

Graduate School of Chemical Sciences and Engineering

Curriculum Policy

© Policy on curriculum design and methods used for teaching and learning

Graduate School of Chemical Sciences and Engineering Curriculum Policy

To foster the development of individuals as described in the Diploma Policy, the Graduate School of Chemical Sciences and Engineering formulates and implements curricula for the Division of Chemical Sciences and Engineering based on the specific initiatives outlined below.

Double-major curriculum system

The Graduate School of Chemical Sciences and Engineering offers a double-major curriculum system to give students a broad knowledge base and cognitive flexibility so that they can keep up with new developments and boldly rise to new challenges in the ever-evolving fields of advanced science and engineering. Under the system, students must earn at least five credits from major subjects on their courses and at least two credits from minor subjects on courses offered outside their own.

Collaborative education between fundamentals and application

The Graduate School of Chemical Sciences and Engineering offers curricula reflecting the latest research results in a wide range of chemical fields with focus on those of nanotechnology and biotechnology, life and medical science, and energy and the environment as well as basic molecular chemistry. This is supported by organic collaboration with the Faculty of Science, the Faculty of Engineering, research institutions, and other organizations.

Development of researchers and engineers

The Graduate School of Chemical Sciences and Engineering provides education and curricula tailored to students' career aspirations and other pursuits through collaboration and integration between science and engineering, which enable students to take a wide variety of course subjects. These arrangements are expected to prepare students for their transition into society or the next steps in their careers, thereby producing researchers and engineers capable of playing active roles in their fields of specialization.

Exchanges with the business community

As chemistry covers a broad range of topics and is closely related to a variety of industries, the Graduate School of Chemical Sciences and Engineering offers lectures highlighting how chemistry benefits society and the business community, the research perspectives of private companies, and other considerations. The lectures are given by researchers, engineers, and other professionals playing active roles in the business community. The Graduate School also proactively provides opportunities for internships at private companies, research institutions, and other organizations in Japan and elsewhere.

Development of global perspectives

To support the development of internationally minded professionals, the Graduate School of Chemical Sciences and Engineering proactively offers courses for the Hokkaido Summer Institute, where Hokkaido University faculty members, alongside world-leading researchers invited from universities and research institutions worldwide, deliver cutting-edge lectures in English. Classes and seminars designed to promote English presentation skills are also offered.

Division of Chemical Sciences and Engineering Curriculum Policy

The Division of Chemical Sciences and Engineering formulates and implements curricula as outlined below based on the double-major curriculum system in order to foster the development of individuals with the abilities described in the degree conferral standards.

➤ Master's Degree Program

- The Graduate School of Chemical Sciences and Engineering offers curricula covering a wide range of chemical fields based on collaboration between science and engineering with its faculty members from different departments of HU. This provides students at the Graduate School with opportunities to learn in a variety of chemical fields, including those of integrated science and engineering. The aim is to equip them with basic and applicable knowledge that will be useful in future research and engineering careers.
- Students are expected to develop competency in basic academic skills through classes to learn about a wide variety of fields. Individual students are also presented with unresolved chemistry issues and receive practical training toward resolution. This encourages them to develop practical expertise that will support future contributions to research and development in advanced chemistry.
- The Master's Degree Program offers Inter-Graduate School Classes with the aim of developing students' knowledge and capacity to respond to a wide range of chemical challenges and producing socially minded researchers and engineers in chemistry.
- The Master's Degree Program offers course subjects to help students develop a high degree of specialization in chemistry.
- Sub-advisers with science/engineering research backgrounds different from those of supervisors provide students with research guidance based on scientific and engineering perspectives. Three or more faculty members covering science and engineering fields conduct degree examinations. With these arrangements, lectures as well as research guidance and degree examinations are provided from a variety of angles encompassing both fields, thereby motivating students to develop broad outlooks and insights in research. Teaching staff specializing in a wide range of chemical fields also provide advice to support superior master's thesis research.
- To deepen specialized knowledge specific to individual courses, students preferentially learn about subjects offered on their own courses. They are also given opportunities to take lectures on other courses to help develop the ability to see chemistry as a whole with a broad perspective. This allows students to learn about various issues in chemistry

and related fields, and motivates them to build sound academic skills and knowledge that will be useful for future research and engineering careers in chemistry.

- The Master's Degree Program offers courses in English, including *Modern Trends in Physical and Material Chemistry* and *Modern Trends in Organic Chemistry and Biological Chemistry*. These English-taught courses are intended to develop global perspectives by providing students with opportunities to familiarize themselves with chemistry-related English from early on and contribute to Q&A sessions and discussions in English.
- Laboratories offer *Laboratory Exercise in Chemical Sciences and Engineering III*, a special seminar subject consisting mainly of seminars and literature reading, to help students investigate and find out more about the latest research trends in chemical fields. It also fosters the ability to analyze and solve problems.
- The Master's Degree Program offers *Laboratory Exercise in Chemical Sciences and Engineering II* with the aim of improving students' educational capacity required in various professions. The course focuses on developing students' ability to properly understand the principles and methodologies of experimental techniques and to provide instruction in these techniques to undergraduate students and others.
- The Master's Degree Program offers *Internship* and *Industrial Practice in Chemical Processes* to teach students about related activities in actual situations and come into contact with the real world early.
- The Master's Degree Program offers *Laboratory Exercise in Chemical Sciences and Engineering III* to develop a strong sense of ethics in the areas of research and engineering.
- The Master's Degree Program supports students in their master's thesis research by offering *Laboratory Exercise in Chemical Sciences and Engineering I* in each laboratory to cultivate the problem-solving abilities and thesis-writing skills necessary for independent researchers.

➤ Ph.D. Program

- To develop future leaders at the helm of research and development in advanced chemistry, the Ph.D. Program offers the compulsory subject of *Research in Chemical Sciences and Engineering I* and the elective subjects of *Research in Chemical Sciences and Engineering III*, *Modern Trends in Chemical Sciences and Engineering*, and *Internship*. Cutting-edge practical training toward the resolution of issues in these subjects helps students to further enhance their expertise, to foster originality, insight, sound judgment and other qualities, and to develop global perspectives.
- A supervisor and two or more sub-advisers (including one from a science/engineering research background different from that of the chief academic supervisor) provide students with research guidance from scientific and engineering perspectives. A chief examiner (other than the chief academic supervisor) and three or more faculty members covering science and engineering fields conduct degree examinations. With these

arrangements, lectures as well as research guidance and degree examinations are provided from a variety of angles encompassing both fields, thereby motivating students to develop broad perspectives and insights in research. Teaching staff and other individuals specializing in a wide range of chemical fields also provide advice to support superior doctoral dissertation research.

- Laboratories support doctoral dissertation research by offering *Research in Chemical Sciences and Engineering I* to help students develop problem-solving abilities and learn how to write academic papers, both of which are prerequisites for capable researchers.
- The Ph.D. Program offers students opportunities to serve as high-level teaching assistants and engage in other work to enhance the educational capacity required at university and in chemical R&D institutions.
- The Ph.D. Program offers Research in *Chemical Sciences and Engineering III* to develop a strong sense of ethics in the areas of research and engineering.

©Policy for grading and evaluation of learning outcomes

I Criteria for Grade Evaluation

1. Students are graded based on their academic achievement and how well they meet “Course Goals” set for each course, which is aligned with “the specific abilities students are expected to acquire to foster the ideal human resource (degree conferral standards)” as stated in the Diploma Policy.
2. The following is the grading scale used: AA (Excellent)100-90, A (Very Good)89-80, B (Good) 79-70, C (Satisfactory) 69-60, Fail (less than 60)
3. In principle, grades will be given based on an absolute scale.
4. For practical training courses, the grading scale used is “pass/fail.”
5. Each semester, the academic affairs committee will verify that appropriate “Course Goals” are set for each course and the results of grading are given based on these goals. If necessary, the committee may request reconsideration of the “Course Goals” by the faculty member in charge.

II Assessment method

1. Grades will be given based on the results of examinations, reports, presentations, and academic attitude.
2. Class attendance should not simply be used for the computation of grades.
3. Specific evaluation methods will be determined by the instructor of the course.