College of Engineering Sciences

■ Bachelor of Engineering

Program Educational Objectives

We foster engineers and researchers with enriched creativity who understand the fundamental principles for science and technology that constitute a foundation for the most advanced engineering necessary for continuing to maintain and develop our society and who are able to develop such science and technology.

Graduate Profile	– Students have acquired basic academic skills that allow them to understand fundamental principles the most advanced science technology at atomic and molecular level. Furthermore, such students have also obtained specialized knowledge that allows them to develop and create the aforementioned basic academic skills. – Students are able to logically think about various problems that they confront in the course of science technology from an interdisciplinary vantage and wide- ranging viewpoints in physics, chemistry, and biology. – Students have acquired cooperation abilities that allow them to play active parts vigorously in a team and abilities that allow them to express themselves through communicating with people in different fields. – Students have acquired language proficiency and presentation abilities that allow them to play vigorous active roles internationally. With these abilities, as represented by Mathematics x Physics x Chemistry x Biology, our goal is to foster engineers who can deal with current problems as well as unknown future challenges by synergistically fusing experience and knowledge from each field, particularly in fields such as materials and measurement technology, which are the foundation of industry even though they may not be directly visible in everyday life.
Career Paths after Graduation / Completion	Approximately 90% of our graduates go on to graduate school, and of those, approximately 1.5% go on to a doctoral program. Our graduates, including those with graduate degrees, are active in a wide range of fields both in Japan and overseas. Employment sectors (including graduate school graduates): Machinery/electrical/chemicals, metals/materials, information/communications, medical/pharmaceuticals, food, finance/insurance, school teaching, government/local government

Diploma Policy

We grant diplomas for Bachelor of Engineering to persons who have acquired the knowledge and skills (Generic Competences) to be learned based on the educational purpose for undergraduate students of the University of Tsukuba, as well as the knowledge and skills (Specialized Competences) to be learned based on the educational purpose of our school and college.

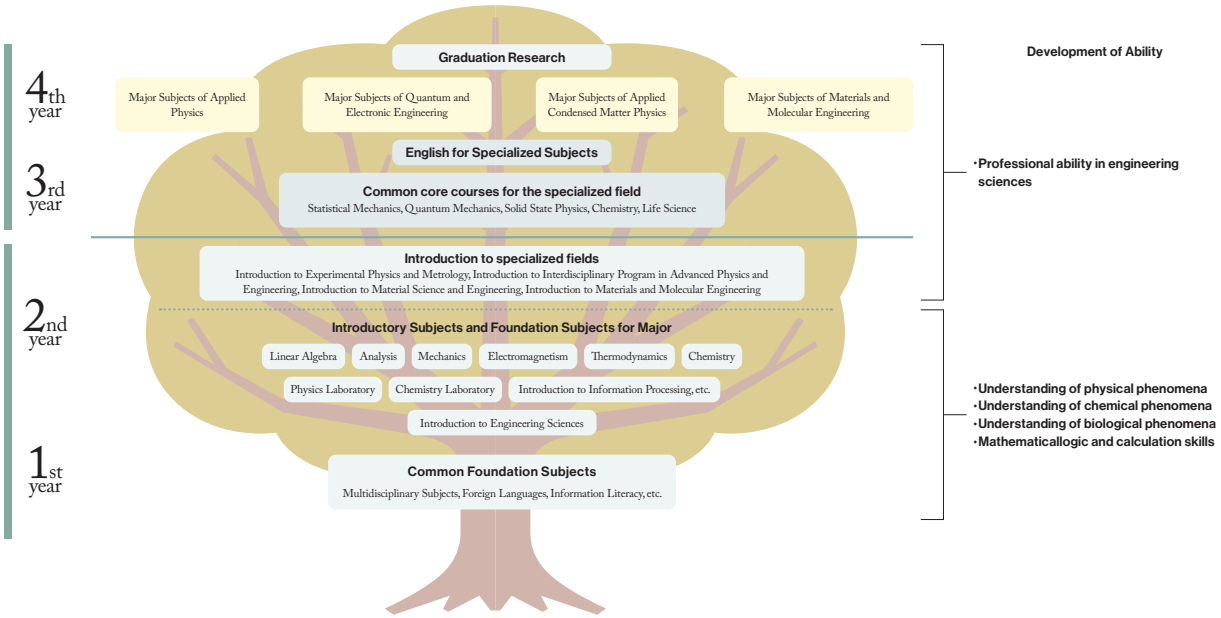
Knowledge and Skills (Specialized Competences)	1. Understanding of physical phenomena	Understanding of a wide range of physical phenomena from quantum mechanics to electromagnetism and thermodynamics
	2. Understanding of chemical phenomena	Understanding of the chemistry that forms the basis of modern chemistry
	3. Understanding of biological phenomena	Understanding of the molecules in living organisms and the phenomena of life produced by those molecules
	4. Mathematical logic and calculation skills	Ability to think and operate mathematically on the basis of linear algebra and analysis
	5. Professional ability in engineering sciences	Understanding of and ability to apply cutting-edge measurement techniques, electron and quantum nanotechnology, the physical properties of diverse materials, and hybrid chemistry and molecular engineering.
Guidelines for Assessing Learning Outcomes	Graduation research is emphasized as the culmination of learning outcomes, and learning outcomes are evaluated based on the degree awarding policy through the graduation thesis and graduation research presentation. Graduation thesis evaluation is conducted through peer review by the supervisor and multiple faculty members in the major department, and this is reflected in the achievement of learning outcomes. At the graduation research presentations held for each major, multiple faculty members from that major will evaluate the achievement of learning outcomes based on an oral summary explanation and question-and-answer session. A comprehensive assessment of these results will be used to make a final evaluation of learning outcomes.	

Curriculum Policy

We organize and implement curricula based on the following policies for programs that allow students to acquire basic abilities and logical ways of thinking for handling various problems in the field of engineering and learning outcomes related to Bachelor of Engineering.

Curriculum Design Framework	**General policy** In the highly advanced modern society, the mission of college education is to return outcomes from natural science from the technical aspect and contribute the same to the society. In order to do so, we offer an educational curriculum for acquiring basic academic skills essential for understanding and developing fundamental principles for advanced science technology, specialized knowledge for the most advanced science and technology, and a sense of the international milieu. **Course sequence policy** We offer education that emphasizes mathematics, physics, and chemistry in order for students to foster basic and logical ways of thinking for understanding the most advanced science by the second year. In particular, students sufficiently experience seminars during the second year. We allow for the fostering of calculation abilities and processing abilities as well as logical ways of thinking. In addition to experience and experiment-related learning for basic science, we have mandatory experiment sessions for physics and chemistry in which students can cultivate cooperativeness during the second year. Moreover, through introductory and general lectures in specialized fields, we offer education in specialized fields after the third year. During the third year, in order to respond to science technology that continues to be developed in an advanced manner, we provide four major courses (i.e., Applied Physics, Quantum and Electronic Engineering, Applied Condensed Matter Physics, and Materials and Molecular Engineering). In this way, we offer students highly specialized lectures and experiment subjects. We provide major courses giving consideration to desires of students to the maximum extent possible. During the fourth year, all students are assigned to relevant seminars and laboratories by college faculty members. In addition to classes, students engage in graduation project and thesis. We foster abilities for carrying out proactive learning, which constitute research for discovering students' own value. **Implementation policy** We offer specialized subjects that constitute the foundations of each field (i.e., physics, chemistry, and biology) as specialized shared core subjects. We offer students a wide variety of viewpoint that allow students to gain a vantage regarding matters in a cross-sectional manner. Moreover, we continuously offer specialized English education until the third year. In this way, we provide education that enhances language proficiency and a sense of internationality for students.
Teaching and Learning Methods	As part of active learning from early years, students are encouraged to participate in the Advancing Researcher Experience Program, which supports first- to third-year students who are interested in research.

Structure of competences to be developed and curriculums



Admission Policy

Desired Student Profile	Personnel with mathematic and logical ways of thinking that constitute a foundation for understanding fundamental principles in advanced science and with basic scientific knowledge in physics, chemistry, etc. who are interested in advanced engineering applications are desired.

Student Evaluation and Selection	Individual Achievement Test First Round	Judgments are made primarily on the mathematics and science ability required to apply science to technological fields and to master science and technology based on the microscopic laws of nature. Basic academic ability and aptitude for further study are assessed.
	Individual Achievement Test Second Round	We select individuals who have the basic academic ability to essentially understand cutting-edge technology from a scientific perspective, can clearly state their goals for studying after entering university, and are motivated to enter the field of engineering based on the laws of physics and chemistry.
	Entrance Examination by School Recommendation	In addition to having excellent grades in high school, we select individuals who understand the application of natural science to technical fields, have the ability to appropriately express their interests and career paths in matters related to the laws of nature, substances, and materials, and also have the ability to reflect and analyze.
	Entrance Examination for IB Students	We select individuals who have the strong motivation necessary to understand and develop cutting-edge science and technology from a scientific perspective, basic academic ability in mathematics and physics, and the language proficiency in Japanese and English necessary to study this.
	Transfer examination	The applicant will be comprehensively evaluated based on the basic academic ability and motivation to study at the level of a second-year university student who is able to accept specialized engineering education, as well as a strong interest in engineering, logical thinking skills, and communication skills.

Learning Support Framework

Academic Support	We have a four-class system, with class teachers providing academic support. For students who are struggling with their studies, senior professors at the Terakoya Counseling Center provide detailed support.
Opportunities for Peer Interaction	At the orientation for new students, we encourage interaction between students through off-campus training, and also support interaction between female students through orientation for female students.
Opportunities for Student–Faculty Interaction	Through class meetings held twice a year, we encourage interaction between students and faculty, such as exchanging opinions on improving motivation for learning and the quality of education. For graduation research, approximately two students are assigned to one faculty member, who provides research guidance through a generous system.

Approaches to Assuring and Enhancing Educational Quality

In order to understand the rapidly evolving advanced technology, it is essential to review the educational contents from time to time. Therefore, we improve our educational abilities through the following measures. For the Foundation Subjects for Major (i.e., mathematics, physics, chemistry), which are the common foundation for all engineering fields, as well as for the specialized common core courses, we conduct class questionnaires and work on educational improvement through the Curriculum Committee meetings and the FD Committee meetings. Discussions are made based on comments from students, and the results of the questionnaires are fed back to improve classes and are used to enhance the educational abilities of the faculty. For all classes, from Foundation Subjects for Major to Major Subjects, a list of priority items to be learned in each class is created, which is used by the Curriculum Committee to review the continuity between courses and class contents as needed. The Curriculum Committee and FD Committee evaluate students' learning outcomes and verify the validity of the curriculum and the appropriateness of instruction. The results of student-led class questionnaire surveys are also used to improve the classes from the students' perspective.