F□□□□□□□□□ FY 2021

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 to acquire 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). Academic achievement is evaluated based on the grade scores for subjects and the level of achievement against the target defined for the educational program.

| . Q R Z O H G J H X Q G H U V W D Q G L Q J

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

õ Abilities & skills

experience of industrial safety)

Boiler Handling Supervisors (Graduates of Faculty of Engineering who successfully studied subjects related to boilers at the university, and who have received at least one year or two years of on-the-job training for handling boilers after graduation can take the license examination for class-1 boiler experts, or license examination for special class boiler experts, respectively.)

Hazardous Materials Engineers (Graduates of this Program who have at least six months' practical experience after graduation can take the class A hazardous materials engineer's qualification examination.)

Poisonous Substances Handling Supervisors (All graduates of this Program qualify.)

7.Class subjects and class content

* See t K H 7 D E O H R I 5 H J L V W U D W L R Q 6 W D Q G D U G V R Q $ W W D F K H G 6 K H
* See the syllabus announced in each fiscal year for class contents.

8.Academic achievements

At the end of each semester, evaluation criteria will be shown with a clear indication of attainment levels according to the evaluation items for academic achievements.

Students' learning outcomes from admission to the current semester will be indicated as one of three levels: "Excellent," "Very Good," and "Good," based on evaluation criteria calculated by adding the weighted values to numerically converted evaluations of their academic achievements (S = 4, A = 3, B = 2, and C= 1) in each subject being evaluated.

Evaluation of academic achievement	Converted values
S (Excellent: 90 points or higher)	4
A (Superior: 80 – 89 points)	3
B (Good: 70 – 79 points)	2
C (Fair: 60 – 69 points)	1

Academic achievement	Evaluation criteria
Excellent	3.00 – 4.00
Very Good	2.00 – 2.99
Good	1.00 – 1.99

* See the relationships between evaluation items and evaluation criteria on Attached Sheet 2.
* See the relationships between evaluation items and class subjects on Attached Sheet 3.
* See the Curriculum Map on Attached Sheet 4.

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

| 3 R V L W L R Q

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

(4) Give a presentation on the graduation thesis.

5HDG DQ (QJOLVK ERRN LQ WXUQ ZLWK RWKHU VWXGHQWV DQG related articles in the form of seminar.

10. 5HVSRQVLELOLW\ V\VWHP

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

The Program of Applied Chemistry 5HYLHZLQJ &RPPLWWHH KHUHLQDIWHU 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 3URJUDP 5HYLHZLQJ &RPPLWWHH HVWDEOLVKHV D OHRS 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 &RPPLWWHH LQ FRUSRUDWLRQ ZLWK HDFK RWKHU ZLWK WKH & Committee as its main member.

(2) Program assessment

| &ULWHULD IRU 3URJUDP DVVHVVPHQW

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.

| ,PSOHPHQWLQJ WKH DVVHVVPHQW

7KH 3URJUDP 5HYLHZLQJ &RPPLWWHH SOD\V D OHDGLQJ UROH L 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 H[SODLQHG EHORZ 7KH 3URJUDP 5HYLHZLQJ &RPPLWWHH H[DPLQH 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:

Cluster 3 (Applied Chemistry, Biotechnology and Chemical Engineering)

E, Required subject (period of registration specified)
E• Compulsory elective subject (any of these subjects shall be registered
Eg Free elective subject (any of these subjects shall be registered)

Subject Type				Required No. of credits	Class subjects	No. of credits	Type of course registration	Year in which the subject is taken (The lower figure means semester) H Note 1H											
								1st grade				2nd grade				3rd grade			
								Spring		Fall		Spring		Fall		Spring		Fall	
								1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T
Liberal Arts Education Subjects	Peace Science Courses			2		2	Compulsory elective		E•										
	Basic Courses in University Education	Introduction to University Education		2	Introduction to University Education	2	Required	E,											
		Introductory Seminar for First-Year Students		2	Introductory Seminar for First-Year Students	2	Required	E,											
	Common Subjects	Area Courses		4	Courses in Arts and Humanities/Social Sc	2	Compulsory elective	E•		E•									
				4	Courses in Natural Sciences	2			E•		E•								
		Foreign Languages	English (Note2 GB‰	Basic English Usage 2	Basic English Usage I	1	Required												
					Basic English Usage II	1													
				Communication I 2	Communication IA	1	Required	E,	E,										
					Communication IB	1		E,	E,										
				Communication Bi 2	Communication IIA	1	Required			E,	E,								
					Communication IIB	1				E,	E,								
			Initial Foreign Languages (Select one language from German, French, Spanish, Russian, Chinese, Korean and Arabic)	2	1 subjects from Basic language I	1	Compulsory elective	E•											
					1 subjects from Basic language II	1			E•										
		Information and Data Science Courses		2	Introduction to Information and Data Sciencies	2	Required		=										
		Health and Sports Courses		2		1or2	Compulsory elective	E•	E•	E•	E•								
		Basic Subjects		15	Calculus I	2	Required	=											
					Calculus II	2				E,									
					Linear Algebra I	2			E,										
					Linear Algebra II	2					E,								
					General FMechanics I	2			E,										
					General FMechanics II	2					E,								
					Experimental Methods and Laboratory Work in Physics I	1						E,							
					Experimental Methods and Laboratory Work in Physics II	1							E,						
					Seminar in Basic Mathematics I	1			E,										
				1	Seminar in Basic Mathematics II	1	Compulsory elective				E•								
					Experimental Methods and Laboratory Work in Biology I H Note 4H	1				E•									
					Experimental Methods and Laboratory Work in Biology II	1					E•								
					Basic Electromagnetism	2					E•								
	Free elective subjects			2	From all Subject Type		Free elective	Eg	Eg	Eg	Eg	Eg	Eg	Eg	Eg				
	No. of credits required for graduation			44															

Note 1H When students fail to acquire the credit during the term or semester marked with E,H E•H Egn the boxes for the year in which the course is taken, they can take the course in subsequent terms or semesters. Depending on class subject, courses may be offered in semesters or terms different from those scheduled. Please be sure to check the time schedule for Liberal Arts Education subjects to be issued every school year.

Note 2H The credit obtained by mastery of "English-speaking Countries Field Research" or self-directed study of "Online Seminar in English A GB‰ cannot be counted towards the credit necessary for graduation. The credit obtained by Overseas Language Training can be recognized as Communication B or Bi if application is made in advance. For more details, please refer to the article on English in Liberal Arts Education in

Note 3H We have a recognition of credit system for foreign language proficiency tests. For more details, please refer to the article on English in Liberal Arts Education in the student handbook.

Note 4H Students must take both FÊExperimental Methods and Laboratory Work H%1credit H aÃd FÊExperimental Methods and Laboratory Work H%H% H1credit H FÃ

Cluster 3 Specialized Basic Subjects

Required

Class Subjects	Credits	Type of course registration			Class Hours/ Week																note
		Applied Chemistry	Biotechnology	Chemical enneenering	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
HProgram of Applied ChemistryH

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																		

B 1 Intensive courses

Academic Achievements in Chemical Engineering

The Relationship between Evaluation Items and Evaluation Criteria

Academic achievements		Evaluation criteria			
Evaluation items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	Wide range of basic knowledge on liberal arts and specialized education, and professional basic knowledge on chemistry.	Acquiring the wide range of basic knowledge on liberal arts and specialized education, and professional basic knowledge on chemistry, and being able to explain them.	Acquiring the wide range of basic knowledge on liberal arts and specialized education, and professional basic knowledge on chemistry.	Acquiring the outline of wide range of basic knowledge on liberal arts and specialized education, and professional basic knowledge on chemistry.
	(2)	Advanced technical knowledge of applied chemistry.	Acquiring the advanced technical knowledge of applied chemistry and being able to explain it.	Acquiring advanced technical knowledge of applied chemistry.	Acquiring the outlines of advanced technical knowledge of applied chemistry.
	(3)	The conception ability based on logical thinking supported by basic and technical knowledge.	Acquiring the conception ability based on logical thinking supported by basic and technical knowledge and being able to explain them.	Acquiring the conception ability based on logical thinking supported by basic and technical knowledge.	Acquiring the outline of conception ability based on logical thinking supported by basic and technical knowledge.
Abilities and Skills	(1)	The quality to be able to understand technologies and their social effects, and to fullfill the resopnsibility as researchers í engineers to contribute	Acquring the quality to be able to understand technologies and their social effects, and fullfill the resopnsibility as researchers í engineers to contribute to society. Being able to explain them.	Acquring the quality to be able to understand technologies and their social effects, and fullfill the resopnsibility as researchers í engineers to contribute to society.	Acquring the outline of the quality to be able to understand technologies and their social effects, and fullfill the resopnsibility as researchers í engineers to contribute to society.
	(2)	The knowledge on economy, safety and reliability of technologies, and the judgment ability to utilize them from global point of view.	Acquiring the knowledge on economy, safety and reliability of technologies and the judgment ability to utilize them from global point of view, and being able to explain them.	Acquiring the knowledge on economy, safety and reliability of technologies and the judgment ability to utilize them from global point of view.	Acquiring the outline of the knowledge on economy, safety and reliability of technologies and the judgment ability to utilize them from global point of view.
	(3)	Creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills	Acquiring the creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills, and to be able to explain it.	Acquiring the creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills.	Acquiring the outline of the creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills.
	(4)	Socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher í engineer	Acquiring the socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher í engineer, and to be able to explain them.	Acquiring the socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher í engineer.	Acquiring the outline of the socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher í engineer.
Comprehensive Abilities	(1)	Self-motivating and continuous learning ability	Acquiring self-motivating and continuous learning ability and to be able to explain it.	Acquiring self-motivating and continuous learning ability.	Acquiring the outline of self-motivating and continuous learning ability.
	(2)	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	Aquireing 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. Also, to be able to explain these items.	Aquireing 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.	Aquireing the outline of 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.
	(3)	Abilities for logical description, presentation, and discussion in Japanese language.	Aquiring the abilities for logical description, presentation, and discussion in Japanese language, and to be able to explain these abilities.	Aquiring the abilities for logical description, presentation, and discussion in Japanese language.	Aquiring the outline of abilities for logical description, presentation, and discussion in Japanese language.
	(4)	Ability to collect and send information from international views.	Acquiring the ability to collect and send information from international views and being able to explain that	Acquiring the ability to collect and send information from international views.	Acquiring the outline of ability to collect and send information from international views.
	(5)	International sense to deal with problems from global perspectives.	Acquiring the international sence to deal with problems from global perspectives and being able to explain it	Acquiring the international sence to deal with problems from global perspectives.	Acquiring the outline of international sence to deal with problems from global perspectives.

Placement of the Liberal Arts Education in the Major Program

Liberal arts education in this Program creates the academic foundations for a specialized education, encourages a self -motivatin g and independent attitude, cultivates scientific thinking based on the ability to gather information·analytical capacity·critical thinking, establishes a viewpoint to give a deep insight into the nature and background of things from a broad perspective, strengthens students' language skills and their interest in peace suitable for living as an international person, integrates students' extensive knowledge into a

Relationships between the evaluation items and class subjects

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

Curriculum Map of Applied Chemistry

Academic Achievement	Evaluation Items	1st grade Spring	1st grade Fall	2nd grade Spring	2nd grade Fall	3rd grade Spring	3rd grade Fall	4th grade Spring	4th grade 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 H E,H Introductory Seminar for First-Year Students H E,H Area Courses H E•H Information and Data Science Courses H E•H Calculus I H E,H Linear Algebra I H=H General Mechanics I H E,H Seminar in Basic Mathematics I H E,H	Calculus II H E,H Linear Algebra II H E,H General Mechanics II H E,H Seminar in Basic Mathematics II H E•H Experimental Methods and Laboratory Work in Biology I Ob,Bi,H E•H Basic Electromagnetism H E•H Applied Mathematics I H E,H Basic Organic Chemistry I H E,H Basic Inorganic Chemistry H E,H Basic Environmental Sciences H E•H Basic life science H E•H	Experimental Methods and Laboratory Work in Physics I Ob,Bi,H E•H Applied Mathematics II H E,H Basic Engineering Computer Programming H E,H Chemical Stoichiometry H E,H Physical Chemistry I H E,H Biochemistry I H E,H Analytical Chemistry H E,H Basic Organic Chemistry II H E•H Introduction to Applied Chemistry, Chemical Engineering and Biotechnology H E•H Introduction to Fundamental Industry H E•H	Basic Experiments in Chemistry H E,H Advanced Organic Chemistry I H E,H Advanced Organic Chemistry II H E,H Physical Chemistry II H E,H Quantum Chemistry I H E,H	Inorganic Chemistry H E,H Chemical Experiments I H E,H Advanced Organic Chemistry III H E,H Quantum Chemistry II H E,H Synthetic Polymer Chemistry H E,H Chemical Kinetics H E•H Organometallic Chemistry H E•H Organic Structural Analysis H E•H Physical Chemistry III H E•H Solid State Chemistry H E•H	Exercises in Organic Chemistry H E,H Exercises in Physical Chemistry H E,H Chemical Experiments II H E,H Advanced Organic Chemistry IV H E•H Quantum Chemistry III H E•H Catalysis Chemistry H E•H		
	Advanced technical knowledge of applied chemistry.		Basic Organic Chemistry I H E,H Basic Inorganic Chemistry H E,H	Physical Chemistry I H E,H Analytical Chemistry H E,H Basic Organic Chemistry II H E•H Introduction to Applied Chemistry, Chemical Engineering and Biotechnology H E•H Introduction to Fundamental Industry H E•H	Advanced Organic Chemistry I H E,H Advanced Organic Chemistry II H E,H Physical Chemistry II H E,H Quantum Chemistry I H E,H	Inorganic Chemistry H E,H Advanced Organic Chemistry III H E,H Quantum Chemistry II H E,H Synthetic Polymer Chemistry H E,H		Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	The conception ability based on logical thinking supported by basic and technical knowledge.	Introductory Seminar for First-Year Students H E,H Area Courses H E•H	Basic Organic Chemistry I H E,H Basic Inorganic Chemistry H E,H	Physical Chemistry I H E,H Biochemistry I H E,H Chemical Stoichiometry H E,H Analytical Chemistry H E,H Basic Organic Chemistry II H E•H	Advanced Organic Chemistry I H E,H Advanced Organic Chemistry II H E,H Physical Chemistry II H E,H Quantum Chemistry I H E,H	Inorganic Chemistry H E,H Advanced Organic Chemistry III H E,H Quantum Chemistry II H E,H Synthetic Polymer Chemistry H E,H Chemical Experiments I H E,H	Exercises in Organic Chemistry H E,H Exercises in Physical Chemistry H E,H Chemical Experiments II H E,H	Graduation Thesis >& Ô>' Engineering and ethics H E,H	Graduation Thesis >& Ô>'
Abilities and Skills	The quality to be able to understand technologies and their social effects, and to fullfill the resopnsibility as researchers G‰engineers to contribute to society.	Introductory Seminar for First-Year Students H E,H Area Courses H E•H	Area Courses H E•H	Basic Experiments in Chemistry H E,H				Graduation Thesis >& Ô>' Engineering and ethics H E,H	Graduation Thesis >& Ô>'
	The knowledge on economy, safety and reliability of technologies, and the judgment ability to utilize them from global point of view.	Introductory Seminar for First-Year Students H E,H Area Courses H E•H	Area Courses H E•H	Basic Experiments in Chemistry H E,H				Graduation Thesis >& Ô>' Engineering and ethics H E,H	Graduation Thesis >& Ô>'
	Creativity to solve various problems related to applied chemistry utilizing acquired knowledge and skills.	Introductory Seminar for First-Year Students H E,H Area Courses H E•H	Area Courses H E•H			Chemical Experiments I H E,H	Chemical Experiments II H E,H Exercises in Organic Chemistry H E,H Exercises in Physical Chemistry H E,H	Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	Socially acceptable sense of moral and designing ability of research and development, which allow demonstrating the ability to solve issues as a researcher G‰engineer.	Introduction to University Education H E,H Area Courses H E•H	Area Courses H E•H					Graduation Thesis >& Ô>' Engineering and ethics H E,H	Graduation Thesis >& Ô>'
Comprehensive Abilities	Self-motivating and continuous learning ability	Introduction to University Education H E,H Introductory Seminar for First-Year Students H E,H Peace Science Courses H E,H Area Courses H E•H	Area Courses H E•H	Experimental Methods and Laboratory Work in Physics I Ob,Bi,H E•H Basic Experiments in Chemistry H E,H		Chemical Experiments I H E,H	Chemical Experiments II H E,H Exercises in Organic Chemistry H E,H Exercises in Physical Chemistry H E,H	Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	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 H E,H Introductory Seminar for First-Year Students H E,H Peace Science Courses H E,H Area Courses H E•H	Area Courses H E•H	Experimental Methods and Laboratory Work in Physics I Ob,Bi,H E•H Basic Experiments in Chemistry H E,H		Chemical Experiments I H E,H	Chemical Experiments II H E,H Exercises in Organic Chemistry H E,H Exercises in Physical Chemistry H E,H	Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	Abilities for logical description, presentation, and discussion in Japanese language.	Introductory Seminar for First-Year Students H E,H Peace Science Courses H E,H Area Courses H E•H	Area Courses H E•H	Basic Experiments in Chemistry H E,H		Chemical Experiments I H E,H	Chemical Experiments II H E,H	Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	Ability to collect and send information from international views.	Basic English Usage I H E,H Basic English Usage II H E,H Communication I H H E,H Communication IB H E,H Basic language I H E•H Basic language II H E•H	Communication II H H E,H Communication IIB H E,H	Technical English H E,H				Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'
	International sense to deal with problems from global perspectives.	Introductory Seminar for First-Year Students H E,H Peace Science Courses H E,H Area Courses H E•H	Area Courses H E•H					Graduation Thesis >& Ô>'	Graduation Thesis >& Ô>'

H ExH Liberal Arts Education | Basic Specialized Subjects | Specialized Subjects | Graduation Thesi | H E,Required | H E•Compulsory elective | H EgHree electi