

平成30年度入学生対象

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	Applied Molecular & Cellular Biology Program

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For entrants in AY 2018

Appended Form 1

Specifications for Major Program

Name of School (Program) [School of Applied Biological Science comprises]

Program name (Japanese)	
(English)	Applied Molecular & Cellular Biology Program

1 Degree to be obtained: Bachelor of Agriculture

2 Overview

In the five major programs of the School of Applied Biological Science (Integrated Ecoscience Program, Fisheries Biology Program, Animal Science Program, Food Science Program, and Applied Molecular and Cellular Biology Program), the aim is to enable students to acquire a wide range of knowledge and wisdom in the realms of natural and social sciences related to applied biology. Specifically, we provide education that allows students to acquire basic knowledge regarding biotic resources and food production, biotechnology, and protection of the biological environment; gain experience in field science; understand bioethics and engineering ethics; and obtain capabilities in foreign languages such as English and in data processing.

In the Applied Molecular and Cellular Biology Program, education is provided by faculty members belonging to five educational subjects (ecological biochemistry, biological chemistry, microbial chemistry, enzyme chemistry, and immunobiology) to enable students to develop the ability to cast light on the functions of organisms from the perspective of low molecule chemical compounds and biopolymers such as genes and proteins. In this program, furthermore, cells and organelles are characterized as an assembly of organic molecules, and students study the biological phenomena generated by those molecules in a cell and an individual organism. This program covers all organisms, including microorganisms, animals, and plants, and the activities of these organisms in terms of their relationship with the ecosystem. The academic areas that constitute the core of this program include molecular biology, biochemistry, organic chemistry, and immunobiology. Students are permitted to begin their study from the basics, learning theories related to organisms and acquiring the ability to apply their knowledge and skills in areas related to foods and the environment.

In implementing this program, the faculty members of this course constitute a horizontal network and provide education that is oriented towards the application of biology. Individual faculty members in this course have generated research results that are highly valued globally and, therefore, students are enabled to acquire the basic knowledge and skills while, at the same time, experiencing cutting-edge knowledge and broadening their perspective in areas in which this knowledge can be applied.

This program educates students to become experts, who go on to acquire a higher level of expertise in the graduate school after this program, or to become researchers and specialists with an international outlook working in institutions such as the public office for agriculture and fisheries, or in business fields related to foods and chemical/pharmaceutical products.

3 Diploma policy (policy for awarding degrees and goal of the program)

The Applied Molecular and Cellular Biology Program aims to enable students to acquire the basic knowledge, expertise, and skills related to biological phenomena generated by organic molecules, cells, and individual organisms, which constitutes the foundation of applied biology, in order to develop professionals who are capable of working as scientists in such institutions as companies, colleges, and public organizations. Therefore, in this program, the degree of bachelor of agriculture will be awarded to the students who have earned the required credits and certification to satisfy the specified level of achievement, passed the examination that is administered by the School of Applied Biological Science, and acquired the following abilities.

Through the liberal arts education, the student is required to acquire:

1. The ability to study independently, collecting, analyzing, and criticizing data, together with the willingness to demonstrate the use of this ability;
2. Insight from a broad perspective into the essentials and background of phenomena, and the linguistic ability and interest in peace that are required for a citizen of the world;
3. The ability to identify a problem based on broad knowledge, to integrate findings to establish a "knowledge system" that is truly useful for problem solving, and to examine phenomena from a comprehensive perspective; and
4. General and basic knowledge of science that enables the student to develop the knowledge and skills required for application in any of the specialized fields of applied biological science.

Through the specialized education (specialized basic subjects), the student is required to acquire:

5. The ability to understand advanced topics and basic ideas related to organisms and the biosphere;
6. The ability to understand the value, orientation, and relevance to the globalized society of applied biology, and the importance of communication and consensus building related to the application of scientific results; and
7. An understanding of the problems regarding research misconduct, and the importance of research and engineering ethics.

Through the specialized education in this program, the student is required to acquire:

8. Systematic and hierarchical knowledge and understanding regarding the physiology of microorganisms, plants, and animals, and functions of living bodies from the level of molecules and cells to that of the individual organisms and ecosystems;

<p>5</p> <p>29.4.1</p>									
<p>6</p>									
<p>7</p> <p>()</p> <p>S=4 A=3 B=2 C=1</p> <p>(Good) (Excellent) (Very Good)</p> <table border="1" data-bbox="97 1900 632 2047"> <tr> <td>(Excellent)</td> <td>3.00</td> <td>4.00</td> </tr> <tr> <td>(Very Good)</td> <td>2.00</td> <td>2.99</td> </tr> <tr> <td>(Good)</td> <td>1.00</td> <td>1.99</td> </tr> </table>	(Excellent)	3.00	4.00	(Very Good)	2.00	2.99	(Good)	1.00	1.99
(Excellent)	3.00	4.00							
(Very Good)	2.00	2.99							
(Good)	1.00	1.99							

9. Data collection and analysis abilities, and systematic skills for research in academic fields related to molecules, cells, and the functions of living bodies and ecosystems, as well as the ability to practically use and apply these skills; and

10. The ability to apply the knowledge, skills, and attitude that he/she has obtained in an integrated manner, in order to solve problems that he/she identifies, logically express conclusions orally or in writing, and engage in discussion in the study of the functionality of cells and living bodies from the molecular perspective.

4 Curriculum policy (policy for organizing and implementing the curriculum)

To enable students to achieve the targets that have been set for the Applied Molecular and Cellular Biology Program, the curriculum is organized and implemented according to the following policies:

1. Liberal arts education courses aim to impart wide-ranging and in-depth education and general intelligence, and to foster deep humanity with a desire for peace. They also aim to develop practical foreign language abilities, an international perspective, the ability to understand different cultures, and the ability to utilize information and communication. In addition to this, courses in basic subjects are integrated into the liberal arts education in order to develop the basic scientific knowledge and skills required for application in any of the specialized fields of applied biological science.

2. Specialized education courses develop the basic capabilities related to organisms and the biosphere through the "specialized fundamental subjects" that are common to all programs in the School of Applied Biological Science. The courses include overseas exercises, internships, fieldwork, and lectures regarding ethics in science and engineering, in order to develop the imagination and practical basic capabilities required for working in a leading position in the international and/or local community. The courses also aim to develop the ability to understand problems regarding research misconduct, and the importance of research and engineering ethics.

3. The courses in specialized education for this program provide the "specialized subjects" related to such topics as biochemistry, molecular biology, organic chemistry, and immunobiology, in order to understand organisms in an integrated manner. Also, the courses in "exercises" and "experimentation and practice" in related areas are provided in order for students to acquire the skills and attitudes to practically apply and make use of their results. In addition to this, students develop general capabilities for problem solving, including skills for communication, presentation, and practical foreign language abilities, while preparing their "graduation thesis."

4. The achievement in education is evaluated based on the grade scores for the subjects and the achievement level against the target set for this program.

5 Start time and acceptance conditions

The School of Applied Biological Science holds the entrance examination together with the Department of Applied Biological Science. In the first and second semesters of the first year and the first semester of the second year, students mainly take the liberal arts subjects that are common to the whole university (educational seminars, subjects related to peace, package subjects, foreign languages, data processing, area subjects, and subjects related to health and sports). Assignment of students to the Applied Molecular and Cellular Biology Program is conducted in the second semester of the second year.

Students study the basic subjects for one year after entering the university, in order to acquire the basic knowledge required for studying the specialized fields. They then mainly study the specialized basic subjects common to all students of the School of Applied Biological Science in the second semester of the second year. In particular, they take the subjects Laboratory Work in General Chemistry, Laboratory Work in General Physics, and Laboratory Work in General Biology I & II (including computer exercises), since these relate to experimentation, are common to all students of the School of Applied Biological Science, and consist of receiving the basic training in a wide range of experimentation procedures that is commonly required for the students of the School of Applied Biological Science. By the first semester of the second year, students acquire a wide-ranging education, ability in foreign languages such as English, data processing skills, the basic knowledge common to students of the School of Applied Biological Science, and an understanding of bioethics and engineering ethics, in order to allow them to understand the aim and characteristics of each major program and select the most appropriate program.

The School of Applied Biological Science comprises five courses, i.e. the Integrated Ecoscience Course, the Fisheries Biology Course, the Animal Science Course, the Food Science Course, and the Applied Molecular and Cellular Biology Course, and each of these provides an educational program under the same name as its course name, i.e. the Integrated Ecoscience Program, the Fisheries Biology Program, the Animal Science Program, the Food Science Program, and the Applied Molecular and Cellular Biology Program. The student is allocated to one of the five courses based on his/her wishes and level of achievement, according to the "course allocation method" described below. The allocated student takes the program with the name of the course to which he/she is allocated as his/her major program.

(Course allocation method)

Students who are to be allocated to the courses in a given year are allocated to each course proportionally to the number of faculty members, excluding specially appointed faculty members, for each course. In making these calculations, digits after a decimal point are rounded up.

Number of faculty members (as of April 1, 2017):

Integrated Ecoscience Course (12), Fisheries Biology Course (15), Animal Science Course (15), Food Science Course (12), and Applied Molecular and Cellular Biology Course (10)

The student must meet the specified "requirements for allocation to the course" in order to be allocated to the course.

6 Obtainable qualifications

1. Type 1 License for High School Teacher (Science)

90	
80 89	
70 79	
60 69	

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* For details of acquisition of these qualifications, refer to the "Student Handbook."

7 Class subjects and their contents

* For the class subjects, refer to the subject table in Attachment 1. (The subject table is to be attached.)

* For the details of the class subjects, refer to the syllabus that is published for each academic year.

8. Academic achievement

The evaluation criteria are specified for each evaluation item for academic achievement, and the level of achievement against the criteria is given at the end of the semester.

The evaluation score for each evaluation item is converted to a numerical value (S = 4, A = 3, B = 2, and C = 1) and the evaluation standard for academic achievement, from the time the student entered the university to the end of the current semester, is determined using these values while applying weightings. The evaluation standard values correspond to three levels, i.e. Excellent, Very Good, and Good.

Study achievement	Evaluation standard
Excellent	3.00 - 4.00
Very Good	2.00 - 2.99
Good	1.00 - 1.99

Achievement evaluation	Numerical conversion
S (Excellent: 90 or more points)	4
A (Very good: 80 - 89 points)	3
B (Good: 70 - 79 points)	2
C (Passed: 60 - 69 points)	1

* Refer to the relationship between evaluation items and evaluation criteria described in Attachment 2.

* Refer to the relationship between evaluation items and class subjects described in Attachment 3.

* Refer to the curriculum map in Attachment 4.

9. Graduation thesis (graduation research) (meaning, student allocation, timing, etc.)

In graduation research, students study experimental biology in their selected area of study, while directly observing the research activities being conducted by faculty members, in order to organize the basic knowledge of the biology of molecules and cells that they have acquired up to the first semester of the third year. In addition to this, through graduation research, students experience the process of understanding of the situation (comprehension ability and intelligence), identifying problems (analytical ability and insight), and presenting their results (proposal ability and implementation). Students acquire the abilities and skills required to work as experts after their graduation.

Students are allocated to one of five laboratories to conduct their graduate research on the topic that they have been given by their mentor. In their graduation research, students learn the concepts and ethics fundamentally required for research activities, establish a plan for the research, study the methods needed for the research and experiments, and carry out their research under the instruction of their mentor. Furthermore, students review the results obtained in the research and identify targets for further research. Students experience a series of research processes in person, and have the chance to observe cutting-edge research activities. An interim debriefing session is held in each laboratory. In addition, the graduation thesis presentation assembly for whole the program is held before the end of the fourth academic year. The thesis is required to be organized as a booklet.

1. Students are allocated to a laboratory in the second semester of the third year.
2. Students are allocated to a laboratory under the guidance of the tutor in charge, according to the allocation method stipulated for the course.

The tutor holds a guidance seminar for students in their second year to explain the specialties of each faculty member. The tutor also instructs students to attend the presentation assembly for graduation theses and master's theses, in order to understand the details of the research undertaken by each faculty member. A session is held in the first semester of the third year to allow faculty members to explain to students the details of their research and the situation in their laboratory. Students visit laboratories to learn about the details of the graduation thesis and the situation in the laboratories.

The upper and lower limits for the number of students allocated to each laboratory and/or faculty are determined in a course meeting after the tutor in charge discusses it with each faculty member. Students express their wishes and discuss with one another to determine the laboratory to which each student is to be allocated, and then the allocation is approved in the course meeting. In some cases, the tutor adjusts the number of students to be allocated to each laboratory.

10. Responsibility

(1) Responsibility for PDCA (plan, do, check, and act) cycle

1. The education affairs committee of school and the faculty members who provide the lectures are engaged in the "plan" and "do" processes.
2. Each course has responsibility for planning and executing its major program. A chief faculty member is designated as the supervisor of the course.
3. The education affairs committee of the school exercises control over the major programs provided by the

plan (do) (plan) (do) (check) (action)

(check)

(action)

(plan) (do) (check) (action)

(a)

(b)

(c)

school.

4. The education affairs committee of the school consists of five members who are elected from each course, and a chairman who is chosen by the school.
5. The education reform promotion committee is engaged in the process of "check."
6. The education reform promotion committee consists of five members who are elected from each course, a chairman who is chosen by the school, the chairman of the education affairs committee of the school, and an assistant chief of the graduate course.
7. The education reform promotion committee reviews and evaluates the major programs provided in each course, reports the results to the education affairs committee of the school and the courses, and provides advice and recommendations.
8. The course committee that takes the responsibility for execution of the major program is engaged in the process of "act."
9. The course committee and the education affairs committee of the school prepare and execute a plan for improvement taking into consideration the report, advice, and recommendations that are provided by the education reform promotion committee after the "check" process.

The course committee, the education affairs committee of the school, and the education reform promotion committee cooperate with one another to execute their roles with responsibility in the "plan", "do", "check", and "act" cycle in order to improve the education provided by the school.

(2) Evaluation of program

(a) Viewpoint for evaluation of program

The program is evaluated from the viewpoints of "educational effectiveness" and "social effectiveness."

The "educational effectiveness" is evaluated by the effect of the implementation of the program on the educational achievement of students.

The "social effectiveness" is evaluated by the effect of educational achievement in the program on society.

(b) Evaluation method

Achievement in this program is evaluated from the perspectives described above for students in the second semester of the fourth year.

For "educational effectiveness", the results and achievements of the students who took the program are evaluated comprehensively by the group of faculty members who are engaged in the execution of the program. Also, the level of achievement of all the students is evaluated and reviewed.

"Social effectiveness" is evaluated based on such things as the rate of employment in corporations that have a close connection with the contents of this program, and the pass rate in public servant examinations. We regularly request a member of human resources staff from a company that mainly employs students from this program to evaluate the program. In addition to this, we request graduates of this program to evaluate their own achievement and that of the program. The staff working in companies and other graduates are requested to provide evaluation and advice regarding whether the class subjects and their contents in this program had a positive effect on their social activities, whether the contents of the classes appropriately corresponded to changes in science, technology, and society, and any additional class subject that may be required in the future.

(c) Policy and method for feedback to students

The education reform promotion committee regularly conducts surveys and interviews for students to review and evaluate the program, improve the contents of the program, and provide advice and recommendations for improvement.

			Graduation Thesis	6						
			Required subjects: 31 total credits							
			Animal Reproduction	2						
			Biotechnology Topics in Molecular and Cellular Biology	2						
			Food Microbiology	2						
			Plant Nutritional Physiology	2						
			Animal Breeding and Genetics	2						
			Nutrition	2						
			Fish Pathology	2						
			Aquatic biochemistry	2						
			Food Biochemistry	2						
			Food Hygiene	2						
			Food and health sciences	2						
			Aquaculture	2						
			<p>Elective or required subjects: 12 credits are required from a total of 26 credits.</p> <p>(Credits obtained beyond the 12 credits shall be regarded as credits obtained in elective subjects)</p>							
			<p>Elective subjects: At least 13 credits must be obtained. Specialized subjects from other Applied Biological Science programs outside the table can be included in the elective subjects. Up to 12 credits obtained from specialized subjects at another School and from subjects offered by the AIMS Program completed at the dispatch destination can be included in the credits required for graduation. Credits obtained from Liberal Arts Education Subjects and subjects related to the teaching profession cannot be included in the credits required for graduation.</p>							
			Total	128						

[No. of credits required for graduation]

128 credits (Liberal Arts Education Subjects: 48 credits + Basic Specialized Subjects: 24 credits + Specialized Subjects: 56 credits)

Academic achievements of Applied Molecular and Cellular Biology program

Relationships between the evaluation items and evaluation criteria

	Excellent	Very Good	Good
(1) To have and understand the knowledge for considering academically and comprehensively in order to act based on a broad perspective.	The condition of having the basic academic knowledge and advanced comprehension to examine phenomena based on the comprehensive perspective, and having the explanation and application ability on basic	The condition of having the basic academic knowledge and advanced comprehension to examine phenomena based on the comprehensive perspective, and having the explanation ability on the basic academic	The condition of having the basic academic knowledge and comprehension to examine phenomena based on the comprehensive perspective.
(2) To have and understand the basic knowledge required for learning specialties.	The condition of having the basic academic knowledge and advanced comprehension to learn specialties, and having the explanation and application ability on basic academic	The condition of having basic academic knowledge and advanced comprehension to learn specialties, and having the explanation ability on basic academic knowledge.	The condition of having the basic academic knowledge and comprehension to learn specialties.
(3) To have and understand the knowledge of molecules, cells, individual organisms and ecosystem.	The condition of having the basic academic knowledge and advanced comprehension of molecules, cells, individual organisms and ecosystem, and having the explanation and application ability on the knowledge.	The condition of having the basic academic knowledge and advanced comprehension of molecules, cells, individual organisms and ecosystem, and having the explanation ability on the knowledge.	The condition of having the basic academic knowledge and comprehension of molecules, cells, individual organisms and ecosystem.
(1) To acquire the basic communication, information processing and physical ability and skills, which are required for learning specialties.	The condition of having the enough ability and skills of basic communication, information processing and physical activities, and having the enough application	The condition of having the ability and skills of basic communication, information processing and physical activities, and having the application ability.	The condition of having the adequate ability and skills of basic communication, information processing and physical activities.
(2) To acquire the basic experimental ability and skills to learn specialties.	The condition of having the enough basic experiment ability and skills to learn specialties, and having the application	The condition of having the basic experiment ability and skills to learn specialties, and having the application ability.	The condition of having the basic experiment ability and skills to learn specialties.
(3) To acquire the intellectual ability and skills needed to learn molecules, cells, individual organisms, and ecosystem.	The condition of having the enough intellectual ability and skills in academic fields related to molecules, cells, individual organisms and ecosystem, and having the	The condition of having the intellectual ability and skills in academic fields related to molecules, cells, individual organisms and ecosystem, and having the application ability.	The condition of having the intellectual ability and skills in academic fields related to molecules, cells, individual organisms, and ecosystem.
(4) To acquire the basic English language ability needed to read English scientific papers.	The condition of having the basic English language ability, and having the advanced comprehension and explanation ability for scientific papers in a specialty.	The condition of having the basic English language ability, and having the comprehension and explanations ability for scientific papers in a specialty.	The condition of having the basic English language ability, and having the comprehension ability for scientific papers in a specialty.
(1) To acquire the ability for the			

Academic achievements

Evaluation criteria

Academic achievements	Evaluation criteria
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Placement of the Liberal Arts Education in the Major Program

The liberal arts education in this program aims to build the academic foundation required for the specialized education. It develops the ability to study independently and scientific intelligence based on the ability to collect, analyze, and critically examine data. It also enhances insight from a broad perspective into the essentials and background of phenomena, and the linguistic ability and concern about peace that are required of a citizen of the world. It enables students to acquire the ability to integrate their findings in order to establish a "knowledge system" that is truly useful for problem solving, and to examine phenomena from a comprehensive

Subject Classification	Subject Name	Credits	Type of course registration	Grade	Evaluation items																		Total weighted values of evaluation items in the	
					Knowledge and Understanding						Abilities and Skills								Comprehensive Abilities					
					(1)		(2)		(3)		(1)		(2)		(3)		(4)		(1)		(2)			
					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		
Specialized Education	Animal Physiology	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Genetics	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Introduction to Biological Science of Animal	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Introduction to Plant Biological Science	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Biological Statistics	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Biophysical Chemistry	2	Elective/required	semester			50	1					50	1										100
Specialized Education	Public Hygiene	2	Elective/required	5semester			50	1					50	1										100
Specialized Education	Enzyme Protein Chemistry	2	Required	4 semester					80	1												20	1	100
Specialized Education	Molecular Cell Biology	2	Required	4 semester					80	1												20	1	100
Specialized Education	Biopolymer Sciences	2	Required	4 semester					80	1												20	1	100
Specialized Education	Chemical Ecology	2	Required	5semester					80	1												20	1	100
Specialized Education	Immunobiology	2	Required	4 semester					80	1												20	1	100
Specialized Education	Microbial Biochemistry	2	Required	5semester					80	1												20	1	100
Specialized Education	Plant Molecular Biology	2	Required	5semester					80	1												20	1	100
Specialized Education	Mammalian Molecular Biology	2	Required	5semester					80	1												20	1	100
Specialized Education	Animal Cell Technology	2	Required	5semester					80	1												20	1	100
Specialized Education	Chemistry of natural organic compounds	2	Required	4 semester					80	1												20	1	100
Specialized Education	Laboratory Work in Enzyme Chemistry	1	Required	4 semester										80	1							20	1	100
Specialized Education	Laboratory Work in Microbial Biochemistry	1	Required	4 semester										80	1							20	1	100
Specialized Education	Laboratory Work in Ecological Biochemistry	1	Required	5semester										80	1							20	1	100
Specialized Education	Laboratory Work in Immunobiology	1	Required	4 semester										80	1							20	1	100
Specialized Education	Laboratory Work in Biological Chemistry	1	Required	5semester										80	1							20	1	100
Specialized Education	Reading of Foreign Literature	2	Required	5semester						25	1	25	1			25	1					25	1	100
Specialized Education	Graduation Thesis	6	Required	6-8semester				10	1					10	1							80	15	100
Specialized Education	Plant Nutritional Physiology	2	Elective/required	6 semester														50	1	50	1			100
Specialized Education	Animal Breeding and Genetics	2	Elective/required	6 semester														50	1	50	1			100
Specialized Education	Biotechnology	2	Elective/required	5semester														50	1	50	1			100
Specialized Education	Topics in Molecular and Cellular Biology	2	Elective/required	5semester														50	1	50	1			100
Specialized Education	Nutrition	2	Elective/required	6 semester														50	1	50	1			100
Specialized Education	Food Microbiology	2	Elective/required	5semester														50	1	50	1			100
Specialized Education	Fish Pathology	2	Elective/required	6 semester														50	1	50	1			100
Specialized Education	Aquatic biochemistry	2	Elective/required	6 semester														50	1	50	1			100

Subject Classification	Subject Name	Credits	Type of course registration	Grade	Evaluation items																		Total weighted values of evaluation items in the		
					Knowledge and Understanding						Abilities and Skills								Comprehensive Abilities						
					(1)		(2)		(3)		(1)		(2)		(3)		(4)		(1)		(2)				
					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	
Specialized Education	Food and health sciences	2	Elective/required	7 semester																50	1	50	1	100	
Specialized Education	Aquaculture	2	Elective/required	7 semester																	50	1	50	1	100
Specialized Education	Animal Reproduction	2	Elective/required	4 semester																	50	1	50	1	100
Specialized Education	Food Biochemistry	2	Elective/required	6 semester																	50	1	50	1	100
Specialized Education	Food Hygiene	2	Elective/required	6 semester																	50	1	50	1	100

Curriculum Maps of Applied Molecular and Cellular Biology program

Academic achievements Evaluation items	1st grade		2nd grade		3rd grade		4th grade	
	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester
(1) To have and understand the knowledge for considering academically and comprehensively in order to act based on a broad perspective.	Literature/MC/P							
	Peace Science Courses(O)							
	Integrated Courses(O)							
	Area Courses(O)							
	Information Literacy(O)							
	Health and Sports Courses(O)							
	Foreign Languages(O)	Foreign Languages(O)	Foreign Languages(O)	Foreign Languages(O)				
(2) To have and understand the basic knowledge required for learning specialties.	Basic Calculus/Elements of Calculus(O)	Organic Chemistry(O)	Environmental Sciences for Bioreproduction(O)		Public Hygiene(O)			
	Species Biology(O)	Cell Science(O)	Basic Molecular Biology(O)					
	General Chemistry/Basic Concepts of	Introduction to Biochemistry(O)	Laboratory Work in General Biology I II(O)					
	Introduction to Applied Biological Sciences(O)	Agricultural Production Resources(O)	Basic Experiments in Chemistry(O)					
	Introduction to Microbiology(O)	Physics for Applied Biological Science(O)	Laboratory Work in General Physics(O)					
		Ethics of Science and Technology(O)	Ecology(O)					
		Seminar in Field Science(O)	Animal Physiology(O)					
	Experimental Methods and Laboratory Work in Physics(O)		Genetics(O)					
	Experimental Methods and Laboratory Work in Chemistry(O)		Introduction to Biological Science of Animal					
	Experimental Methods and Laboratory Work in Biology(O)		Introduction to Plant Biological Science(O)					
		Biological Statistics(O)						

Knowledge and Understanding

Academic achievements Evaluation items		1st grade		2nd grade		3rd grade		4th grade	
		Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester
(3)To have and understand the knowledge of molecules, cells, individual organisms and ecosystem.				Biophysical Chemistry (○)					
				Enzyme Protein Chemistry (◎)	Microbial Biochemistry (◎)	Graduation Thesis (◎)	Graduation Thesis (◎)	Graduation Thesis (◎)	
				Molecular Cell Biology (◎)	Plant Molecular Biology (◎)				
				Biopolymer Sciences (◎)	Mammalian Molecular Biology (◎)				
				Immunobiology (◎)	Chemical Ecology (◎)				
				Chemistry of natural organic compounds (◎)	Animal Cell Technology (◎)				

Academic achievements		1st grade		2nd grade		3rd grade		4th grade		
		Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	
Ability and Skills	(1) To acquire the basic communication, information processing and physical ability and skills, which are required for learning specialties.	Introductory Seminar for Freshman (◎)				Reading of Foreign Literature (◎)				
		Peace Science Courses (○)								
		Integrated Courses (○)								
		Area Courses (○)								
		Information Literacy (○)								
		Health and Sports Courses (○)								
		Foreign Languages (◎)	Foreign Languages (◎)	Foreign Languages (◎)	Foreign Languages (○)					
	(2) To acquire the basic experimental ability and skills to learn specialties.	Experimental Methods and Laboratory Work in Physics (○)		Laboratory Work in General Biology I, II (◎)		Public Hygiene (○)				
		Experimental Methods and Laboratory Work in Chemistry (○)		Basic Experiments in Chemistry (◎)		Reading of Foreign Literature (◎)				
		Experimental Methods and Laboratory Work in Biology (○)		Laboratory Work in General Physics (◎)						
Introduction to Microbiology (○)		Ethics of Science and Technology (◎)	Ecology (○)							
		Seminar in Field Science (○)	Animal Physiology (○)							
			Genetics (○)							
			Introduction to Biological Science of Animal							
			Introduction to Plant Biological Science (○)							
			Biological Statistics (○)							
(3) To acquire the intellectual ability and skills needed to learn molecules, cells, individual organisms, and ecosystem.				Laboratory Work in Enzyme Chemistry (◎)	Laboratory Work in Ecological Biochemistry (◎)	Graduation Thesis (◎)	Graduation Thesis (◎)	Graduation Thesis (◎)		
				Laboratory Work in Microbial Biochemistry (◎)	Laboratory Work in Biological Chemistry (◎)					
				Laboratory Work in Immunobiology (◎)						

Academic achievements Evaluation items		1st grade		2nd grade		3rd grade		4th grade	
		Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester
	(4) To acquire the basic English language ability needed to read English scientific papers.					Reading of Foreign Literature (⊙)			
Comprehensive Abilities	(1) To acquire the ability for the comprehensive molecular perspective on function of cells, individual organisms and ecosystem, through data collection and complementation for research in academic fields.					Biotechnology (○)	Aquatic biochemistry (○)	Aquaculture (○)	
						Topics in Molecular and Cellular Biology	Food Biochemistry (○)	Food and health sciences (○)	
						Food Microbiology (○)	Animal Breeding and Genetics (○)		
							Fish Pathology (○)		
					Animal Reproduction (○)		Food Hygiene (○)		
							Plant Nutritional Physiology (○)		
							Nutrition (○)		
	(2) With regard to comprehensive perspective on cells, individual organisms and ecosystem, to acquire the ability for summarizing and verifying their opinions and delivering presentations or reports logically, and answering questions.	Introductory Seminar for Freshman (⊙)	Organic Chemistry (⊙)		Enzyme Protein Chemistry (⊙)	Microbial Biochemistry (⊙)	Graduation Thesis (⊙)	Graduation Thesis (⊙)	Graduation Thesis (⊙)
		Basic Calculus/Elements of Calculus (⊙)	Cell Science (⊙)		Molecular Cell Biology (⊙)	Plant Molecular Biology (⊙)	Animal Breeding and Genetics (○)	Aquaculture (○)	
		Species Biology (⊙)			Biopolymer Sciences (⊙)	Mammalian Molecular Biology (⊙)	Fish Pathology (○)	Food and health sciences (○)	
					Immunobiology (⊙)	Chemical Ecology (⊙)	Aquatic biochemistry (○)		
		General Chemistry/Basic Concepts of			Chemistry of natural organic compounds (⊙)	Animal Cell Technology (⊙)	Food Biochemistry (○)		
					Laboratory Work in Enzyme Chemistry (⊙)	Laboratory Work in Ecological Biochemistry (⊙)	Food Hygiene (○)		
			Laboratory Work in Microbial Biochemistry (⊙)	Laboratory Work in Biological Chemistry (⊙)	Plant Nutritional Physiology (○)				
			Laboratory Work in Immunobiology (⊙)	Biotechnology (○)	Nutrition (○)				
				Topics in Molecular and Cellular Biology					
				Food Microbiology (○)					
				Reading of Foreign Literature (⊙)					

Liberal Arts Educati Basic Specialized S Specialized Educati Graduation Thesis (⊙) Required (○) Elective/require (Δ) Free elective