

For entrants in FY 2024

Appended Form 1

Name of School (Program)

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

Program name (Japanese)	
(English)	
1. Academic degree to be acquired Bachelor's degree in engineering	
2. Outline <p>While the purpose of science is "pursuit of truth," the purpose of Engineering lies in "pursuit of realization." Applied chemistry is an academic field that deals with systems to realize, by exploiting the power of chemical reactions, new substances with excellent properties and functions, that are desired to be created based on the dreams (ideas) of humankind and social needs.</p> <p>In the Program of Applied Chemistry, the primary learning & educational goal is to surely acquire the basic sciences, involving chemistry, mathematics, physics, and biology, as well as to develop problem-solving abilities for creating new substances. The above mentioned problem-solving abilities include:</p> <ol style="list-style-type: none">1) Ability to carry out molecular design (design of molecular structures) of new target substances, using full knowledge of chemical reactions, taking into account their influences on society and nature,2) Ability to actually synthesize new target substances utilizing a knowledge of chemical reactions and experimental methods,3) Ability to look into the structure of the acquired substances and to analyze their molecular structures, and4) Ability to accurately assess the physical and chemical properties and influence on the environment of the acquired substances. <p>The learning & educational goals of this Program also include developing the ability to understand the social responsibilities of engineers, English ability, reading comprehension, the ability to write good texts, the ability to give a presentation, communication skills such as negotiating skills, the ability to consider things multilaterally from a global perspective, the ability to pursue self-development, and creative powers beyond the above knowledge frameworks so that the graduates of this Program can play an full active role in the real world. With many graduates going on to the Pre-doctoral (Master's) Course, the connection of this Program to graduate school education is fully taken into account.</p> <p>Graduates from this Program are employed mainly by chemicals manufacturers, in such fields as chemistry, fibers, and pharmaceuticals, as well as industrial fields related to electricity, machines, metal, and the environment, and are playing an active role inside and outside of Japan, utilizing the abilities they acquired in this Program.</p>	
3. Diploma policies (degree conferment policy & program attainment goals)	

The Program of Applied Chemistry shall develop human resources who have acquired basic knowledge, skills, and attitude as professional chemical engineers, and who can demonstrate scientific thinking and creative power. This Program shall confer a bachelor degree (engineering) on students who have acquired the standard number of credits prescribed in the curriculum and attained the goals described below.

This Program adopts (Ka) ~ (Ko) as attainment goal. The goal of this Program from program registration to graduation is for students to cultivate the basic essentials required of an engineer/researcher, including creative powers and communication skills, as well as expertise related to applied chemistry.

(Ka) To acquire reliable basic knowledge,

(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer,

(Ku) To acquire creative power and design ability,

(Ke) To become independent as a researcher & engineer through continuous self-development, and

(Ko) To acquire communication skills and an international outlook.

Attainment goals from (Ka) to (Ko) shall be achieved by completing the class subjects set for each goal. The content of each attainment goal is as follows:

(Ka) To acquire reliable basic knowledge

Students will acquire a broad basic knowledge and basic specialized knowledge of chemistry in the Liberal Arts Education and Specialized Education as well as advanced expertise in applied chemistry, and will acquire conceptual skills based on logical thinking supported by their acquired knowledge.

(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer

To contribute to society through research and technologies, students will acquire the maturity required to fulfill their responsibilities as a researcher/engineer. To do this, they should cultivate their understanding of technologies and the effect of these technologies on society, acquire knowledge of economy, safety, and reliability of technology, and judgment in utilizing the acquired knowledge from a global perspective.

(Ku) To acquire creative power and design ability

Students will acquire the creative power required to solve diverse problems related to applied chemistry using the acquired knowledge and technologies. They will also develop a sense of ethics as recognized by society, and design skills in research and development, so that they can demonstrate their problem-solving abilities as a researcher/engineer.

(Ke) To become independent as a researcher & engineer through continuous self-development

Students will devise their own methods of information collection, technological improvement, improvement of research methods, analysis and understanding of research results and achievements, in addition to developing their own ability to continue to learn, and actively engage as an independent researcher or engineer, developing the attitude required to make multidimensional approaches toward solving problems.

(Ko) To acquire communication skills and an international outlook

Students will cultivate the ability to make logical descriptions, give presentations, and hold discussions, as well as the ability to collect and convey information from an international perspective. They will simultaneously acquire the international outlook required to handle problems from a global perspective.

4. Curriculum policies (policies for organizing & providing curricula)

To achieve the goals of this Program, after acquiring basic academic abilities and knowledge in Liberal Arts Education Subjects, students are required to study specialized fields in engineering and chemistry. This Program offers a curriculum in which students will take Liberal Arts Education Subjects up to the 1st and 2nd terms of the 2nd year, and after being assigned to this Program at the 3rd and 4th terms of the 2nd year, they will take Specialized Subjects.

The distinguishing feature of this curriculum is that it classifies the Specialized Subjects that are basic and common in Cluster 3 as "Specialized Basic Subject," and allows students to take them from the 3rd and 4th terms of the first year, at an early time after admission. While allowing new students to take Specialized Basic Subjects, their awareness of their own specialized fields and motivation for study will be enhanced, and this curriculum can cultivate students' knowledge of and interest in peripheral fields by enabling students to attend lectures by faculty members in programs other than Applied Chemistry (Chemical Engineering and Biotechnology).

The following describes the program system consisting of liberal arts education subjects and specialized education subjects which will enable students to achieve the targets from (Ka) to (Ko).

In the curriculum, teaching and learning will be implemented by utilizing active learning and online classes, depending on the delivery methods of the program, such as lectures, practical skill courses and seminars.

In addition to strict grading using the standards clearly outlined in the syllabus, learning outcomes are evaluated based on the degree to which the goals set by the educational program are achieved.

Knowledge & understanding

Broad basic knowledge of the liberal arts and specialized education subjects, together with basic expertise in chemistry (achievement target (Ka)). Students acquire this knowledge and expertise while taking liberal arts subjects provided in the 1st and 2nd years such as "Introduction to University Education" and "Introductory Seminar for First-Year Students", area courses and information subjects, Foundation Courses such as "Calculus I"; specialized basic subjects such as "Basic Organic Chemistry I" and "Basic Inorganic Chemistry", and specialized subjects provided in the 3rd and 4th terms of the 2nd year; and in the 3rd year; such as "Advanced Organic Chemistry I" and "Inorganic Chemistry"

Advanced expertise in applied chemistry (achievement target (Ka)). Students acquire this expertise while taking specialized basic subjects provided in the 1st year; and in the 1st and 2nd terms of the 2nd year; such as "Physical Chemistry I" and "Analytical Chemistry", spe

terms of the 2nd year; and in the 3rd year; such as "Chemical Experiments I" and "Chemical Experiments II", and preparation of the "Graduation Thesis" in the 4th year.

Abilities & skills

The qualities required for understanding the effect of science and technology on society, and for taking responsibility for making a contribution to society as researchers or technicians (achievement target (Ki)). Students acquire these qualities while taking liberal arts education subjects such as "Introductory Seminar for First-Year Students" and area courses that are provided in the 1st year, "Basic Experiments in Chemistry" provided as a specialized basic subject in the 3rd and 4th terms of the 2nd year, "Engineering and Ethics" provided as a specialized subject in the 4th year, and preparation of the "Graduation Thesis"

Knowledge of areas such as economics, and the safety and reliability of technology, as well as the ability to utilize this knowledge in making judgments from a global point of view (achievement target (Ki)). Students acquire these qualities while taking liberal arts education subjects such as "Introductory Seminar for First-Year Students" and area courses

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Laboratory Work in Physics" provided as a foundation course; "Basic Experiments in Chemistry " provided as a specialized basic subject in the 3rd and 4th terms of the 2nd year; specialized subjects such as "Chemical Experiments I" and "Chemical Experiments II" provided in the 3rd year; and preparation of the "Graduation Thesis" in the 4th year.

The ability to produce logical descriptions, presentations, and discussion in the Japanese language (achievement target (Ko)). Students acquire this ability while taking liberal arts education subjects such as "Introductory Seminar for First-Year Students", peace science courses, area courses provided in the 1st year, "Basic Experiments in Chemistry" provided as a specialized basic subject in the 3rd and 4th terms of the 2nd year, specialized subjects such as "Chemical Experiments I" and "Chemical Experiments II" provided in the 3rd year, and preparation of the "Graduation Thesis" in the 4th year.

The ability to collect and transmit information from an international perspective (achievement target (Ko)). Students acquire this ability while taking liberal arts education subjects in the 1st and 2nd years such as "Introductory Seminar for First-Year Students", peace science courses, area courses, and foreign language subjects such as "Communication IA" and "Basic Foreign Language", "Technical English" provided as a specialized basic subject in the 3rd and 4th terms of the 2nd year, and preparation of the "Graduation Thesis" in the 4th year.

The international awareness required for solving problems from a global point of view (achievement target (Ko)). Students acquire this awareness while taking liberal arts education subjects such as "Introductory Seminar for First-Year Students", peace science courses, area courses, and foreign language subjects, and preparation of the "Graduation Thesis" in the 4th year.

5. Start of the program / Admission conditions

Start of the Program

Second semester of the second year

Cluster 3 provides a distinctive education into which fields related to Chemistry, Biotechnology and Process Engineering are organically integrated. Specifically, the educational purpose of Cluster 3 is to develop human resources who have acquired a broad integrated basic knowledge in the development of new functional substances and materials, biotechnology of animals, plants, and microorganisms, design and control of chemical processes, environmental conservation and purification, and the development of resources and energy, as well as advanced expertise and technologies. To achieve this, three programs in Applied Chemistry, Biotechnology, and Chemical Engineering are offered in addition to the common-subject basic specialized education to offer Specialized Education related to Chemistry, Biotechnology and Process Engineering, respectively. In Cluster 3, in registering these three programs at the second semester of the second year, students are allowed to choose specialized fields or programs that suit them, in addition to acquiring extensive specialized basic knowledge.

Requirements of the number of credits to be obtained

To be assigned to each program, students must obtain more than 16 credits out of a total of 18 credits from required subjects in the Specialized Basic Subjects (excluding Basic Experiments in Chemistry and Technical English), and a total of at least 60 credits (including Liberal Arts Education Subjects).

Admission quota for the Program

* See the relationships between evaluation items and evaluation criteria on Attached Sheet 2.

* See the relationships between evaluation items and class subjects on Attached Sheet 3.

* See the Curriculum Map on Attached Sheet 4.

9. Graduation thesis (graduation research) (position and method & time of assignment, etc.)

Position

The Graduation Thesis is positioned as one of the major subjects in the attainment goals of this educational program listed below.

(Ka) To acquire reliable basic knowledge,

(Ki) To acquire the maturity to fulfill their social responsibilities as an engineer,

(Ku) To acquire creative power and design ability,

(Ke) To become independent as a researcher & engineer through continuous self-development, and

(Ko) To acquire communication skills and an international outlook.

Details of the goals are as follows:

(1) Collect and analyze literature and materials (including those in English) related to the given research theme, and understand the purpose and significance of the research. (Ka), (Ki), and (Ko)

(2) Set concrete goals, and design a research plan. (Ka) and (Ku)

(3) Analyze and consider data obtained in the research process based on a knowledge of basic chemistry and specialized technologies. (Ka)

(4) Understand problems in attaining the goal, and set an appropriate new goal and plan. (Ka), (Ku), and (Ke)

(5) Consider the effect and importance of research results on society, nature, and learning from a multifaceted perspective. (Ki)

(6) Organize and logically describe research results. (Ka) and (Ko)

(7) Give an easy-to-understand oral presentation on research results, and express one's own opinions in a discussion. (Ko)

Time and method of assignment

Time of assignment: Start of the fourth year (Targeting students who meet the "conditions for starting graduation research.")

Conditions for starting a graduation thesis

(1) To have taken all the required Experimental Subjects (including experiments in fundamental subjects) and have acquired eight credits in foreign language subjects,

(2) To have taken at least 115 credits, and at least 69 of those credits to be obtained in Specialized Basic Subjects and Specialized Subjects.

Method of assignment

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

Guidance on preparing a graduation thesis

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

- (1) Set a research theme, and frame a research plan after exploring the literature and materials related to the theme.
- (2) Carry out the research. During the research period, students will receive individual guidance from faculty members as required and research report sessions will be held periodically.

The Program Reviewing Committee plays a leading role in assessing and improving the Program. As assessment of this Program, external assessment is made by graduates of the Program of Applied Chemistry and questionnaires on classes and the educational environment are answered by students.

Specific organizations for assessment and improvement of the Program and improvement flows are explained below. The Program Reviewing Committee examines the validity of the Program's learning & educational goals, and evaluates the achievement levels for the learning & educational goals. This Committee requests graduates of the Program of Applied Chemistry to conduct external assessments and

answer questionnaires on classes and the educational environment, and then checks the opinion by the Program based on the questionnaires. After checking the validity of the learning & educational goals and the educational environment, the Committee further proposes methods of improving curriculum and class contents when deemed necessary. Cluster 3 is composed of three programs: Applied Chemistry, Chemical Engineering, and Biotechnology. Some subjects offered are shared by the programs. Requests for checks and improvements to these shared subjects, when deemed necessary, will be proposed to the Cluster 3 Curriculum Reviewing Committee, and will be checked and

approved. Professors and former faculty members conduct external assessment of class subjects and their teaching methods. Using the assessment results as a reference, the committee perform basic checks on whether the subjects and the class contents are appropriate or not, and draft improvement plans. If further improvements are needed between subjects and examinations and improvements to contents, the committee will require

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