

## Bachelor's Program in Interdisciplinary Engineering

### ■ Bachelor of Engineering

#### Program Educational Objectives

This program aims to foster the development of global human resources, who by acquiring firm and basic academic skills in mathematics and physics, which form the foundation of engineering education, will be able to understand and analyze any issues in the field of Interdisciplinary Engineering ranging from the micro to macro-scale, from the fundamental perspective, and to find creative solutions.

<b>Graduate Profile</b>	The students we train have the knowledge to solve interdisciplinary engineering problems and the ability to create new value in multicultural and multidisciplinary teams. With these abilities, they will be able to contribute to the realization of a sustainable society, the advancement of industry, and the resolution of local and international issues, in the domain of interdisciplinary engineering.
<b>Career Paths after Graduation / Completion</b>	Graduates go on to graduate school in Japan or overseas to acquire more advanced and broader specialized knowledge and cultivate application skills. Alternatively, they find employment at global companies in the automotive and aerospace, robotics, construction, electrical and electronics, medical equipment, and materials development industries, where they work as engineers tackling cross-disciplinary engineering challenges.

### Diploma Policy

The degree of Bachelor of Engineering is conferred upon those who have acquired the knowledge and skills (Generic Competences) specified in the educational objectives of the University of Tsukuba undergraduate programs, as well as the following knowledge and skills (Specialized Competences) defined in accordance with the educational goals of the Bachelor's Program in Interdisciplinary Engineering.

<b>Knowledge and Skills (Specialized Competences)</b>	1. Mathematical logic and calculation skills	Mathematical thinking skills based on analysis and linear algebra, and computational skills to solve physical problems
	2. Understanding of phenomena in physics	Understanding of a wide range of physical phenomena, from mechanics to electromagnetism to thermodynamics
	3. Understanding of phenomena in chemistry and biology, and analytical skills for physics and systems engineering experiments	Ability to analyze and critically evaluate a wide range of physics and engineering experiments, and to work well in a manufacturer and interdisciplinary environment
	4. Ability in micro-engineering, and a nanoscience	Broad knowledge of micro-engineering, and the nanoscience and an understanding of diverse research methods
	5. Ability in macro-engineering, and system engineering	Broad knowledge of macro-engineering, and system engineering, and an understanding of diverse research methods
	6. Problem explanation and problem solving skills	Ability to explore cross-disciplinary issues and solve them from a principled perspective, and to communicate and present information
<b>Guidelines for Assessing Learning Outcomes</b>	As the culmination of their studies, students compile the results of their two-year Project-Based Learning (PBL) research into a bachelor's thesis. The outcomes are presented at a public thesis presentation session, followed by an oral examination attended by the academic supervisor and other faculty members. The student's attainment of the knowledge and competences specified in the degree awarding policy is comprehensively evaluated, in conjunction with the thesis examination, by a committee consisting of the chief examiner and members of the program committee.	

Curriculum Policy

<p><b>Curriculum Design Framework</b></p>	<p><b>Comprehensive Policy</b>                  To be active in the modern field of engineering, which is becoming increasingly interdisciplinary across a wide range of domains, students must acquire a solid foundation in mathematics and physics, which form the common basis of these disciplines, as well as the ability to address complex problems in cutting-edge science and technology with interdisciplinary perspectives, initiative, and creativity. This degree program provides a curriculum designed to cultivate these competences.</p> <p>Mathematical Logic and Calculation Skills:                  Students acquire mathematical thinking skills based on analysis and linear algebra, and develop computational skills to solve physical problems.</p> <p>Understanding of Physical Phenomena:                  Students gain an understanding of a wide range of physical phenomena, from quantum mechanics to electromagnetism and thermodynamics.</p> <p>Understanding of Chemical and Biological Phenomena, and Analytical Skills for Physics and Systems Engineering Experiments:                  Through experiments in physics and engineering, students develop the ability to analyze and critically evaluate experimental results, as well as the capacity to collaborate effectively with individuals from diverse cultural and disciplinary backgrounds.</p> <p>Ability in Microengineering and Nanoscience:                  By completing specialized courses, students acquire broad knowledge of microengineering and nanoscience, and an understanding of diverse research methods in these fields.</p> <p>Ability in Macroengineering and Systems Engineering:                  Through specialized coursework, students gain broad knowledge of macroengineering and systems engineering, together with an understanding of diverse research methodologies.</p> <p>Problem Exploration and Problem-Solving Skills:                  Through Project-Based Learning (PBL) courses, students develop the ability to explore cross-disciplinary issues, solve them from a principled perspective, and communicate and present their findings effectively.</p> <p><b>Policy on Curriculum Progression</b>                  In the first and second years, the program emphasizes education in mathematics and physics, which form the foundation of all fields in science and engineering. Particular emphasis is placed on exercises incorporating computer-based learning, aiming not only to foster logical thinking but also to cultivate the practical ability to apply fundamental concepts. Through fundamental and specialized experiments, students also cultivate experimental learning skills and a spirit of collaboration. From the third year onward, students study key specialized courses that form the shared core of microengineering and macroengineering, while engaging actively in research (PBL) through assignment to two laboratories. This experience enables them to acquire deeper expertise, creativity, and interdisciplinary competence.</p> <p><b>Policy on Implementation</b>                  To ensure the international standard of educational content, many of the specialized and foundational courses in mathematics and physics adopt globally recognized textbooks. In addition, exercises using computers are incorporated to strengthen information processing and programming skills. During the third and fourth years, students conduct research in two laboratories—one in microengineering and the other in macroengineering—through Project-Based Learning (PBL), thereby fostering interdisciplinary capability. Furthermore, to deepen their understanding of the significance of their own field of specialization and its relationship with other disciplines, students are required to take courses offered by other schools and colleges within the university.</p>
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<p><b>Teaching and Learning Methods</b></p>	<p>In order to foster interaction with Japanese students, international cooperation abilities and Japanese language skills, laboratories and practical subjects are offered as joint courses of the relevant courses in the College of Engineering Sciences and the College of Engineering Systems. First- and second-year students who are interested in research in the most advanced areas are encouraged to participate in the Advanced Research Experience (ARE) program. Participated students are awarded credits upon completion. Students may also graduate early for entry into graduate schools in Japan.</p>
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### Admission Policy

<p><b>Desired Student Profile</b></p>	<p>The Interdisciplinary Engineering Program requires admittees to satisfy the following.</p> <ol style="list-style-type: none"> <li>(1) To have motivation for leading the next-generation manufacturing in a Super Smart Society.</li> <li>(2) To have the necessary English proficiency to be devoted to studying the engineering field.</li> <li>(3) To have basic academic skills in mathematics to study the wide range of engineering field.</li> <li>(4) To have aptitude and motivation for studying in the engineering field.</li> </ol>
<p><b>Student Evaluation and Selection</b></p>	<p>The document screening will assess whether the applicant is suitable for the type of person the Bachelor's Program in Interdisciplinary Engineering is looking for, based on nationally standardized test scores such as the SAT, and an essay. Applicants who pass the document screening will be evaluated in an oral/essay test in English, either in person or online.</p>

### Learning Support Framework

<p><b>Academic Support</b></p>	<p>All new students will be assigned a student tutor, and senior students will be available to provide advice on study strategies and course selection, promoting peer support and solidifying their learning. From their third year, students will be assigned to laboratories, where they will engage in small-group instruction with faculty, providing opportunities for active learning and group work. With an awareness of the connection between academic content and practical applications, internships will be awarded credits, further enhancing motivation.</p>
<p><b>Opportunities for Peer Interaction</b></p>	<p>All new students will be assigned a student tutor. We will also provide rooms where students in the Bachelor's Program in Interdisciplinary Engineering can gather and study, creating an environment that is conducive to learning together.</p>
<p><b>Opportunities for Student-Faculty Interaction</b></p>	<p>We will hold class meetings for all students, providing an opportunity for them to meet with faculty and staff. First- and second-year students will be assigned a class teacher to promote interaction between students and faculty. Third- and fourth-year students will be assigned to laboratories through PBL, providing opportunities for one-on-one instruction from faculty.</p>

### Approaches to Assuring and Enhancing Educational Quality

The Curriculum Committee evaluates students' learning outcomes and examines the validity of the curriculum and the appropriateness of academic guidance. A class liaison meeting is held to collect feedback from students, and the Program Management Committee continuously reviews and improves the overall educational activities. Through these measures, the program ensures the quality of education and strengthens the organizational framework for achieving the objectives of the degree program.