

## Educational purpose

To develop global human resources with the extensive knowledge needed to realize a sustainable society, and having specialties from the basics to applications of science and technology, flexibility in thinking, competencies for intellectual creativity with problem finding and solving skills, broad perspectives, enriched sense of humanity, and collaboration skills to work in teams, all with a view to contributing to the international society.

College of Mathematics

College of Physics

College of Chemistry

College of Engineering Sciences

College of Engineering Systems

College of Policy and Planning Sciences

Bachelor's Program in Interdisciplinary Engineering

# College of Mathematics

## ■ Bachelor of Science

---

### ■ Educational purpose ■

The educational purpose is to require students to gain extensive basic knowledge in modern mathematics ranging from pure mathematics to applied mathematics. In this way, students can acquire advanced logical abilities and analyze and resolve problems based on an understanding of the structure of problems. As such, we foster global personnel with mathematical thinking abilities who vigorously play active parts in various fields in society.

### ■ Desired students ■

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.

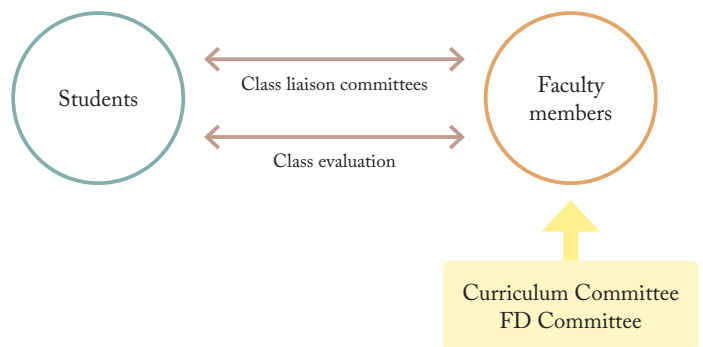
## Measures to ensure and improve the quality of education

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. 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 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 the contents and improve lecture techniques among the instructors.

Measures to ensure and improve the quality of education (conceptual diagram)



# Bachelor of Science

## Diploma Policy

We grant diplomas for Bachelor of Science to persons who have acquired the knowledge and abilities (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.

Students have acquired knowledge and human skills that are desirable for an undergraduate degree.

Students have acquired basic knowledge in natural science and scientific thinking methods.

Students are able to freely make use of Calculus and Linear Algebra, which are foundations of mathematics.

Students have understood mathematical logic development methods as well as acquired mathematical ways of thinking, logical power, and applied abilities.

Students have acquired specialized knowledge in any of the fields of Algebra, Geometry, Analysis, and Mathematics for Informatics.

Students have acquired basic English proficiency and presentation abilities related to specialized fields.

## Curriculum Policy

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

### General policy

Mathematics is a remarkably systematic academic study with international universality and its curriculum is almost the same anywhere 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.

### Course sequence policy

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 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 second year is the period for study from the basic level to the development level.

During such period, students prepare for more profound knowledge about Calculus and Linear Algebra and specialized fields (e.g., Set Theory, Phases, Curved Lines, and Curved 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. The Introduction to the Study of Graduation Thesis allows for smooth

shifting 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 about several persons in each seminar and laboratory. At the same time, we offer lectures related to specialized themes.

#### Implementation policy

Seminar hours are offered for the main subjects, in which students solve examples and development problems on their own. In this way, students are able to deepen their understanding of lectures.

Subjects urging interests (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 their expressions and language proficiency

abilities and consider internationalization.

#### Policy for evaluation of learning outcomes

In Major Subjects and Foundation Subjects for Major, we fairly and strictly conduct grade evaluations. Moreover, in order to verify whether or not education is being effectively implemented, we offer class evaluation questionnaires concerning all Major Subjects and Foundation Subjects for Major.

#### Characteristics

The curriculum design helps students acquire teaching license (mathematics).

To support students in starting their studies, we offer remedial (retake) classes during the summer break for the core courses in the first year (e.g., calculus and linear algebra).

We regularly organize “Tenarai-juku” (tutorial class) for mathematics, where students can get answers for their questions.

Structure of competencies to be developed and curriculums

1st year	2nd year	3rd year	4th year
<b>Foundation Subjects for Major</b> Introduction to Mathematics Mathematics Literacy 1-2-3 Calculus I・II・III Linear Algebra I・II・III	<b>Major Subjects</b> 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	Introduction to the Study of Graduation Research Mathematics in Foreign Language II <b>Major Subjects in Algebra</b> Algebra IA・IB <b>Major Subjects in Geometry</b> Topology A・B Introduction to Manifolds <b>Major Subjects in Analysis</b> Lebesgue Integral Partial Differential Equation Introduction to Functional Analysis Probability Theory I-II <b>Major Subjects in Information Mathematics</b> 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
<b>General Foundation Subjects</b> 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