Professor Kazuo Kashiyama  
Dean, Faculty of Science and Engineering  
Dean, Graduate School of Science and Engineering

The Faculty of Science and Engineering strives to educate a new generation of technologists with wisdom and broad perspectives, and nurture young people who will be able to address the countless and tremendous challenges faced by humanity today.

Our Faculty has ten departments and more than 110 laboratories boasting world-class research capabilities. Please read through this faculty guide brochure carefully, and I believe you will find a suitable department or laboratory that fits your goals and aspirations. Technological progress is accelerating day by day, and today everyone involved in the field of science and engineering has the opportunity to learn, discover, and innovate more than ever before.

If you wish to study at our Faculty, let us joyfully pursue the infinite possibilities of science and engineering together in order to realize a more convenient, safe and secure society.

We look forward to studying with you at our Korakuen Campus in central Tokyo.

Join us as we pursue the infinite possibilities of science and engineering, and let us enjoy the quest for knowledge to the fullest!

Department of Mathematics  
Mathematics Course

Department of Physics  
Physics Course

Department of Civil and Environmental Engineering  
Civil, Human and Environmental Science and Engineering Course

Department of Integrated Science and Engineering for Sustainable Society

Department of Precision Mechanics

Department of Electrical, Electronic, and Communication Engineering  
Electrical, Electronic, and Communication Engineering Course  
Electrical Engineering and Information Systems Course

Department of Information and System Engineering  
Information and System Engineering Course

Department of Applied Chemistry  
Applied Chemistry Course

Department of Data Science for Business Innovation  
Data Science for Business Innovation Course

Department of Biological Sciences  
Biological Sciences Course

Graduate School of Science and Engineering

Master’s program  
Doctoral program

Faculty of Science and Engineering

Department of Mathematics

Department of Physics

Department of Civil and Environmental Engineering

Department of Integrated Science and Engineering for Sustainable Society

Department of Precision Mechanics

Department of Electrical, Electronic, and Communication Engineering

Department of Information and System Engineering

Department of Applied Chemistry

Department of Data Science for Business Innovation

Department of Biological Sciences

Join us as we pursue the infinite possibilities of science and engineering, and let us enjoy the quest for knowledge to the fullest!
The Department of Physics offers excellent opportunities for exploring the world of mathematics. The principal aim of the Department is to educate students with programs in mathematics, statistical science and computer science at the undergraduate and graduate levels. Research at the professional level is also encouraged.

There is currently a great demand in society for highly qualified mathematicians, statisticians and computer scientists. To meet this demand, the Department is offering well-coordinated courses for learning fitted capabilities. Our educational programs include: Introduction to Set Theory, Elementary and Advanced Calculus, Linear Algebra, General Topology, Algebra, Geometry, Statistical Mathematics, Programming Language, as well as more advanced mathematics. Furthermore, we have our own library and computer room available for students.

Our students, in preparation for a wide variety of careers, find that they can increase their capabilities for analyzing, formulating and solving problems arising not only from mathematics but also from any human activities. Mathematical study provides an appreciation of one of the most wonderful and useful human activities.

Fields of interest
- Algebraic Geometry, Arithmetic Geometry
- Complex Manifolds
- Functional Analysis
- Harmonic Analysis
- Ordinary/Partial Differential Equations
- Differential Geometry, Geometric and Global Analysis
- Topology, Mathematical Physics
- Foliation Theory, Contact Topology and Geometry
- Symplectic Geometry, Transformation Groups
- Statistical Science, Mathematical Statistics
- Computer Science, Computational Topology

In the Department of Physics, students enjoy many aspects of physics that they were not familiar with in high school. We offer integrated educational programs to introduce a wide variety of physics. Lectures on main subjects (Classical Mechanics, Electromagnetism, Quantum Mechanics, Thermodynamics and Statistical Mechanics, and Physical Mathematics) include practical classes teaching useful mathematics to solve problems. In experimental courses students witness a superconductor levitated against gravity over magnets and quantum effects observed at low temperatures. Students are also able to improve their skills to use networks and computers in classes held at our IT Center.

Our twelve laboratories realize diversity of contemporary research in physics, covering the theory of elementary particles and black holes, superstring theory, astrophysics using space and ground-based observatories, laser spectroscopy, theoretical and experimental studies for solid state and soft condensed matters, quantum engineered systems, fractals and complex systems, and biophysics and bioinformatics. In the Department of Physics, we are confident that you will find your favorite field of study and complete your graduation research with great satisfaction. Studying in the Department of Physics gives you outstanding preparation for careers in the fields of sciences, industry, education, and business, or for continued academic research.

Fields of interest
- Field Theory and Relativity for Elementary Particles and Cosmology
- Astrophysics Using Space and Ground-Based Observatories
- Quantum Optics and Laser Spectroscopy for Ultracold Atoms
- Theory of Quantum Information and Simulation in Engineered Quantum Systems
- First-Principles Study of Electronic Structure and Properties
- Theory of Photoinduced Dynamics in Strongly Correlated Electron Systems
- Exotic Superconductivity and Quantum Critical Phenomena in Heavy Fermion Systems
- Solid State Physics for Novel Materials
- Statistical Physics and Mathematical Physics for Complex Systems
- Fractal Physics for Biological, Chemical, and Social Systems
- Nonlinear Physics and Bioinformatics
- Nonequilibrium Thermodynamics and Biophysics
In the Department of Precision Mechanics, students study a wide range of basic knowledge and technologies in the field of precision mechanical engineering. Precision machinery industries, an area of strong expertise in Japan, require high levels of precision and manufacturing technologies. Through the pursuit of high precision, we seek machines with high performance and, consequently, new potentiality.

Our department pursues “preciseness” in the technical domains of precision machinery through research activities. Each laboratory addresses issues in various academic domains of precision mechanical engineering from broad perspectives. In particular, about one-third of the professors perform research on robotic technologies, focusing on “diversification” and “intelligence”, such as robots based on unique principles that mimic living creatures or robots that cooperate with humans. Their active research is reported in international and domestic societies on robotics.

More than ten thousand students have graduated from our department since its establishment seventy years ago. Thanks to the high reputation of our alumni, we receive about 3,000 job offers every year. Our research activities enable students to acquire problem finding and problem solving skills from a global viewpoint that will become lifetime skills in any field of engineering. In this era of rapid change, these are requisites for a leading engineer who can sensitively detect changes in global environments and find essential issues and solutions.

Department of Civil and Environmental Engineering

The Department of Civil and Environmental Engineering aims to foster engineers capable of creating new urban environments, analyzing urban spaces by employing a social-science approach, and bequeathing the earth science-based study of natural environments to future generations.

For this purpose, our department offers two courses: “Urban Environment Design” and “Urban Planning”. Students enrolled in Urban Environment Design study natural science, such as applied mathematics, fluid dynamics, and soil mechanics, in order to analyze natural phenomena and train to become urban environment designers. Students who select Urban Planning, on the other hand, learn knowledge of law, administration, finance, etc., which will be of help in planning cities and improving urban lives.

Our department has three characteristic curricula that: (1) provide seminars for teaching design skill and related knowledge; (2) offer tours of construction sites and internship programs to encourage work experience; and, (3) involve lectures for senior graduates in order to introduce the newest technologies and issues. Through these curricula, students become great professional engineers that can improve urban designs and human lives.
The aim of our department is to nurture leading researchers, engineers, and technology professionals, who are competent to work actively at the forefront of R&D activities in the areas of Electrical, Electronic, and Communication Engineering (EECE) and related technologies.

Playing a central role in the revolutionary development of industry, EECE benefits people worldwide. In particular, our lives cannot be imagined without electric power supplies, telecommunications services, electrical and electronic appliances, and various systems that involve microprocessors and/or computers. Moreover, the fundamental and application areas covered by EECE are still actively expanding through the invention of theories and technologies for creating new industries and products in pursuit of affluent, stable and secure lives in a highly advanced information and communication society.

In our department, students are able to study science and technologies related to electric power, electronics and communication, as well as complex systems, such as computers, robots, and software. Electric power engineering ranges from fundamental power electronics to next-generation eco-friendly systems to generate, store and transfer energies. Electronics covers electronic materials, opto-electronics, semiconductor engineering, and device, circuit and system integration technologies. Communication engineering includes electromagnetic waves, information theory, signal processing, mobile computing, and Internet technologies. In addition to these disciplines, control is an important aspect, which handles complex systems including cars, robots, aircraft, and social systems combined with computer networks.

Department of Applied Chemistry

Chemistry is an interdisciplinary subject in the material and life sciences, and the demand for it is expanding in our diversified society. In our department, we offer education and research opportunities for undergraduate and graduate students with a passion for chemistry. We cover various aspects of chemistry, from the basics to cutting-edge science and technology, including nanotechnology, environmental sciences, syntheses of materials and catalysts, biological and medical applications, chemical/biological sensors, and extension to the chemical industry. Our department was established in 1953 and already has more than 10,000 alumni, and they work as researchers or engineers in various professions related to chemistry. Many groups in our department have published many renowned journals, and the researches were sometimes covered in newspapers and journal pages.

The main focus of our undergraduate education is on the basic concepts of physical, inorganic, organic chemistry, and chemical engineering. The deep understanding helps students to gain sufficient knowledge for research progresses. Many undergraduate students in our department enter further education for graduate school to continue their research works. During the periods, students have many opportunities to make presentations in domestic and international conferences, with support for the travel and accommodation from the university. Almost 90% of the alumni and alumnae become scientists or engineers at companies or public organizations. We welcome you to join our department and look forward to advancing chemistry together.

Fields of interest

- Bio-Signal Sensing and its Application to Wearable Robotic Systems
- Communication Network Systems
- Electrochemical Engineering for Energy and Health Care Devices
- Electromagnetic Fields and Waves
- Electromagnetic Wave Propagation Analysis and Antenna Engineering
- Electrophysiology
- Field and Space Robotics
- Intelligent Robots and Systems
- Laser Materials, Devices, and Applications
- Mechatronics
- Multimedia Signal Processing
- Numerical Analysis of Nonlinear Circuits and Systems
- Organic Electronics
- Terahertz and Optical Sensing

Fields of interest

- Applied Biochemistry (Bioenergetics, Photo signal transduction, Lipid metabolism, Enzyme engineering)
- Biorganic Chemistry (Synthesis and practical applications of biomaterials: artificial blood, microtube motors, anticancer agents)
- Chemical Spectroscopy (Solar cell, Photocatalysis, Photoreponsive liquid crystal)
- Chemistry of Natural Products (Synthesis, structure, and biological activity of natural products and their derivatives, Synthetic Methods Development)
- Environmental Resource Energy (Chemical recycling of polymers at high pressures, transport phenomena in supercritical fluids)
- Molecular Sensors and Analytical Chemistry (Control of molecular interactions and its applications using bio/chemical micro sensors)
- Molecular Functional Chemistry (Bistable metal complex, Redox-active liquid crystal, Functional inorganic solid, Photocatalysis)
- Nanomaterials Physical Chemistry (Synthesis of nanocolloids, nanoparticles, and nanoclusters and their application to functional materials)
- Numerical Transport Phenomena (Sustainable and renewable energy, Desalination, Wet Granulation)
- Organic Synthesis and Catalysis (Synthesis of new organometallic catalysts and their application to highly selective organic reactions)
- Organometallic Chemistry (Syntheses and reactivities of organometallic compounds with novel structures)
- Solid State Chemistry (Synthesis, structural analysis, and physical properties of solid materials)
- Theoretical Chemistry (Materials Informatics, Material Design, Quantum Chemistry, Molecular Dynamics, Statistical Thermodynamics)
“Information and System Engineering” is one of the multi-disciplinary areas of research that quantifies or qualifies respective events, formulates or regularizes problems into forms that are processable on computers, describes required information processing with computer codes, and inherits to develop the technology of designing, building, and operating high-performance information systems efficiently.

For this purpose, the faculty members in the Department of Information and System Engineering (ISE) are all active researchers in the domains of social information, visual information, mathematical information, intelligent information, and life information, which are covered by the Institute of Electrical and Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM).

In particular, the department offers an original series of classes “Software Project on CG, VR, and Image Processing 1-4” that takes a practical approach to cultivating IT engineers who can create advanced 3D contents concerning computer graphics (CG), virtual reality (VR), and image processing. These have the potential to appear in next-generation games through project-based learning (PBL) that provides undergraduate students with a strong incentive for learning through teamwork in software development, an approach that is common in information and system engineering.
Welcome to the Department of Biological Sciences!
Undergraduate students in our department participate in exciting interdisciplinary programs, including biology, biochemistry, biophysics, environmental science, pharmaceutical science, computer science, etc. In their final year, students complete a research dissertation under the guidance of faculty mentors. Through intensive research experience, students gain substantial guidance to determine an area of interest and to develop their career potential to become researchers. For those who do not continue to graduate studies, undergraduate research experience at our department will still be an asset, as it complements course work and offers opportunities to learn how to conduct collaborative and individual work. Our department has state-of-the-art laboratories located in our newest building where students enjoy unparalleled opportunities to acquire advanced techniques and skills.

Our graduate programs aim to provide advanced education in biological science in various disciplines and intensive research experience under the supervision of our faculty members. Faculty members’ research covers a wide range of fields, including the evolution of plants, microbial ecology with an emphasis on the nitrogen cycle, biophysics and molecular biology of cell motility and locomotion, molecular mechanisms underlying cell division processes, biochemistry and the physiology of photosynthesis, bioinformatics to predict protein structure and function, and lipid biotechnology. Students are encouraged to conduct original research that will enable them to become independent scientists.

Upon graduation, a broad range of career opportunities are available to our students. Potential fields of work include biotechnology and medical research, machine manufacturers, oil and gas, environmental services and equipment, and many more.

The Department of Integrated Science and Engineering for Sustainable Societies (ISES) addresses the challenges involved in achieving human well-being in balance with environmental needs. Among the areas of specialization at ISES, human cognition and behavior, biological statistics and human wellness provide the foundation for understanding the human mind and human biology. Engineering in relation to energy and water issues provides technical solutions for renewable resource infrastructure in support of a circular economy. Environmental science and conservation ecology together with urban planning and design place the activities of the department firmly in the context of sustainable cities and regions.

The curriculum at ISES gives students access to a variety of academic fields, providing a solid base for tackling sustainability issues using relevant knowledge from different disciplines. Fundamental aspects of theory and real world applications are covered thoroughly across the areas of specialization at the department. Project-based learning (PBL) is used actively to foster problem-solving skills such as recognizing challenges, deriving specific tasks and organizing them in a coherent research plan. Methods for collecting and analyzing data and presenting results in suitable formats for different target audiences are taught in a hands-on manner, enabling students to apply them successfully. Interpersonal skills are given particular attention, and the ability to work as part of a team is one of the strengths that students develop. Graduates are thus well-prepared to excel in leading roles, contributing to the solution of complex problems that human societies are facing.

About thirty percent of ISES students proceed to graduate courses in the Civil, Human and Environmental Engineering Course which is jointly offered by ISES and the Department of Civil and Environmental Engineering. The graduate program provides opportunity for gaining in-depth knowledge of the disciplines represented at both departments and for conducting cutting-edge research within the framework of sustainable societies.

International exchange and collaboration are priorities at ISES, reflected in a high number of incoming and outgoing international students. ISES has the highest participation rate in international exchange programs among all departments across Chuo University, supported by a globalized platform for education through international collaboration. This creates a stimulating environment in which scientific ideas and practical applications can be discussed, and many of the approaches developed here subsequently turn into effective tools used by practitioners in business and administration.

Many students at ISES successfully obtain state-accredited professional qualifications such as the Associate Professional Engineer and the Certificate for Statistics (level-2) as well as high scores in tests of English language proficiency (TOEIC, IELTS, and TOEFL), giving them an additional advantage when applying for positions.

The unique opportunities offered at ISES continue to inspire students to acquire an exceptionally broad knowledge and a wide range of skills in relation to humans and their environment. Equipped with these extraordinary tools, they pursue successful careers in diverse research, engineering, and business domains.
For learning how to analyze and utilize Big Data, which has become indispensable in various fields, Chuo University introduced education in AI and Data Science from 2021. Our faculty provides practical courses for science and engineering students.

### International Exchange Activities

In order to develop global human resources, we are developing our own programs and networks with universities around the world.

- **Global Studies**
  Short-term programs at UC Davis, Univ. of Hawaii at Manoa, Univ. of Western Australia, Univ. of Shanghai for Sci. & Tec., Taiwan, and others.

- **Global Internships**
  Short-term Internship programs. Students can select a course based on the theme or region.

- **Double Degree Programs**
  Partnerships with National Central Univ. (Taiwan) for Ph.D., and the Faculty of Civil and Environmental Engineering, Institute Teknologi Bandung (Indonesia), for Master’s course.

- **Inter-institutional Partnerships**
  RWTH Aachen Univ. (Germany), Institut Teknologi Bandung (Indonesia), Univ. of Messina (Italy), Escola Politecnica of the Univ. of Sao Paulo (Brazil), EPAC, INE, FSA in Université d’Abomey-Calavi (Benin), Jeju National Univ. (Korea), and Magellan University (Chile)

### Access to Korakuen campus

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