

## 1. Diploma Policy and Curriculum Policy

At the Graduate School of Natural Science and Technology, each division has formulated its own Diploma Policy (DP) and the Curriculum Policy (CP) to assure the quality of education provided at each division.

DP sets academic achievement goals for each division, and students are required to achieve these goals to receive their Master's degree.

To achieve the goals specified by the DP, students need to systematically study many subjects and earn required credits. CP is the policy of each division regarding their systematic configuration of subjects.

### ○ Division of Mathematical and Physical Sciences

#### Diploma Policy

The division aims to systematically develop human resources who have acquired high-level specialized knowledge and research techniques on mathematics, physics, and/or computational science and are capable of solving various problems in the field of natural science and technology at a fundamental level; and who, as highly skilled professionals or researchers, are capable of applying specialized knowledge and research techniques acquired at the division to solving diverse real-world problems with regard to society and the environment. Earning required credits and passing the thesis review are requirements for receiving the Master's degree.

#### Curriculum Policy

Three courses comprising the areas of Mathematics, Physics, and Computational Science are available for students to develop their ability to a level essential to address various basic problems theoretically or experimentally in the field of natural science and technology. Students are guided through basic subjects, specialized subjects, and developmental subjects as they advance in their studies, with emphasis placed on seminars and special lectures. Through this curriculum, the division aims to develop professionals who are capable of solving diverse phenomena as well as a broad spectrum of human resources who will lead the educational community.

#### <<Mathematics Course>>

The objective of the Mathematics Course is to sharpen students' ability to see the essence of matters through the study of generalization and abstraction. The course starts with basic subjects and eventually aims to bring students to the forefront of research with developmental subjects.

#### <<Physics Course>>

In the Physics Course, a diverse set of subjects ranging from elementary particle physics and astrophysics to plasma/condensed matter physics and biophysics are available for students to develop their abilities to identify fundamental laws behind complicated natural phenomena.

#### <<Computational Science Course>>

In the Computational Science Course, basic subjects provide basic knowledge on mathematics and physics, while developmental subjects allow students to learn how to apply such knowledge to natural science and engineering. The ability to skillfully utilize computer simulations and other techniques is nurtured through applied computational science and other subjects.

In addition to education aimed at developing the skills required of professionals, all courses also provide the basic education necessary to perform doctoral level research.

### ○ Division of Material Chemistry

#### Diploma Policy

The division provides students with a wide range of basic knowledge and research methods for working in fields that require chemical expertise, as well as skills in self-expression, communication and problems solution required to play an important role in various areas of the business world. Earning required credits in the dual programs and hierarchized curriculum designed for students to acquire the above-mentioned expertise and capabilities, as well as passing the thesis review after developing knowledge and skills required to become advanced professionals, are requirements for receiving the Master's degree.

#### Curriculum Policy

In accordance with the Admission Policy, the Chemistry Course and the Applied Chemistry Course cover basic to applied chemical studies and, under the curriculum designed to teach up to advanced, specialized expertise, develop students into highly skilled professionals and researchers.

#### <<Chemistry Course>>

In the Chemistry Course, the property, structure and reaction of materials are studied at the levels of atomic nuclei to molecular aggregates in order to understand underlying fundamental principles, thus enabling elucidation of the functionality of diverse materials and the essence of natural world phenomena as well as the creation of new functional materials. To achieve this, the course offers dual programs—Material Creation Chemistry Program and Material Analysis Program—each of which is organized systematically with a curriculum hierarchized into basic subjects, developmental subjects, and advanced practical subjects, as well as the optimal allocation of instructors. With these programs and curriculum in addition to environmentally-considerate and safe education/research facilities, the course provides education that can contribute to social needs and science development. The Early Completion Program is also available for students with outstanding achievements to meet their needs to complete the course earlier.

#### <<Applied Chemistry Course>>

The Applied Chemistry Course can be divided into two areas: understanding and solving energy and environmental problems through the development of materials with new functions, separation and analysis of materials, and other chemical approaches; and developing highly functional materials and improving their reaction efficiencies by analyzing the material structure and functions of collective materials. To build students' understanding through basic to applied research, the course offers dual programs—an Energy/Environmental Program and a Material Program—each of which is organized systematically with its curriculum hierarchized into basic subjects, developmental subjects, and advanced practical subjects, as well as with the optimal allocation of instructors. With these programs and curriculum in addition to environmentally considerate and safe education/research facilities, the course provides education that can contribute to social needs and science development. The Early Completion Program is also available for students with outstanding achievements to meet their needs to complete the course earlier.

### ○ **Division of Mechanical Science and Engineering**

#### Diploma Policy

The division aims to produce engineers who have acquired practical expertise and advanced, specialized knowledge in the field of mechanical engineering, which is the basis for all production systems; who are capable of creating intelligent mechanical systems that are in harmony with humanity and the environment; and who possess an international mindset and creativity to play active roles internationally as well as flexibility in response to social and scientific changes. Earning required credits while acquiring the above-mentioned expertise and capabilities, in addition to passing the thesis review after developing the abilities and skills required of highly technical professions, are requirements for receiving the Master's degree.

#### Curriculum Policy

The division aims to help students develop in-depth specialized knowledge and the ability to pursue and create innovation through a wide range of studies and research covering the basics of mechanical science to state-of-the-art technology, as well as to train students to become researchers and advanced engineers who can work actively in the international arena. Toward this end, the following two courses are offered.

#### <<Mechanical Systems Engineering Course>>

The curriculum of this course is hierarchized into physics and mathematics subjects, which are considered as the foundation of mechanical science; five basic subjects for mechanical engineering, which is the basis for all production systems; and applied subjects (design/material/processing, mechatronics, thermic fluid) aimed at supporting students to acquire highly technical knowledge in a particular specialized field and the skills to apply that knowledge to their project research. With this curriculum, the course aims to develop human resources who aspire to create technological systems that will be instrumental in solving various industrial issues.

#### <<Environment and Human related Mechanical Systems Course>>

The curriculum of this course is hierarchized into basic subjects intended to expand students' knowledge and strengthen their basic skills; an Environment and Human related Mechanical Science Seminar designed to enhance students' basic experimental and analytical skills; and applied subjects (manufacturing, biomedical engineering, energy/environment) aimed at reinforcing students' practical application skills in their respective fields of specialization as well as their ability to address interdisciplinary issues by integrating different knowledge domains and overviewing and connecting different technologies. With this curriculum, the course aims to develop human resources who aspire to develop technological systems that are aligned with the needs of people, the environment, and society.

## ○ **Division of Electrical Engineering and Computer Science**

### Diploma Policy

A Master's degree is granted to students who have acquired advanced, specialized knowledge and technology development capabilities in the fields of electricity, electronics, information engineering, and bioinformatics engineering and who are capable of taking leadership in technological development in corporations or other organizations; who understand the roles that electricity, electronics, information engineering, and bioinformatics engineering can play in society and are capable of applying their expertise in each field to the real world with regard to society and the environment; who are able to write and publish papers and engage in discourse and who are internationally minded with a good command of the English language; and who have earned required credits and passed the thesis review.

### Curriculum Policy

Electronics and information technologies, on which a highly advanced information-oriented society is built, and their application technologies have been developing rapidly, bringing about great change to social and industrial activities, and even to personal lifestyles. This tendency is expected to accelerate even further. The division looks to a future information-intensive society and provides global-standard education that combines information engineering, electronic engineering, and electric engineering to produce human resources capable of leading R&D in innovative technologies. Education at the division is also aimed at developing students into researchers or highly specialized engineers with significant expertise in their respective fields, great creativity, high motivation to open up technological frontiers, independent thinking and leadership skills, and an international mindset. The curriculum comprises basic mathematics subjects and specialized basic subjects that are common for all students across the division, as well as applied subjects in the fields of intelligent systems, information systems, and electronics systems. The curriculum is thus structured in a systematic way that allows students to efficiently study basic, applied, and leading-edge engineering across a wide range of fields.

## ○ **Division of Environmental Design**

### Diploma Policy

The division aims to systematically produce creative researchers and engineers who, in this "century of the environment," aspire to create social and environmental infrastructure in harmony with nature; who have extensive expertise and interdisciplinary skills in various aspects of environmental design ranging from investigation, research, planning, design, construction, and maintenance of infrastructure even to waste treatment and recycling; and who are capable of playing an active part in the development of a safe, anxiety-free, sustainable society.

### Curriculum Policy

The division places emphasis on the cultivation of students' inquiring minds, willingness to continue life-long study, and the ability to identify and solve issues, as well as their acquisition of essential knowledge underlying their respective fields of specialization and in-depth insight. Students are also encouraged to expand their domains of inquiry to include humanities and social sciences in addition to natural sciences, in connection with social infrastructure, global and regional environments, and urban design, as well as to interact with other universities, research institutions, and the private sector through scientific society activities, joint research, internships, and other opportunities to deepen their interdisciplinary knowledge.

## ○ **Division of Natural System**

### Diploma Policy

With the goal of preserving an abundant and sustainable natural environment and creating a society in harmony with nature, the division aims to develop human resources who have acquired specialized knowledge and practical skills necessary for research on life science, bioengineering, chemical engineering, and geo-environmental studies; who have presentation and communication skills that enable them to play an active role in the international arena; who are able to set and solve challenges in a flexible manner in addition to carrying out plans; and who are rich in humanity and creative. To receive a Master's degree, students are required to obtain:

- (1) specialized knowledge in their respective courses and fields and highly technical and practical knowledge necessary to implement investigations and research, as well as the skills to apply such knowledge to natural science;
- (2) the ability to analyze issues faced by the international community, propose how their respective fields of specialization can contribute to solving these issues, and plan and implement solutions;
- (3) the ability to identify, investigate, and solve issues that must be overcome to solve global environmental problems and create a sound material-cycle and healthy society; and
- (4) the ability to present their research results and proposals through logical thinking and judgment processes as well as to accurately communicate their ideas to society.

## Curriculum Policy

The division offers four courses: Biological Science Course, Bioengineering Course, Chemical Engineering Course, and Earth and Environmental Sciences Course. In each of these courses, students learn specialized knowledge on the natural system consisting of organisms, human beings, materials, and the Earth, and develop the ability to apply this knowledge comprehensively. The division aims to nurture researchers, engineers, and educators who have global mindedness and high ethics in the field of natural science.

### <<Biological Science Course>>

The course provides integrated, interdisciplinary life science developed on the basis of biology—both basic and applied, and from the molecular and cellular level to the population and ecosystem level—and its related fields.

### <<Bioengineering Course>>

The course offers programs aimed at honing students' logical thinking skills as well as at developing students' interest in a broad range of life scientific phenomena and helping them to inquire into complex life science phenomena—particularly those associated with people and their lives—and gain the ability to apply the results of their inquiries to a practical context.

### <<Chemical Engineering Course>>

The course aims to produce engineers and researchers who are capable of identifying issues concerning the design of production processes, effective use of energy, global-scale materials and resources cycle, and other matters, and solving them by drawing on the basic knowledge of chemical engineering, a discipline that serves as the basis of the chemical industry.

### <<Earth and Environmental Sciences Course>>

This course aims to develop researchers and engineers who understand the natural system from a broad long-term perspective and who are capable of applying their specialized knowledge to the activities and material composition of the Earth to prepare for natural disasters and solve global environmental problems. The course also aims to nurture students into educators who can pass on their skills of applying expertise and knowledge on Earth and environmental sciences to practical use.