# For entrants in FY 2022

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### Cluster 3 (Applied Chemistry, Biotechnology and Chemical Engineering

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	No. of credits required for graduation																							

- 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 is
- 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 both Experimental Methods and Laboratory WorkI in Physics I 1credit and Experimental Methods and Laboratory WorkII in Physics II 1credit .
- Note 5: Experimental Methods and Laboratory Work in Biology I should basically be taken together with Experimental Methods and Laboratory Work in Biology II. Person who took Methods and Laboratory Work in Biology I can take Experimental Methods and Laboratory Work in Biology II.

# Required

	Credits	Applied Chemistry Biotechnolog	y Chemical enneenering	1 1T	rade Fa 3T				grad Fa 3T	all	1T	2T	3T	4T	Sp	4th gring 2T	
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

Г	Compulsory Elective subjects  Class Hours/ Week																		
	<b>'0</b>	course									п —					th g			
Class Subjects	Credits	of co						nd g			1	Ť	rad		_	Not e			
	Ö	Type of course registration		ing				ing			Spr		Fa			ring			
Inorganic Chemistry	11 21 31 41		41	11	2T	31	41	11	4	31	41	11	21	31	41				
Advanced Organic Chemistry I	2								4			_							
Exercises in Organic Chemistry	1								-					4					
Exercises in Physical Chemistry	1													4					
Advanced Organic Chemistry II	2									4				1					
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	1								
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																		

<sup>1</sup> 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									
e and nding	(1)	liberal arts and specialized education, and professional basic knowledge on	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.									
Knowledge and Understanding	(2)		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.									
Kno	(3)	thinking supported by basic and	Acquiring the conception ability based on logical thinking supported by basic and technical knowledge and being able to explain them.	knowledge.	Acquiring the outline of conception ability based on logical thinking supported by basic and technical knowledge.									
	(1)	technologies and their social effects, and to fullfill the resopnsibility as	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 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.									
and Skills	(2)	The knowledge on economy, safety and reliability of technologies, and the judgment ability to utilize them from	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.									
Abilities a	(3)	related to applied chemistry utilizing	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)	development, which allow	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.	designing ability of research and development,	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.									
	(1)	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.									
Comprehensive Abilities	(2)	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.									
mprehe	(3)	Abilities for logical description, presentation, and discussion in	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.									
్రి	(4)	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)		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

	Weighted values of evaluatio	(2)  ightse Values of evaluatio	Weightse d values evalue	ted of Weightse	Weighted values of evaluatio	d volues	Weighted values of evaluatio	d voluce	Weighted values of evaluatio	Weightse d values	Weighted values of evaluatio	d volues		dwalnes	Weighted values of evaluatio	d voluce	Weighted values of evaluatio	d volues	Weighted values of evaluatio	Weightse d values	Weighted values of evaluatio	Weightse d values	
	n items of eval	n items	of evaluatio n items in the subje	of evaluation	n items	of evaluatio n items	n items	of evaluatio	evaluatio n items in the subject	of evaluatio n items	n items	of	n items in the	of evaluatio	n items in the	of evaluatio	n items in the subject	of evaluatio n items	n items in the subject	of evaluatio n items	n items in the	of evaluatio n items	
Liberal Arts Education Introduction to University Education 2 Required Isomosti	subject 11 to	1	subje		subject		subject		subject		20	1	subject 30	1	subject 30	1	subject		subject		subject		100
Liberal Arts Education laundaring Senians for Firet Year Students 2 Required International Control of the Contr	- 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 Immunit	10	1	5	1	10	1	5	1	5	1	5	1	20 10	1	20 10	1	20 15	1	20 15	1	20 10	1	100 100
Liberal Arts Education Basic English Usage I 1 Required 1 semsest				-		-		-	-	-		-		-		-		-	50	1	50	1	100
Liberal Arts Education Basic English Usage II 1 Required Immand																			50	1	50	1	100
Liberal Arts Education Communication 1 Required 1 sensest																			50	1	50	1	100
Liberal Arts Education Communication I 1 Required 1 summer  Liberal Arts Education Communication II 1 Required 2 summers																			50 50	1	50 50	1	100 100
Liberal Arts Education Communication II 1 Required 2 memors																			50	1	50	1	100
Liberal Arts Education Basic language I 1 Elective 1 semant																			50	1	50	1	100
Liberal Arts Education Basic language II 1 Elective 1 summers																			50	1	50	1	100
Liberal Arts Education Information and Data Science Courses 2 Required 1 termsest  Liberal Arts Education Health and Sports Courses 2 Elective 1 termsest		1																					100 100
Liberal Arts Education CalculusI 2 Required 1 senses		1																					100
Liberal Arts Education Calculus II 2 Required 2-semsest	100	1																					100
Liberal Arts Education Linear Algebra  2 Required 1 semsest		1																					100
Liberal Arts Education Linear AlgebraII 2 Required Zumansi  Liberal Arts Education Conoral Machanics I 2 Required termons		1																					100
Liberal Arts Education General Mechanics I 2 Required temment  Liberal Arts Education General Mechanics II 2 Required 2 Properties 1 Required 2 Properties 2 Prop		1																					100 100
Liberal Arts Education Engenteened Methods and Liberary Work in Physical 2 Required Sourmanni		1											10	1	10	1							100
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Specialized Education Applied Mathematics II 2 Required Summers	100	1																					100
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Specialized Education Basic Engineering Computer Programming 2 Required Summans		1 40	1 2	) 1																			100
Specialized Education Probability and Statistics 2 Elective Summerst  Specialized Education Technical English 1 Required 4summerst	100	1																	100	1			100 100
Specialized Education Basic Environmental Sciences 2 Elective 300 manual	- 40	1 40	1 2	) 1																			100
Specialized Education Chemical Stoichiometry 2 Required 3wemness	- 40	1 40	1 2	1																			100
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Specialized Education Biochemistry I 2 Required 30cmans		1 40	1 2																				100
Specialized Education Basic Experiments in Chemistry 4 Required 4-vermons	- 20	1 10	1 2	1	10	1	10	1					10	1	10	1	10	1					100
Specialized Education Basic Inorganic Chemistry 2 Required 2-semantal Processing Process		1 40	1 2																				100
Specialized Education Analytical Chemistry 2 Required Summers  Specialized Education Basic life science 2 Elective 2 Summers		1 40 1 20	1 2																				100 100
Specialized Education		1 40	1 2																				100
Specialized Education Introduction to Fundamental Industry 2 Elective Swemness	40	1 20	1 4	1																			100
Specialized Education Inorganic Chemistry 2 Required Summerst		1 40	1 2																				100
Specialized Education Advanced Organic Chemistry I 2 Required Assessment Specialized Education Exercises in Organic Chemistry 1 Required Resembles		1 40	1 2						10		10		10	1	10	,							100
Specialized Education Exercises in Organic Chemistry 1 Required 6wmses		1 20 1 20	1 2							1	10 10	1			10 10	1							100 100
Specialized Education Advanced Organic Chemistry II 2 Required toemsest		1 40	1 2																				100
Specialized Education Physical Chemistry II 2 Required 4 semantal Physical Chemistry II 3 Required 4 semantal Physical Physi		1 40	1 2																				100
Specialized Education Chemical Experiments I 4 Required Summers	- 20	1 20	1 1	) 1					10	1	10	1	10	1	10	1	10	1					100
Specialized Education																							

## Sheet

### **Curriculum Map of Applied Chemistry**

