

College of Mathematics

■ Bachelor of Science

Program Educational Objectives

In modern society, the demand for individuals with high mathematical abilities is increasing across various fields. The purpose of training personnel in the department of mathematics is to foster individuals who possess the problem-solving skills required in society by deepening their understanding of mathematics.

Graduate Profile	By acquiring a wide range of knowledge on the foundations of modern mathematics, from pure to applied mathematics, students will acquire a high level of logical reasoning, as well as the mathematical ability to analyze problems, understand their structure, and solve them, and will become people who can play an active role globally in various fields of society.
Career Paths after Graduation / Completion	About half of the graduates go on to graduate school. On the other hand, graduates who choose to enter the workforce find employment in a variety of industries, including: <ul style="list-style-type: none">- Information and Communication Technology- Finance and Insurance- Junior high school /high school teacher, education- Public servant- System engineer- Outsourcing and others.

Diploma Policy

We grant diplomas for Bachelor of Science to persons who have acquired the knowledge and skills (that is, Generic Competences) to become learned based on the educational purpose for undergraduate students of the University of Tsukuba. In their learning outcomes, they will achieve the following goals based on the educational purpose of our school and college.

Knowledge and Skills (Specialized Competences)	1. Basic knowledge of natural sciences	Students have acquired fundamental knowledge of natural sciences and developed scientific thinking skills. They can also freely utilize the foundational mathematical concepts of calculus and linear algebra.
	2. Expertise in mathematics (algebra)	By understanding mathematical logical reasoning methods and acquiring mathematical thinking skills, logical reasoning skills, and application skills, students master specialized knowledge in algebra.
	3. Expertise in mathematics (analysis)	By understanding mathematical logical reasoning methods and acquiring mathematical thinking skills, logical reasoning skills, and application skills, students master specialized knowledge in analysis.
	4. Expertise in mathematics (geometry)	By understanding mathematical logical reasoning methods and acquiring mathematical thinking skills, logical reasoning skills, and application skills, students master specialized knowledge in geometry.
	5. Expertise in mathematics (mathematics of information)	By understanding mathematical logical reasoning methods and acquiring mathematical thinking skills, logical reasoning skills, and application skills, students master specialized knowledge in mathematics of information.
	6. English skills for mathematics	Students have acquired basic English proficiency and presentation abilities related to specialized fields.
Guidelines for Assessing Learning Outcomes	The knowledge and competences outlined in the Degree Awarding Policy are evaluated through the acquisition of credits in courses corresponding to those competences. Grades for each course are determined through an appropriate combination of assessments based on the course syllabus, such as quizzes, tests, and reports, using grading methods aligned with the competence evaluation criteria published in the syllabus. The pass/fail standard is generally set at 60% or higher of the total points as a guideline for credit recognition, and is clearly stated in advance in the syllabus according to the characteristics of the course.	

Curriculum Policy

We organize and implement curricula based on the following policies for programs that allow students to acquire learning outcomes related to the Bachelor of Science.

<p>Curriculum Design Framework</p>	<p>General policy</p> <p>Mathematics is a remarkably systematic academic study with international universality, and its curriculum is almost the same in many universities in developed countries. In line with this, we organize and implement curricula so that students will be able to move along the sequence smoothly, ranging from the basic level to specialized, developed, and applied levels.</p> <p>Course sequence policy</p> <ul style="list-style-type: none"> - During the first year, students acquire basic knowledge related to overall natural science and learn Calculus and Linear Algebra, which are foundations for all mathematics as Foundation Subjects for the Major. In addition to lectures in the aforementioned studies, seminar hours are included, during which students actually solve problems. Moreover, students widely learn non-specialized fields such as languages as Common Foundation Subjects and Specific Foundation Subjects. (The competence 'Basic knowledge of natural sciences' is acquired here.) - The second year is the period for study from the basic level to the development level. During such a period, students prepare for more profound knowledge about Calculus and Linear Algebra and specialized fields (e.g., Set Theory, Topology, Curves and Surfaces). We also offer seminar-form “Mathematics in Foreign Language I” for improving linguistic proficiency and presentation abilities. - During the third year, students learn general foundation subjects for specialized fields. We offer lectures and seminars that allow students to obtain core knowledge about the four fields of Algebra, Geometry, Analysis, and Information. We also offer seminar-form “Mathematics in Foreign Language II” . “Introduction to the Study of Graduation Research” allows for a smooth shift to graduation theses engaged in during the fourth year. - During the fourth year, students participate in seminars and laboratories. They join small-class and seminar-form graduation theses groups comprising several persons in each seminar and laboratory. At the same time, we offer lectures related to specialized themes. (The competences ' Expertise in mathematics (algebra, analysis, geometry, mathematics of information)' and 'English skills for mathematics' are acquired in the second to fourth years.)
---	---

Teaching and Learning Methods	<ul style="list-style-type: none"> - Seminar hours are offered for the main subjects, in which students solve examples and develop problems on their own. In this way, students are able to deepen their understanding of lectures. - Subjects urging interest (e.g., “Introduction to Mathematics” and “Mathematics in Foreign Language”) are prepared. - English textbooks are used for some classes and seminars. In this way, students are able to brush up on their expressions and language proficiency abilities and consider internationalization. - The curriculum design helps students acquire a teaching license (mathematics). - At the “Career Path Seminar in the College of Mathematics”, company representatives explained the high demand for mathematics in society and the career paths available after graduating from the College of Mathematics.
--------------------------------------	---

Structure of competences to be developed and curriculums			
1 st year	2 nd year	3 rd year	4 th year
Foundation Subjects for Major Introduction to Mathematics Mathematics Literacy 1·2·3 Calculus 1·2·3 Linear Algebra 1·2·3	Major Subjects Advanced Linear Algebra Vector Analysis and Geometry Introduction to Differential Equations Introduction to Set Theory Introduction to Algebra Introduction to Topology Surface Theory Introduction to Complex Analysis Exercise in Computer Statistics Mathematics in Foreign Language I Career Path Seminar in the College of Mathematics	Introduction to the Study of Graduation Research Mathematics in Foreign Language II Major Subjects in Algebra Algebra IA · IB Major Subjects in Geometry Topology A · B Introduction to Manifolds Major Subjects in Analysis Lebesgue Integral Introduction to Functional Analysis Probability Theory I · II Major Subjects in Information Mathematics Mathematical Logic I · II Mathematical Statistics I · II Computer Mathematics I · II	Graduation Research Algebra II · III · IV Topology C Differential Geometry Functional Analysis Complex Analysis
General Foundation Subjects Common Foundation Subjects Specific Foundation Subjects			
Basic knowledge of natural science in general	Obtain more profound theory, prepare for specialized fields	Fundamental knowledge in the fields of algebra, geometry, analysis, and information.	Graduation research with small-group seminars
Basic skills for studying specialized mathematics	Improve language and presentation skills	Improve language and presentation skills, preparation for graduation research	More specialized knowledge

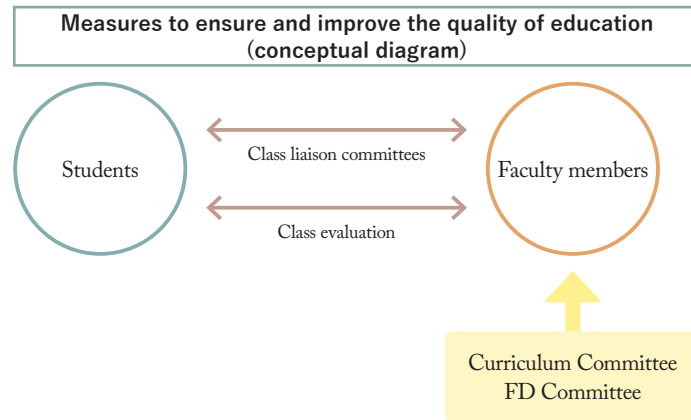
Admission Policy

Desired Student Profile	Personnel who have a passion for mathematics and are persistent in thinking about answers when there are unclear matters are desired. Moreover, personnel who desire to acquire logical (mathematical) thinking abilities are desired.
--------------------------------	--

Student Evaluation and Selection	Individual Achievement Test First Round	We will comprehensively evaluate general basic academic skills, as well as the logical thinking, mathematical reasoning, and application skills necessary for studying mathematics.
	Entrance Examination by School Recommendation	We will comprehensively evaluate factors such as excellent academic performance in high school, a clear sense of purpose in studying mathematics, and a strong motivation to engage with the discipline of mathematics.
	Entrance Examination for IB Students	We will comprehensively evaluate a strong curiosity for the natural sciences, a broad international perspective, fundamental academic abilities related to mathematics, and a strong willingness to learn mathematics.
	Entrance Examination for Foreign School Students	We will comprehensively evaluate a strong interest in mathematics, the language skills necessary for studying mathematics after enrollment, and fundamental academic abilities.
	Transfer examination	We will comprehensively evaluate whether the applicant possesses the fundamental academic abilities necessary to undertake specialized mathematics education, as well as a strong interest in and aptitude for mathematical thinking.

Learning Support Framework

Academic Support	We regularly organize “Tenarai-juku” (tutorial class) for mathematics, where students can get answers for their questions, including those concerning calculus and linear algebra, which are core courses in the first year.
Opportunities for Peer Interaction	We organize exchange meetings with students who have transferred from the School of Comprehensive Studies, ensuring that their studies progress smoothly after the transfer.
Opportunities for Student-Faculty Interaction	<ul style="list-style-type: none"> - In addition to graduation research conducted in a small group of several students per laboratory, small seminar-style classes are offered from the second year. In these classes, students prepare and give presentations to check their own level of understanding and improve their understanding through direct discussions with the faculty members. - For smooth communication between the students and faculty members, class liaison committees are organized at the College of Mathematics.



Approaches to Assuring and Enhancing Educational Quality

- The Management Committee of the College of Mathematics evaluates student learning outcomes to verify the validity of the curriculum and the appropriateness of instruction.
- Based on class questionnaires answered by the students, as well as other data, we hold discussion meetings for students and faculty (class liaison meetings) twice a year in the spring and autumn. The candid opinions exchanged in these meetings are used for educational improvement.
- For courses with multiple classes, such as calculus and linear algebra, course liaison committees are organized to coordinate content and improve lecture techniques among the instructors.