Specifications for Major Program

○ Knowledge & understanding

○ Admission quota for the Program

* See the Table of Registration Standards on Attached Sheet 1 for class subjects.

○ Position

○ Time and method of assignment

○ Method of assignment

Chemistry, Chemical Engineering and Biotechnology" lectures and the orientation concerning assignment. After the number of acceptable students by each laboratory is shown, students, who can begin their graduation thesis, will be assigned according to their requests. However, since only a limited number of students can be accepted, the assignment may be adjusted.

○ Guidance on preparing a graduation thesis

Although different academic advisors have different methods of giving academic guidance, the process is generally as follows:

(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— 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.

( ) 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 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

- Implementing the assessment
  - The Program Reviewing Committee plays a leading role in assessing and imp

Cluster 3 (Applied Chemistry, Biotechnology and Chemical Engineering)

Required subject (period of registration specified)
○ Compulsory elective subject (any of these subjects shall be registered
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) Note 1															
								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
Liberal Arts Education Subjects	Peace Science Courses			2		2	Compulsory elective		○														
	Basic Courses in University Education	Introduction to University Education		2	Introduction to University Education	2	Required																
		Introductory Seminar for First-Year Students		2	Introductory Seminar for First-Year Students	2	Required																
	Common Subjects	Area Courses		4	Courses in Arts and Humanities/Social Sc	2	Compulsory elective	○		○													
				4	Courses in Natural Sciences	2			○		○												
		Foreign Languages	English (Note2 3)	Basic English Usage	2	Basic English Usage I	1	Required															
						Basic English Usage II	1																
				Communication I	2	Communication IA	1	Required															
						Communication IB	1																
				Communication	2	Communication IIA	1	Required															
						Communication IIB	1																
			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	○															
					1 subjects from Basic language II	1			○														
		Information and Data Science Courses		2	Note 4 Elements of Information Literacy or Exercise in Information Literacy	2	Compulsory elective		○														
		Health and Sports Courses		2		1or2	Compulsory elective	○	○	○	○												
	Basic Subjects			15	Calculus I	2	Required																
					Calculus II	2																	
					Linear Algebra I	2																	
					Linear Algebra II	2																	
					General Mechanics I	2																	
					General Mechanics II	2																	
					Experimental Methods and Laboratory Work in Physics I	1																	
					Experimental Methods and Laboratory Work in Physics II	1																	
					Seminar in Basic Mathematics I	1																	
				1	Seminar in Basic Mathematics II	1	Compulsory elective				○												
					Experimental Methods and Laboratory Work in Biology I Note 5	1				○													
					Experimental Methods and Laboratory Work in Biology II	1					○												
					Basic Electromagnetism	2					○												
	Free elective subjects			2	From all Subject Type		Free elective																
	No. of credits required for graduation			44																			

Note 1 When students fail to acquire the credit during the term or semester marked with ○ in 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 2 The credit obtained by mastery of "English-speaking Countries Field Research" or self-directed study of "Online Seminar in English A B" cannot be counted towards the credit necessary for graduation. The credit obtained by Overseas Language Training can be recognized as Communication or if application is made in advance. For more details, please refer to the article on English in Liberal Arts Education in

Note 3 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 4 Students must take "Elements of Information Literacy" provided in the first semester. You can take the "Exercise in Information Literacy" provided in the second semester only if you fail to obtain credit for "Information Utilization Basics."

Note 5 Students must take both Experimental Methods and Laboratory Work 1credit and Experimental Methods and Laboratory Work

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	2	3T	4T	1	2	3	4	1	2	3	4	
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	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

Sheet

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 engineers to contribute	Acquring the quality to be able to understand technologies and their social effects, and fullfill the resopnsibility as researchers 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 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 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 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 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 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 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-motivating 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 system

Relationships between the evaluation items and class subjects

Subject type	Class subjects	credits	Type of course registration	Period	Evaluation items																										Total weighted values of evaluation items
					Knowledge and Understanding						Abilities and Skills								Comprehensive Abilities													
					(1)		(2)		(3)		(1)		(2)		(3)		(4)		(1)		(2)		(3)		(4)		(5)			
					Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	Weighted values of evaluation items	Weighted values of evaluation items in the ...	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 Courses	2	Elective	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-II	2	Required	1semester	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-II	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	6semester																					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	3semester	40	1	40	1	20	1																					100
Specialized Education	Basic Organic Chemistry II	2	Elective	3semester	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	3semester	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	5semester	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	Chemical Experiments II	4	Required	6semester	20	1	20	1	10	1					10	1	10	1	10	1	10	1	10	1							100
Specialized Education	Advanced Organic Chemistry III	2	Required	5semester	40	1	40	1	20	1																					100
Specialized Education	Quantum Chemistry I	2	Required	4semester	40	1	40	1	20	1																					100
Specialized Education	Quantum Chemistry II	2	Required	5semester	40	1	40	1	20	1																					100
Specialized Education	Advanced Organic Chemistry IV	2	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Quantum Chemistry III	2	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Chemical Kinetics	2	Elective	5semester	40	1	40	1	20	1																					100
Specialized Education	Organometallic Chemistry	2	Elective	5semester	40	1	40	1	20	1																					100
Specialized Education	Organic Structural Analysis	2	Elective	5semester	40	1	40	1	20	1																					100
Specialized Education	Catalysis Chemistry	2	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Synthetic Polymer Chemistry	2	Required	5semester	40	1	40	1	20	1																					100
Specialized Education	Physical Chemistry III	2	Elective	5semester	40	1	40	1	20	1																					100
Specialized Education	Electrochemistry	2	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Solid State Chemistry	2	Elective	5semester	40	1	40	1	20	1																					100
Specialized Education	Applied Inorganic Chemistry	1	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Industrial Polymer Chemistry	2	Elective	6semester	40	1	40	1	20	1																					100
Specialized Education	Bioorganic Chemistry	2	Elective	5semester	40	1	20	1	40	1																					100
Specialized Education	Chemical Engineering Exercise I	2	Elective	4semester	40	1	20	1	40	1																					100
Specialized Education	Chemical Engineering Fundamentals	2	Elective	4semester	40	1	20	1	40	1																					100
Specialized Education	Green Technology	2	Elective	6semester	40	1	20	1	40	1																					100
Specialized Education	Recycling engineering	2	Elective	6semester	40	1	20	1	40	1																					100
Specialized Education	Engineering and ethics	2	Required	7semester							40	1	30	1			30	1													100
Specialized Education	Graduation Thesis	5	Required	7,8semester			10	1	5	1	10	1	5	1	20	1	20	1	10	1	5	1	5	1	5	1	5	1			100

Sheet

Curriculum Map of Applied Chemistry