# For entrants in AY 2024

Appended Form 1

Specifications for Major Program

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

| | |
|---|---|
| Program name (Japanese) | |
| (English) | Program of Biotechnology |

1. Academic Degree to be Acquired

Bachelor's degree in engineering

2. Overview

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 (Graduate School of Integrated Sciences for Life) to obtain a higher degree of education and undertake research.

3. Academic Awards Policy (Policy for awarding degrees and goal of the program)

The Program of Biotechnology nurtures professionals that have acquired the basic knowledge, skills, and attitudes needed to work as bioengineering researchers and engineers and, further, to embrace opportunities for creativity in scientific thought.

Therefore, this program offers education aimed at cultivating a broad range of general knowledge, a global perspective to seek peace, a general sense of judgment, and a well-rounded character. The program awards a bachelor's degree in engineering to students who have completed sufficient liberal arts education and specialized education to achieve the following goals from (A) to (E), as well as the number of credits necessary to meet the standard of the course.

(A) The ability to understand the relationship between people, society, nature, and engineering, and to demonstrate multifaceted and logical thinking skills

(B) The ability to understand basic natural science

(C) The ability to acquire basic knowledge of biotechnology and biological science, and to expand it widely to applied technology

(D) The ability to come up with conceptual ideas and to implement ideas, as well as the ability to transmit learning and research results

(E) The ability to adapt to the highly sophisticated information society with high level communication skills

4. Curriculum Policy (Policy for Preparing and Implementing the Curriculum)

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 mastery of “Group Discussion of Current Biotechnology Topics” to be offered in the third year and “Graduation Thesis” to be offered in the fourth year.

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 mastery of “Group Discussion of Current Biotechnology Topics” to be offered in the third year, and “Graduation Thesis” to be offered in the fourth year.

Teamwork ability, leadership ability, and communication ability in group work (Goal E). These are obtained through mastery of “Basic Experiments in Chemistry”, and “Training of Biotechnology I II” to be offered from the third and fourth term of the second year though the third year, and through “Group Discussion of Current Biotechnology Topics” to be offered in the third year.

The ability to read, write, and converse in the English language necessary for conducting research (Goal E). This is obtained through mastery of “Communication Basic I II” in the liberal arts education subjects, “Technical English” to be offered in the third and the fourth terms of the second year, and “Graduation Thesis“ to be offered in the fourth year.

5. Program Timing and Acceptance Conditions

When to start the program:

The second semester of the second year

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 Biotechnology, and the Program of Chemical Engineering. Registration to these three programs is to be made in the second semester of the second year, so that students are able to choose the suitable specialized field or program while acquiring a wide range of specialized basic knowledge.

Requirements of Acquired Credits

In order to be assigned to each program, students must acquire 16 or more credits out of a total of 18 credits in compulsory specialized basic subjects (excluding Basic Chemical Experiment and Technical English) and must acquire an overall total of 60 or more credits (including in liberal arts education subjects).

Program Quota

An upper limit is set for acceptance of students. Assignment to the Program of Applied Chemistry, the Program of Biotechnology and the Program of Chemical Engineering is decided after taking into account the requests of students and their academic results.

6. Qualifications to be Acquired

Type-1 High School Teaching License (Industry) (By mastering “Vocational Guidance”, the prescribed “liberal arts education subjects” and “specialized education subjects”, students can obtain the Type-1 High School Teaching License (Industry) upon graduation.)

Details are described in the student handbook and guidance materials.

# 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 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | Spring | | Fall | |
| | | | | | | | | 1T | 2T | 3T | 4T | 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 | | | | | | | | | | | | | | | | | | |
| | | Advanced Seminar | | 0 | | 1 | Free elective | | | | | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | | | | | |
| | | | English (Note2 3) Communication I | 2 | Communication IA | 1 | Required | | | | | | | | | | | | | | | | | | |
| | | | | | Communication IB | 1 | | | | | | | | | | | | | | | | | | | |
| | | | English (Note2 3) 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 | Introduction to Information and Data Sciencies | 2 | Required | | ◎ | | | | | | | | | | | | | | | | |
| | | Health and Sports Courses | | 2 | | 1or2 | Compulsory elective | ○ | ○ | ○ | ○ | | | | | | | | | | | | | | |
| | Basic Subjects | | | 15 | Calculus I | 2 | Required | | | | | | | | | | | | | | | | | | |
| | | | | | Calculus II | 2 | | | | | | | | | | | | | | | | | | | |
| | | | | | [illegible] 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 | | | | | ○ | | | | | | | | | | | | | | |
| | | | | 2 | From all Subject Type | | Free elective | | | | | | | | | | | | | | | | | | |
| | | | | 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 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 the student handbook.

Note 3 We have a recognition of credit system for foreign language proficiency tests. For more details, please refer to the article on Foreign Language 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.

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Required

| | Credits | Applied Chemistry | Biotechnology | Chemical enneenering | 1st grade | | | | 2nd grade | | | | | | | | 4th grade | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Fall | | | | Fall | | | | | | Spring | | | | |
| | | | | | 1T | 2T | 3T | 4T | 1T | 2T | 3T | 4T | 1T | 2T | 3T | 4T | 1T | 2T | 3T | 4T | |
| Applied Mathematics I | 2 | | | | | | 4 | | | | | | | | | | | | | | |
| Applied Mathematics II | 2 | | | | | | | | 4 | | | | | | | | | | | | |
| Applied Mathematics III | 2 | | | | | | | | | | | | | 4 | | | | | | | |
| Basic Engineering Computer Programming | 2 | | | | | | | | 4 | | | | | | | | | | | | |
| Probability and Statistics | 2 | | | | | | | | | | | | 4 | | | | | | | | |
| Technical English | 1 | | | | | | | | | | | 4 | | | | | | | | | |
| Basic Environmental Sciences | 2 | | | | | | 4 | | | | | | | | | | | | | | |
| Chemical Stoichiometry | 2 | | | | | | | | | 4 | | | | | | | | | | | |
| Basic Organic Chemistry I | 2 | | | | | | 4 | | | | | | | | | | | | | | |
| Basic Organic Chemistry II | 2 | | | | | | | 4 | | | | | | | | | | | | | |
| Physical Chemistry I | 2 | | | | | | | | | 4 | | | | | | | | | | | |
| Biochemistry I | 2 | | | | | | | | | 4 | | | | | | | | | | | |
| Basic Experiments in Chemistry | 4 | | | | | | | | | | 12 | 12 | | | | | | | | | |
| Basic Inorganic Chemistry | 2 | | | | | | 4 | | | | | | | | | | | | | | |
| Analytical Chemistry | 2 | | | | | | | | 4 | | | | | | | | | | | | |
| Basic life science | 2 | | | | | | | 4 | | | | | | | | | | | | | |
| Introduction to Applied Chemistry, Chemical Engineering and Biotechnology | 2 | | | | | | | | | 4 | | | | | | | | | | | |
| Introduction to Fundamental Industry | 2 | | | | | | | | | 4 | | | | | | | | | | | |

# Cluster 3　Specialized Subjects
## Program of Biotechnology

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 | |
| Training of Biotechnology I | 4 | | | | | | | | | | 12 | 12 | | | | | | | |
| Experiments on Biotechnology II | 4 | | | | | | | | | | | | 12 | 12 | | | | | |
| MicrobiologyI | 2 | | | | | | | | | 4 | | | | | | | | | |
| MicrobiologyII | 2 | | | | | | | | | | | 4 | | | | | | | |
| Molecular biology I | 2 | | | | | | | | | 4 | | | | | | | | | |
| Molecular biology II | 2 | | | | | | | | | | | 4 | | | | | | | |
| Biochemistry II | 2 | | | | | | | | 4 | | | | | | | | | | |
| BiochemistryIII | 2 | | | | | | | | | | 4 | | | | | | | | |
| Enzyme Chemistry | 2 | | | | | | | | 4 | | | | | | | | | | |
| Bioorganic Chemistry | 2 | ○ | | | | | | | | | 4 | | | | | | | | |
| Fermentation Technology | 2 | | | | | | | | | | 4 | | | | | | | | |
| Biochemical Engineering | 2 | | | | | | | | | | | 4 | | | | | | | |
| Glycotechnology & Immunotechnology | 2 | | | | | | | | | | | | | 4 | | | | | |
| Molecular BiologyIII | 2 | | | | | | | | | | | | | 4 | | | | | |
| Genetic and protein engineering | 2 | ○ | | | | | | | | | | | | 4 | | | | | |
| Molecular Bioinformatics | 2 | ○ | | | | | | | | | | | 4 | | | | | | |
| Biotechnology | 2 | | | | | | | | | | | | 4 | | | | | | |
| Group Discussion of Current Biotechnology Topics | 2 | | | | | | | | | | | | 2 | 2 | | | | | |
| FoodProcess Engineering I | 1 | | | | | | | | | | | 2 | | | | | | | |
| Food Process Engineering II | 1 | | | | | | | | | | | | | 2 | | | | | |
| FermentationProcess Engineering I | 1 | | | | | | | | | | | | | | 1 | 1 | | | |
| Fermentation process engineeringII | 2 | | | | | | | | | | | 4 | | | | | | | |
| Fermentation Process Engineering III | 1 | | | | | | | | | | | | | 2 | | | | | |
| Physical Chemistry II | 2 | | | | | | | | 4 | | | | | | | | | | |
| Chemical Kinetics | 2 | | | | | | | | | | | 4 | | | | | | | |
| Organic Structural Analysis | 2 | | | | | | | | | 4 | | | | | | | | | |
| Advanced Organic Chemistry IV | 2 | | | | | | | | | | | | 4 | | | | | | |
| Chemical Engineering Exercise I | 2 | | | | | | | | 4 | 4 | | | | | | | | | |
| Chemical Engineering Fundamentals | 2 | | | | | | | | 2 | 2 | | | | | | | | | |
| Green Technology | 2 | | | | | | | | | | | | 4 | | | | | | |
| Recycling engineering | 2 | | | | | | | | | | | | | 4 | | | | | |
| Graduation Thesis | 5 | | | | | | | | | | | | | | | | | | |

Sheet

# Academic Achievements in Biotechnology Program

## The Relationship between Evaluation Items and Evaluation Criteria

| Academic Achievements | | | Evaluation Criteria | | |
|---|---|---|---|---|---|
| Evaluation Items | | | Ex0807(iaf5(n)(5r)-4(ia78(s)(5/MCIl2a3B(C(e)37M0D65B1C1B8B6M(4)6B28.8 | Velm rnn0a(e)-45 | la(e)-5(n)0-3-5(lo)-0(n)-5a(e) |
| Knowledge and Understanding | | | Being able to fully understand engineering. | Being able to understand mathematics and physics well. | Being able to understand mathematics and physics well and differences between engineering areas and other areas and take various consideration to the standard level. |
| | (2) | Acquisition of basic knowledge (achievement target C) | | | Being able to understand the left well. |
| | | | Being able to understand chemistry, applied biology, advanced engineering, basic biotechnologists. | Being able to understand chemistry, applied biology, basic biotechnologists. Being able to demonstrate standard level abilities to think logically, to plan and carry out research and to analyze data. | Being able to well demonstrate the ability described on the left. |
| Abilities and Skills | (1) | Acquisition of basic knowledge (achievement target C) | Being able to demonstrate the ability to think logically, to plan and carry out research and to analyze data with a plan, ability to analyze data and explanation. | | |
| | (1) | Cultivation of ability creating concept and solving problesms (achievement target D) | | | |
| Overall Abilities | | | Being able to display abilities, required for biotechnologists, such as to make plan and carry out research, to demonstrate research outcome, to discuss, and to solve problems. | To be able to demonstrate standard level abilities to make plan and carry out research, to show outcomes and to solve problems. | Being able to demonstrate the ability described on the left. |
| | (2) | Cultivation of communication skills (achievement target E) | Being able to show logical writing abilities, information transmission abilities to domestic and overseas, debating and information utilization. | To be able to demonstrate standard level abilities to make plan and carry out research, to show outcomes and to solve problems. | Being able to demonstrate the ability described on the left. |

## Placement of the Liberal Arts Education in the Major Program

Liberal Arts Education in this program assumes the role of establishing the academic foundation on which the specialized education will be built. It respects a voluntary, self-reliant attitude and cultivates scientific thinking based on information gathering abilities, analytical abilities, and critical thinking abilities. It establishes perspectives that make it possible to provide insight on the inner nature of things and their background from a wide broad viewpoint, and enhances linguistic abilities to the level appropriate for living as a global citizen. It also strengthens interest in peace, and integrates a broad range of knowledge into a body of knowledge that will be truly useful in solving problems. It cultivates the ability to explore and promote cross-disciplinary /comprehensive research that goes beyond the established frameworks of biotechnology.

Sheet

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 in the subject |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Knowledge and Understanding | | | | | | Abilities and Skills | | Comprehensive Abilities | | | | |
| | | | | | (1) | | (2) | | (3) | | (1) | | (1) | | (2) | | |
| | | | | | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | |
| Liberal Arts Education | Introductory Seminar for First-Year Students | 2 | Required | 1semsester | 40 | 1 | | | | | | | 40 | 1 | 20 | 1 | 100 |
| Liberal Arts Education | Introduction to University Education | 2 | Required | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | Peace Science Courses | 2 | Elective | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | Area Courses | 8 | Elective | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | Basic English Usage I | 1 | Required | 1semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Basic English Usage II | 1 | Required | 1semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | CommunicationI | 1 | Required | 1semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Communication I | 1 | Required | 1semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Communication II | 1 | Required | 2semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Communication II | 1 | Required | 2semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Basic language I | 1 | Required | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | Basic language II | 1 | Required | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | Information and Data Science Courses | 2 | Required | 1semsester | | | | | | | | | | | 100 | 1 | 100 |
| Liberal Arts Education | Information and Data Science Courses | 2 | Required | 1semsester | 100 | 1 | | | | | | | | | | | 100 |
| Liberal Arts Education | CalculusI | 2 | Required | 1semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | CalculusII | 2 | Required | 2semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | Linear AlgebraI | 2 | Required | 1semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | Linear AlgebraII | 2 | Required | 2semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | General Mechanics I | 2 | Required | 1semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | General Mechanics II | 2 | Required | 2semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | Experimental Methods and Laboratory Work in Physics I- Ⅱ | 2 | Required | 3semsester | | | 50 | 1 | | | 30 | 1 | 20 | 1 | | | 100 |
| Liberal Arts Education | Seminar in Basic Mathematics I | 1 | Elective | 1semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | Seminar in Basic Mathematics II | 1 | Elective | 2semsester | | | 100 | 1 | | | | | | | | | 100 |
| Liberal Arts Education | Experimental Methods and Laboratory Work in Biology I- Ⅱ | 2 | Elective | 2semsester | | | | | | | 80 | 1 | 20 | 1 | | | 100 |
| Liberal Arts Education | Basic Electromagnetism | 2 | Elective | 2semsester | | | 100 | 1 | | | | | | | | | 100 |
| Specialized Education | Applied Mathematics I | 2 | Required | 2semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Applied Mathematics II | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Applied Mathematics III | 2 | Elective | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Probability and Statistics | 2 | Elective | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Technical English | 1 | Required | 4semsester | | | | | 20 | 1 | | | | | 80 | 1 | 100 |
| Specialized Education | Basic Engineering Computer Programming | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Basic Environmental Sciences | 2 | Elective | 2semsester | 60 | 1 | | | 40 | 1 | | | | | | | 100 |
| Specialized Education | Chemical Stoichiometry | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Basic Organic Chemistry I | 2 | Required | 2semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Basic Organic Chemistry II | 2 | Elective | 2semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Physical Chemistry I | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Biochemistry I | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Basic Experiments in Chemistry | 4 | Required | 4semsester | | | | | | | 80 | 1 | 20 | 1 | | | 100 |
| Specialized Education | Basic Inorganic Chemistry | 2 | Required | 2semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Analytical Chemistry | 2 | Required | 3semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Basic life science | 2 | Elective | 2semsester | 40 | 1 | | | 60 | 1 | | | | | | | 100 |
| Specialized Education | Introduction to Applied Chemistry, Chemical Engineering and Biotechnology | 2 | Elective | 3semsester | 40 | 1 | | | 60 | 1 | | | | | | | 100 |
| Specialized Education | Introduction to Fundamental Industry | 2 | Elective | 3semsester | 40 | 1 | | | 60 | 1 | | | | | | | 100 |
| Specialized Education | Training of Biotechnology I | 4 | Required | 5semsester | | | | | | | 60 | 1 | 20 | 1 | 20 | 1 | 100 |
| Specialized Education | Experiments on Biotechnology II | 4 | Required | 6semsester | | | | | | | 60 | 1 | 20 | 1 | 20 | 1 | 100 |
| Specialized Education | MicrobiologyI | 2 | Required | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | MicrobiologyII | 2 | Required | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Molecular biology I | 2 | Required | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Molecular biology II | 2 | Required | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Biochemistry II | 2 | Required | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | BiochemistryIII | 2 | Required | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Enzyme Chemistry | 2 | Elective | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Bioorganic Chemistry | 2 | Elective | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Fermentation Technology | 2 | Required | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Biochemical Engineering | 2 | Required | 5semsester | | | | | 100 | 1 | | | | | | | 100 |

| Subject type | Class subjects | credits | Type of course registration | Period | Evaluation items | | | | | | | | | | | | Total weighted values of evaluation items in the subject |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Knowledge and Understanding | | | | | | Abilities and Skills | | Comprehensive Abilities | | | | |
| | | | | | (1) | | (2) | | (3) | | (1) | | (1) | | (2) | | |
| | | | | | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | Weighted values of evaluation items in the subject | Weightsed values of evaluation items | |
| Specialized Education | Glycotechnology & Immunotechnology | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Molecular BiologyIII | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Genetic and protein engineering | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Molecular Bioinformatics | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Biotechnology | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Group Discussion of Current Biotechnology Topics | 2 | Required | 6semsester | 40 | 1 | | | | | | | 40 | 1 | 20 | 1 | 100 |
| Specialized Education | FoodProcess Engineering I | 1 | Elective | 5semsester | 20 | 1 | | | 80 | 1 | | | | | | | 100 |
| Specialized Education | Food Process Engineering II | 1 | Elective | 6semsester | 20 | 1 | | | 80 | 1 | | | | | | | 100 |
| Specialized Education | FermentationProcess Engineering I | 1 | Elective | 7semsester | 20 | 1 | | | 80 | 1 | | | | | | | 100 |
| Specialized Education | Fermentation process engineeringII | 2 | Elective | 5semsester | 20 | 1 | | | 80 | 1 | | | | | | | 100 |
| Specialized Education | Fermentation Process Engineering III | 1 | Elective | 6semsester | 20 | 1 | | | 80 | 1 | | | | | | | 100 |
| Specialized Education | Physical Chemistry II | 2 | Elective | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Chemical Kinetics | 2 | Elective | 5semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Organic Structural Analysis | 2 | Elective | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Advanced Organic Chemistry IV | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Chemical Engineering Exercise I | 2 | Elective | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Chemical Engineering Fundamentals | 2 | Elective | 4semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Green Technology | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Recycling engineering | 2 | Elective | 6semsester | | | | | 100 | 1 | | | | | | | 100 |
| Specialized Education | Graduation Thesis | 5 | Required | 7,8semsester | 10 | 1 | | | | | 50 | 1 | 20 | 1 | 20 | 1 | 100 |

BasicIanguageII（○）
CalculusI(◎)
Linear AlgebraI (◎)
(2T)General Mechanics I(◎)
Seminar in Basic Mathematics I( )

Basic life science（△）
CalculusII(◎)
Linear AlgebraII(◎)
(3T)General Mechanics II(◎)
Seminar in Basic Mathematics II ( )
T)BasicElectromagnetism( )

Introduction to Fundamental Industry
Experimental Methods and Laboratory Work in Physics I ( )

ExperimentalMethodsandLaboratoryWorkinBiologyI ・Ⅱ（△）
Basic Organic Chemistry II
Applied Mathematics I (◎)
Basic life science（△）
Basic Environmental Sciences（△）
Basic Organic Chemistry I( )
Basic Inorganic Chemistry( )

Basic Engineering Computer Programming
Applied Mathematics II (◎)
Physical Chemistry I(◎)
Chemical Stoichiometry(◎)
Biochemistry I(◎)
Analytical Chemistry(◎)
Introduction to Applied Chemistry, Chemical Engineering and Biotechnology
Introduction to Fundamental Industry（△）

Technical English(◎)
Physical Chemistry II ( )
MicrobiologyI (◎)
Molecular biology I (◎)
Biochemistry II (◎)
Enzyme Chemistry ( )
Chemical Engineering Fundamentals ( )
Chemical Engineering Exercise I (○)
Organic Structural Analysis（△）

Probability and Statistics (△)
Applied Mathematics III ( )
MicrobiologyII (◎)
Molecular biology II (◎)
BiochemistryIII(◎)
Bioorganic Chemistry( )
Fermentation Technology ( )
Biochemical Engineering(◎)
Chemical Kinetics (○)
FoodProcess Engineering I ( )
Fermentation process engineeringII ( )

Glycotechnology & Immunotechnology（○）
Molecular BiologyIII
Genetic and protein engineering
Molecular Bioinformatics（○）
Biotechnology（○）
Advanced Organic Chemistry IV ( )
Green Technology（△）
Recycling engineering (△)
Food Process Engineering II(△)
Fermentation Process Engineering III( )

ExperimentalMethodsandLaboratoryWorkinBiologyI ・Ⅱ（△）
Basic Experiments in Chemistry(◎)
Training of Biotechnology I(◎)
Experiments on Biotechnology II（◎）
Graduation Thesis（◎）
Graduation Thesis（◎）

Introductory Seminar for First-Year Students(◎)
Experimental Methods and Laboratory Work in Biology I・Ⅱ（△）
Basic Experiments in Chemistry(◎)
Training of Biotechnology I(◎)
Experiments on Biotechnology II（◎）
Graduation Thesis（◎）
Graduation Thesis（◎）
Group Discussion of Current Biotechnology Topics (◎)

Introductory Seminar for First-Year Students(◎)
Technical English（◎）
Training of Biotechnology I(◎)
Experiments on Biotechnology II （◎）
Graduation Thesis（◎）
Graduation Thesis（◎）
Group Discussion of Current Biotechnology Topics(◎)

Communication IA (◎)
Communication IB (◎)
Basic English UsageI( )
Basic English UsageII ( )
(1T)Information and Data Science Courses (◎)

Communication IIA (◎)
Communication IIB(◎)

（Ex）
Liberal Arts Education Subjects
Basic Specialized