engineer. To do this, they should cultivate their understanding of technologies and the effect of these technologies on society, acquire knowledge of economy, safety, and reliability of technology, and judgment in utilizing the acquired knowledge from a global perspective.

(Ku) To acquire creative power and design ability

Students will acquire the creative power required to solve diverse problems related to applied chemistry using the acquired knowledge and technologies. They will also develop a sense of ethics as recognized by society, and design skills in research and development, so that they can demonstrate their problem-solving abilities as a researcher/engineer.

(Ke) To become independent as a researcher & engineer through continuous self-development

Students will devise their own methods of information collection, technological improvement, improvement of research methods, analysis and understanding of research results and achievements, in addition to developing their own ability to continue to learn, and actively engage as an independent researcher or engineer, developing the attitude required to make multidimensional approaches toward solving problems.

(Ko) To acquire communication skills and an international outlook

Students will cultivate the ability to make logical descriptions, give presentations, and hold discussions, as well as the ability to collect and convey information from an international perspective. They will simultaneously acquire the international outlook required to handle problems from a global perspective.

4.Curriculum policies (policies for organizing & providing curricula)

To achieve the goals of this Program, after acquiring basic academic abilities and knowledge in Liberal Arts Education Subjects, students are required to study specialized fields in engineering and chemistry. This Program offers a curriculum in which students will take Liberal Arts Education Subjects up to the first semester of the second year, and after being assigned to this Program at the second semester of the second year, they will take Specialized Subjects.

The distinguishing feature of this curriculum is that it classifies Specialized Basic Subjects as a common part in Cluster 3 as “Specialized Basic Subject,” and allows students to take them from the second semester of their first year, at an early time after admission While allowing new students to take Specialized Basic Subjects, their awareness of their own specialized fields and motivation for study will be enhanced, and this curriculum can cultivate students’ knowledge of and interest in peripheral fields by enabling students to attend lectures by faculty members in programs other than Applied Chemistry (Chemical Engineering and Biotechnology).

The following describes the program system consisting of liberal arts education subjects and specialized education subjects which will enable students to achieve the targets from (Ka) to (Ko).

In the curriculum, teaching and learning will be implemented by utilizing active learning and online classes, depending on the delivery methods of the program, such as lectures, practical skill courses and seminars.

In addition to strict grading using the standards clearly outlined in the syllabus, learning outcomes are evaluated based on the degree to which the goals set by the educational program are achieved.

○ Knowledge & understanding

Broad basic knowledge of the liberal arts and specialized education subjects, together with basic expertise in chemistry (achievement target (Ka)). Students acquire this knowledge and expertise while taking liberal arts subjects provided in the 1st and 2nd years such as "Introduction to University Education" and "Introductory Seminar for First-Year Students", area courses and information subjects, Foundation Courses such as "Calculus I"; specialized basic subjects such as "Basic Organic Chemistry I " and "Basic Inorganic Chemistry ", and specialized subjects provided in the 3rd and 4th terms of the 2nd year; and in the 3rd year; such as "Advanced Organic Chemistry I" and "Inorganic Chemistry"

Advanced expertise in applied chemistry (achievement target (Ka)). Students acquire this expertise while taking specialized basic subjects provided in the 1st year; and in the 1st and 2nd terms of the 2nd year; such as "Physical Chemistry I" and "Analytical Chemistry", specialized subjects provided in the 3rd and 4th terms of the 2nd year; and in the 3rd year; such as "Synthetic Polymer Chemistry" and "Physical Chemistry II", and preparation of the "Graduation Thesis" in the 4th year.

Creativity, based on logical thinking together with basic knowledge and expertise (achievement target (Ka)). Students acquire this ability while taking specialized basic subjects provided in the 1st year; and in the 1st and 2nd terms of the 2nd year; such as "Physical Chemistry I", specialized subjects provided in the 3rd and 4th

4th terms of 2nd year; specialized subjects such as "Chemical Experiments I" and "Chemical Experiments II" provided in the 3rd year; and preparation of the "Graduation Thesis" in the 4th year.

The ability to produce logical descriptions, presentations, and discussion in the Japanese language (achievement target (Ko)). Students acquire this ability while taking liberal arts education subjects such as " Introductory Seminar for First-Year Students", peace science courses, area courses provided in the 1st year, " Basic Experiments in Chemistry" provided as a specialized basic subject in the 3rd and 4th terms of 2nd year, specialized subjects such as "Chemical Experiments I" and "Chemical Experiments II" provided in the 3rd year, and preparation of the "Graduation Thesis" in the 4th year.

The ability to collect and transmit information from an international perspective (achievement target (Ko)). Students acquire this ability while taking foreign language subjects provided as liberal arts education subjects such as "Communication IA" and "Basic Foreign Language", "Technical English" provided as a specialized basic subject in the 3rd and 4th terms of 2nd year, and preparation of the "Graduation Thesis" in the 4th year.

The international awareness required for solving problems from a global point of view (achievement target (Ko)). Students acquire this awareness while taking liberal arts education subjects such as "Introductory Seminar for First-Year Students", peace science courses, area courses, and preparation of the "Graduation Thesis" in the 4th year.

5.Start of the program / Admission conditions

○ Start of the Program

Second semester of the second year

Cluster 3 provides a distinctive education into which fields related to Chemistry, Biotechnology and Process Engineering are organically integrated. Specifically, the educational purpose of Cluster 3 is to develop human resources who have acquired a broad integrated basic knowledge in the development of new functional substances and materials, biotechnology of animals, plants, and microorganisms, design and control of chemical processes, environmental conservation and purification, and the development of resources and energy, as well as advanced expertise and technologies. To achieve this, three programs in Applied Chemistry, Biotechnology, and Chemical Engineering are offered in addition to the common-subject basic specialized education to offer Specialized Education related to Chemistry, Biotechnology and Process Engineering, respectively. In Cluster 3, in registering these three programs at the second semester of the second year, students are allowed to choose specialized fields or programs that suit them, in addition to acquiring extensive specialized basic knowledge.

○ Requirements of the number of credits to be obtained

To be assigned to each program, students must obtain more than 16 credits out of a total of 18 credits from required subjects in the Specialized Basic Subjects (excluding Basic Experiments in Chemistry and Technical English), and a total of at least 60 credits (including Liberal Arts Education Subjects).

○ Admission quota for the Program

The Program has an upper limit on the number of students to be accepted. Assignment to the Programs in Applied Chemistry, Biotechnology, and Chemical Engineering shall be decided after considering the applicant’s request and academic achievements.

6.Qualification(s)

A Type-1 High School Teaching License (industry) (Students can obtain the Type-1 High School

9.Graduation thesis (graduation research) (position and method & time of assignment, etc.)

○ Position

The Graduation Thesis is positioned as one of the major subjects in the attainment goals of this educational program listed below.

(Ka) To acquire reliable basic knowledge,

(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer,

(Ku) To acquire creative power and design ability,

(1) Set a research theme, and frame a research plan after exploring the literature and materials related to the theme.

(2) Carry out the research. During the research period, students will receive individual guidance from faculty members as required and research report sessions will be held periodically.

(3) Prepare a graduation thesis.

(4) Give a presentation on the graduation thesis.

(5) Read an English book in turn with other students and exchange opinions, and introduce the abstract of related articles in the form of seminar.

10.Responsibility system

(1) PDCA responsibility system (“Plan,” “Do,” “Check,” and “Act”)

The Program of Applied Chemistry Reviewing Committee (hereinafter, “Program Reviewing Committee”), which is composed of faculty members in charge, shall organize the Liaison Conference among Subjects as its subsidiary organization. These entities engage in planning, implementation, assessing/reviewing, and dealing with matters under their respective jurisdictions. For instance, the Program Reviewing Committee establishes a loop of improvement in the PDCA cycle—For smooth progress of the educational programs (Do), the Committee inspects and assesses the degree of attainment of the learning & educational goals and educational systems (such as methods of education and educational environment) (Check), proposes educational improvements (Act), and establishes learning & educational goals that includes the amount of study and education (Plan). The Committee establishes PD and CA Groups under it so that the PDCA cycle can function smoothly through cooperation between these Groups, and assigns a leader and subleader for each Group to make the responsibility system clearer. The Program has a system in which all faculty members in charge contribute to the Committee in corporation with each other, with the Chair of the Educational Program Reviewing Committee as its main member.

(2) Program assessment

○ Criteria for Program assessment

Whether there is an educational checking system for the Program based on an assessment of the degree to which it has attained the learning & educational goals, whether the system’s mechanism has been disclosed, and whether all activities related to the system have been conducted,

Whether the educational checking system contains a mechanism to take into account social demands and requests from students, and is able to monitor the functions of the educational checking system itself,

Whether the faculty members who are involved in the Program have access to records of meetings of the committees that comprise the educational checking system, and

Whether there is any system to continuously improve the Program based on the results of the educational checks, and whether the related activities are being carried out.

○ Implementing the assessment

The Program Reviewing Committee plays a leading role in assessing and improving the Program. As assessment of this Program, external assessment is made by graduates of the Program of Applied Chemistry and questionnaires on classes and the educational environment are answered by students.

Specific organizations for assessment and improvement of the Program and improvement flows are explained below. The Program Reviewing Committee examines the validity of the Program's learning & educational goals, and evaluates the achievement levels for the learning & educational goals. This Committee requests graduates of the Program of Applied Chemistry to conduct external assessments and for students to answer questionnaires on classes and the educational environment, and then checks the overall education by the Program based on the questionnaires. After checking the validity of the learning & educational goals and the educational environment, the Committee further proposes methods of improving class subjects and class contents when deemed necessary. Cluster 3 is composed of three programs: Applied Chemistry, Chemical Engineering, and Biotechnology. Some subjects offered are shared by the three programs. Requests for checks and improvements to these shared subjects, when deemed necessary, will be proposed to the Cluster 3 Curriculum Reviewing Committee, and will be checked and discussed.

Part-time lecturers and former faculty members conduct external assessment of class subjects and their contents, and using the assessment results as a reference, the committee perform basic checks on whether the class subjects and the class contents are appropriate or not, and draft improvement plans. If further adjustments between subjects and examinations and improvements to contents, the committee will request discussions by the respective Specialized Subject Group Liaison Conferences on organic chemistry related subjects, inorganic & physical chemistry related subjects, experiments related subjects, and liberal arts education related subjects. In each Specialized Subject Group Liaison Conference, concrete measures to improve class subjects and class content will be taken. Detailed improvement plans drafted in the Specialized Subject Group Liaison Conference will be proposed to the Program Reviewing Committee. The Program Reviewing Committee, based on these improvement plans, will formulate comprehensive improvement measures that include the learning & educational goals. The decision on the improvement measures will be taken in the Applied Chemistry Classroom Meeting, and a system to implement the measures has been established. In the School of Engineering, the Self-checking and Evaluation Committee has distributed questionnaires on the assessment of classes by students regularly since fiscal 1993, the assessment results of classes have been notified to each faculty member in charge, and improvements to the class content and methods have been implemented by all faculty members.

○ Idea and method of feedback to students

In this Program, in further developing the Tutor System adopted at this university, requests from students obtained from their tutors are used to improve the Program. To improve classes based on requests from students, faculty members in charge of the relevant classes are asked to improve by devising ways to give their classes based on the results of the questionnaire on classes answered by students.

Cluster 3 Specialized Basic Subjects

Required

Class Subjects	Credits	Type of course registration			Class Hours/ Week																note
		Applied Chemistry	Biotechnology	Chemical engineering	1st grade				2nd grade				3rd grade				4th grade				
					Spring		Fall		Spring		Fall		Spring		Fall		Spring		Fall		
					1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	
Applied Mathematics I	2						4														
Applied Mathematics II	2								4												
Applied Mathematics III	2													4							
Basic Engineering Computer Programming	2								4												
Probability and Statistics	2												4								
Technical English	1											4									
Basic Environmental Sciences	2						4														
Chemical Stoichiometry	2									4											
Basic Organic Chemistry I	2						4														
Basic Organic Chemistry II	2							4													
Physical Chemistry I	2									4											
Biochemistry I	2									4											
Basic Experiments in Chemistry	4										12	12									
Basic Inorganic Chemistry	2						4														
Analytical Chemistry	2								4												
Basic life science	2							4													
Introduction to Applied Chemistry, Chemical Engineering and Biotechnology	2									4											
Introduction to Fundamental Industry	2									4											

Cluster 3 Specialized subjects
Program of Applied Chemistry

Required subjects
○ Compulsory Elective subjects

Class Subjects	Credits	Type of course registration	Class Hours/ Week																Note
			1st grade				2nd grade				3rd grade				4th grade				
			Spring		Fall		Spring		Fall		Spring		Fall		Spring		Fall		
			1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	
Inorganic Chemistry	2											4							
Advanced Organic Chemistry I	2								4										
Exercises in Organic Chemistry	1													4					
Exercises in Physical Chemistry	1													4					
Advanced Organic Chemistry II	2									4									
Physical Chemistry II	2								4										
Chemical Experiments I	4										12	12							
Chemical Experiments II	4												12	12					
Advanced Organic Chemistry III	2										4								
Quantum Chemistry I	2									4									
Quantum Chemistry II	2										4								
Advanced Organic Chemistry IV	2	○											4						
Quantum Chemistry III	2	○											4						
Chemical Kinetics	2	○										4							
Organometallic Chemistry	2	○									4								
Organic Structural Analysis	2	○								4									
Catalysis Chemistry	2	○											4						
Synthetic Polymer Chemistry	2												4						
Physical Chemistry III	2	○										4							
Electrochemistry	2												4						
Solid State Chemistry	2	○							4										
Applied Inorganic Chemistry	1												2						
Industrial Polymer Chemistry	2													4					
Bioorganic Chemistry	2										4								
Chemical Engineering Exercise I	2								4	4									
Chemical Engineering Fundamentals	2								2	2									
Green Technology	2												4						
Recycling engineering	2													4					
Engineering and ethics	2														4				1
Graduation Thesis	5																		

1 Intensive courses

Relationships between the evaluation items and class subjects

					Weighted values of evaluation items in the subject	Weighted values of evaluation items	(2) Weighted values of evaluation items in the subject	Weighted values of evaluation items	(3) Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	Weighted values of evaluation items in the subject	Weighted values of evaluation items	
Liberal Arts Education	Introduction to University Education	2	Required	1semester	20	1												20	1	30	1	30	1							100
Liberal Arts Education	Introductory Seminar for First-Year Students	2	Required	1semester	5	1	5	1	5	1	10	1	10	1	10	1			15	1	10	1	10	1	10	1	10	1		100
Liberal Arts Education	Peace Science Courses	2	Elective	1semester															20	1	20	1	20	1	20	1	20	1		100
Liberal Arts Education	Area Courses	8	Elective	1semester	10	1			5	1	10	1	5	1	5	1	5	1	10	1	10	1	15	1	15	1	10	1		100
Liberal Arts Education	Basic English Usage I	1	Required	1semester																					50	1	50	1		100
Liberal Arts Education	Basic English Usage II	1	Required	1semester																					50	1	50	1		100
Liberal Arts Education	CommunicationI	1	Required	1semester																					50	1	50	1		100
Liberal Arts Education	Communication I	1	Required	1semester																					50	1	50	1		100
Liberal Arts Education	Communication II	1	Required	2semester																					50	1	50	1		100
Liberal Arts Education	Communication II	1	Required	2semester																					50	1	50	1		100
Liberal Arts Education	Basic language I	1	Elective	1semester																					50	1	50	1		100
Liberal Arts Education	Basic language II	1	Elective	1semester																					50	1	50	1		100
Liberal Arts Education	Information and Data Science Courses	2	Required	1semester	100	1																								100
Liberal Arts Education	Health and Sports Courses	2	Elective	1semester	100	1																								100
Liberal Arts Education	CalculusI	2	Required	1semester	100	1																								100
Liberal Arts Education	CalculusII	2	Required	2semester	100	1																								100
Liberal Arts Education	Linear AlgebraI	2	Required	1semester	100	1																								100
Liberal Arts Education	Linear AlgebraII	2	Required	2semester	100	1																								100
Liberal Arts Education	General Mechanics I	2	Required	1semester	100	1																								100
Liberal Arts Education	General Mechanics II	2	Required	2semester	100	1																								100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics I	2	Required	3semester	80	1													10	1	10	1								100
Liberal Arts Education	Seminar in Basic Mathematics I	1	Required	1semester	100	1																								100
Liberal Arts Education	Seminar in Basic Mathematics II	1	Elective	2semester	100	1																								100
Liberal Arts Education	Experimental Methods and Laboratory Work in Biology I	2	Elective	2semester	100	1																								100
Liberal Arts Education	Basic Electromagnetism	2	Elective	2semester	100	1																								100
Specialized Education	Applied Mathematics I	2	Required	2semester	100	1																								100
Specialized Education	Applied Mathematics II	2	Required	3semester	100	1																								100
Specialized Education	Applied Mathematics III	2	Elective	5semester	100	1																								100
Specialized Education	Basic Engineering Computer Programming	2	Required	3semester	40	1	40	1	20	1																				100
Specialized Education	Probability and Statistics	2	Elective	5semester	100	1																								100
Specialized Education	Technical English	1	Required	4semester																					100	1				100
Specialized Education	Basic Environmental Sciences	2	Elective	3semester	40	1	40	1	20	1																				100
Specialized Education	Chemical Stoichiometry	2	Required	3semester	40	1	40	1	20	1																				100
Specialized Education	Basic Organic Chemistry I	2	Required	2semester	40	1	40	1	20	1																				100
Specialized Education	Basic Organic Chemistry II	2	Elective	2semester	40	1	40	1	20	1																				100
Specialized Education	Physical Chemistry I	2	Required	3semester	40	1	40	1	20	1																				100
Specialized Education	Biochemistry I	2	Required	3semester	40	1	40	1	20	1																				100
Specialized Education	Basic Experiments in Chemistry	4	Required	4semester	20	1	10	1	20	1	10	1	10	1					10	1	10	1	10	1						100
Specialized Education	Basic Inorganic Chemistry	2	Required	2semester	40	1	40	1	20	1																				100
Specialized Education	Analytical Chemistry	2	Required	3semester	40	1	40	1	20	1																				100
Specialized Education	Basic life science	2	Elective	2semester	40	1	20	1	40	1																				100
Specialized Education	Introduction to Applied Chemistry, Chemical Engineering and Biotechnology	2	Elective	3semester	40	1	40	1	20	1																				100
Specialized Education	Introduction to Fundamental Industry	2	Elective	3semester	40	1	20	1	40	1																				100
Specialized Education	Inorganic Chemistry	2	Required	5semester	40	1	40	1	20	1																				100
Specialized Education	Advanced Organic Chemistry I	2	Required	4semester	40	1	40	1	20	1																				100
Specialized Education	Exercises in Organic Chemistry	1	Required	6semester	20	1	20	1	20	1					10	1	10	1	10	1	10	1								100
Specialized Education	Exercises in Physical Chemistry	1	Required	6semester	20	1	20	1	20	1					10	1	10	1	10	1	10	1								100
Specialized Education	Advanced Organic Chemistry II	2	Required	4semester	40	1	40	1	20	1																				100
Specialized Education	Physical Chemistry II	2	Required	4semester	40	1	40	1	20	1																				100
Specialized Education	Chemical Experiments I	4	Required	5semester	20	1	20	1	10	1					10	1	10	1	10	1	10	1	10	1						100
Specialized Education												5semester	5semester																	

Sheet

Curriculum Map of Applied Chemistry

Academic Achievement Evaluation Items		1st grade		2nd grade		3rd grade		4th grade	
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Knowledge and Understading	Wide range of basic knowledge on liberal arts and specialized education, and professional basic knowledge on chemistry.	Introduction to University Education	CalculusII	Experimental Methods and Laboratory Work in Physics I	Basic Experiments in Chemistry	Inorganic Chemistry	Exercises in Organic Chemistry		
		Introductory Seminar for First-Year Students	Linear AlgebraII	Applied Mathematics II	Advanced Organic Chemistry I	Chemical Experiments I	Exercises in Physical Chemistry		
		Area Courses	General Mechanics II	Basic Engineering Computer Programming	Advanced Organic Chemistry II	Advanced Organic Chemistry III	Chemical Experiments II		
		Information and Data Science Courses ◎	Seminar in Basic Mathematics II	Chemical Stoichiometry	Physical Chemistry II	Quantum Chemistry II	Synthetic Polymer Chemistry		
		CalculusI	Experimental Methods and Laboratory Work in Biology I	Physical Chemistry I	Quantum Chemistry I	Chemical Kinetics	Advanced Organic Chemistry IV		
		Linear AlgebraI ◎	Basic Electromagnetism	Biochemistry I	Organic Structural Analysis	Organometallic Chemistry	Quantum Chemistry III		
		General Mechanics I	Applied Mathematics I	Analytical Chemistry	Solid State Chemistry	Physical Chemistry III	Catalysis Chemistry		
		Seminar in Basic Mathematics I	Basic Organic Chemistry I	Introduction to Applied Chemistry, Chemical Engineering and Biotechnology					
			Basic Inorganic Chemistry	Introduction to Fundamental Industry					
			Basic Environmental Sciences						
			Basic life science						
			Basic Organic Chemistry II ○						
	Advanced technical knowledge of applied chemistry.		Basic Organic Chemistry I	Physical Chemistry I	Advanced Organic Chemistry I	Inorganic Chemistry	Synthetic Polymer Chemistry	Graduation Thesis	Graduation Thesis
			Basic Inorganic Chemistry	Analytical Chemistry	Advanced Organic Chemistry II	Advanced Organic Chemistry III			
				Basic Organic Chemistry II	Physical Chemistry II	Quantum Chemistry II			
				Introduction to Applied Chemistry, Chemical Engineering and Biotechnology					
				Introduction to Fundamental Industry	Quantum Chemistry I				
	The conception ability based on logical thinking supported by basic and technical knowledge.	Introductory Seminar for First-Year Students	Basic Organic Chemistry I	Physical Chemistry I	Advanced Organic Chemistry I	Inorganic Chemistry	Exercises in Organic Chemistry	Graduation Thesis	Graduation Thesis
		Area Courses	Basic Inorganic Chemistry	Biochemistry I	Advanced Organic Chemistry II	Advanced Organic Chemistry III	Exercises in Physical Chemistry		
				Chemical Stoichiometry	Physical Chemistry II	Quantum Chemistry II	Chemical Experiments II		
				Analytical Chemistry	Quantum Chemistry I	Chemical Experiments I	Synthetic Polymer Chemis	e20C a Tal Introduction to University Education	
Abilities and Skills	The quality to be able to understand technologies and their social effects, and to fullfill the resopnsibility as researchers engineers to contribute to society.								
	The knowledge on economy, safety and reliability of technologies, and the judgment ability to utilize them from global point of view.								
	Creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills.								
	Socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher engineer.		Area Courses					Graduation Thesis	Graduation Thesis
		Area Courses						Engineering and ethics	
Comprehensive Abilities	Self-motivating and continuous learning ability	Introduction to University Education	Area Courses	Experimental Methods and Laboratory Work in Physics I	Basic Experiments in Chemistry	Chemical Experiments I	Chemical Experiments II	Graduation Thesis	Graduation Thesis
		Introductory Seminar for First-Year Students					Exercises in Organic Chemistry		
		Peace Science Courses					Exercises in Physical Chemistry		
		Area Courses							
	Attitudes actively trying to take multiple approaches for solving problems as an independent researcher or engineer utilizing the following items: information collection, skill improvement, development of research methods, analysis and understanding of research outcomes and results.	Introduction to University Education	Area Courses	Experimental Methods and Laboratory Work in Physics I	Basic Experiments in Chemistry	Chemical Experiments I	Chemical Experiments II	Graduation Thesis	Graduation Thesis
		Introductory Seminar for First-Year Students					Exercises in Organic Chemistry		
		Peace Science Courses					Exercises in Physical Chemistry		
		Area Courses							
	Abilities for logical description, presentation, and discussion in Japanese language.	Introductory Seminar for First-Year Students	Area Courses		Basic Experiments in Chemistry	Chemical Experiments I	Chemical Experiments II	Graduation Thesis	Graduation Thesis
		Peace Science Courses							
		Area Courses							
	Ability to collect and send information from international views.	Basic English Usage I							
		Basic English Usage II							
		Communication I	Communication II		Technical English			Graduation Thesis	Graduation Thesis
		Communication IB	Communication IIB						
		Basic language I							
		Basic language II							
	International sense to deal with problems from global perspectives.	Introductory Seminar for First-Year Students	Area Courses					Graduation Thesis	Graduation Thesis
		Peace Science Courses							
		Area Courses							

Ex Liberal Arts Education Basic Specialized Subjects Specialized Subjects Graduation Thesi Required Compulsory elective Free electi