

Appended Form 1

Specifications for Major Program

Name of School (Program) [School of Engineering Cluster 3 (Applied Chemistry, Biotechnology and Chemical Engineering)]

Program (Japanese)  (English )	name	生物工学プログラム
		Program of Biotechnology
1. Academic Degree to be Acquired		
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<p>2. Overview</p> <p>In order to contribute to the advancement of the key industries that will play a role in the next generation, such as medicine, food, and environment, this program aims at developing engineers and researchers that possess professional expertise and technical skills in the elucidation and utilization of biological molecules and living organisms. Therefore, this program establishes a curriculum through which students can organically and systematically acquire comprehensive knowledge of the basic mechanisms of life and technical skills in the most-advanced fields, such as gene, protein, carbohydrate, and lipid engineering; microorganism, animal, and plant engineering; biochemical engineering; bioinformatics engineering; environmental biotechnology; immunology; and brewing technology. Students can also acquire the different abilities required for researchers and engineers, such as the ability to think logically, the ability to plan and conduct experiments, the ability to explain data analysis, the ability to discover and resolve the problems, and the ability to deal with practical issues. This program awards the Type-1 High School Teaching License (Industry) to students who have taken the required courses. Graduates gain employment and work actively for corporations in the pharmaceutical, food, brewing, environmental, and chemical industries, or in public research institutions. Graduates can go to graduate school (Department of Molecular Biotechnology, Graduate School of Advanced Sciences of Matter) to obtain a higher degree of education and undertake research.</p>		

To achieve the goals from (A) to (E) set by this program, the Program of Biotechnology organizes and implements a curriculum in which liberal arts education and specialized education are closely connected. After acquiring basic academic abilities and knowledge in liberal arts education subjects, students must learn the specialized fields of engineering and biotechnology. Students mainly study these subjects until the first and second terms of the second year, and then after the third and fourth terms of the second year, when students are assigned to the program, they mainly study specialized subjects. Learning specialized basic subjects before being assigned to the program is

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Furthermore, receiving lectures by the faculties in charge of programs other than the Program of Biotechnology (Program of Chemical Engineering, Program of Applied Chemistry) provides students with knowledge about surrounding fields. Learning outcomes are evaluated based on the grade calculation for each subject and the level of attainment against the goals set by the educational program.

- Cultivation of understanding about the relationship between people, society, nature, and engineering, as well as an ethical outlook, which forms the basic knowledge that researchers and engineers are required to possess (Goal A).

- Basic knowledge of mathematical theory, physics theory, and experimental methods required of researchers and engineers in natural science (Goal B). This is obtained through mastery of mathematical fundamental subjects such

• General understanding of biotechnology, life science, chemistry, and the basic knowledge required of experts in biotechnology (Goal B, C). This is 2 2

- Mathematical method required of experts in biotechnology (Goal B). This is obtained through mastery of
  - II , and Probability and Statistics to be offered from the third and fourth term of the first year through the second year.

- Abilities and Skills

Experimental Methods and Laboratory

• II

- Overall Abilities

- The ability to organize and analyze information from the literature to discover and resolve practical problems and challenges, and the ability to logically make research plans and carry them out (Goal C, D, E). These are obtained through the following subjects: 2 2 2 2 2
- The ability to organize research results and write logically, including about the significance and validity of the obtained outcome, and to prepare presentation data, present it, and discuss it verbally in an easy-to-understand manner (Goal E). These are obtained through the following subjects: 2 2 2 2 2
- Teamwork ability, leadership ability, and communication ability in group work (Goal E). These are obtained through the following subjects: 2 2 2 2 2
- The ability to read, write, and converse in the English language necessary for conducting research (Goal E). This is obtained through the following subjects: 2 2 2 2 2

##### 5. Program Timing and Acceptance Conditions

- When to start the program: 2500282014-01-17 (September 18, 2014)
  - The school year: 2500282014-01-17 (September 18, 2014) to 2500282014-01-17 (September 18, 2014)
- Cluster 3 offers distinctive education that organically integrates fields related to chemistry, biotechnology, and processes. Specifically, it aims at developing professionals that possess a wide range of basic knowledge about the development of new functional substances and materials, the biotechnology of plants, animals, and microbes, the design and control of chemical process, environmental preservation and bioremediation, and the development of resources and energy, as well as having a high level of expertise and technical skill in a harmonious way. To achieve this aim, in addition to the common subjects and a wide range of specialized basic education, three programs are prepared that provide specialized education about chemistry, biotechnology and processes. These are the Program of Applied Chemistry, the Program of Applied Biotechnology, and the Program of Applied Chemical Engineering.

## 8. Academic Achievements

At the end of each semester, evaluation criteria are applied to each evaluation item and indicate academic

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on evaluation criteria calculated by adding the weighted values to the numerically-converted values of their academic achievements (S = 4, A = 3, B = 2, and C= 1) in each subject being evaluated.

Result Evaluation	Conversion
S (90 points or more)	4
A (80 ~ 89 points)	3
B (70 ~ 79 points)	2

learning conditions of each individual student. The tutors or the Educational Improvement Committee members handle matters comprehensively, which is reflected in the improvement of the program through discussions in the committee.

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区分



grade	3rd grade		4th grade	
	Fall	Spring	Fall	Spring
		FoodProcess Engineering I ( )	Food Process Engineering II( )	Graduation Thesis
		Fermentation process engineeringII( )	Permentation Process Engineering III( )	FermentationProcess Engineering I( )
			Group Discussion of Current Biotechnology Topics( )	
Area Courses ( )				
Technical English		Probability and Statistics ( )	Glystotechnology & Immunotechnology	
Physical Chemistry II ( )		Applied Mathematics III ( )	Molecular BiologyIII	
MicrobiologyI ( )		MicrobiologyII ( )	Genetic and protein engineering	
Molecular biology I ( )		Molecular biology II ( )	Molecular Bioinformatics	
Biochemistry II ( )		BiochemistryIII( )	Biotechnology	
Enzyme Chemistry ( )		Bioorganic Chemistry( )	Advanced Organic Chemistry IV ( )	
Chemical Engineering Fundamentals ( )		Fermentation Technology ( )	Green Technology	
Chemical Engineering Exercise I ( )		Biochemical Engineering( )	Recycling engineering ( )	
		Chemical Kinetics ( )	Food Process Engineering III( )	
		Organic Structural Analysis	Permentation Process Engineering III( )	
		FoodProcess Engineering I ( )		
		Fermentation process engineeringII ( )		
Basic Experiments in Chemistry		Training of Biotechnology I	Experiments on Biotechnology II	Graduation Thesis
Basic Experiments in Chemistry		Training of Biotechnology I	Experiments on Biotechnology II	Graduation Thesis
Technical English		Training of Biotechnology I	Experiments on Biotechnology II	Graduation Thesis
Specialized Subjects		Graduation Thesis	Required	Compulsory elective
				Free elective