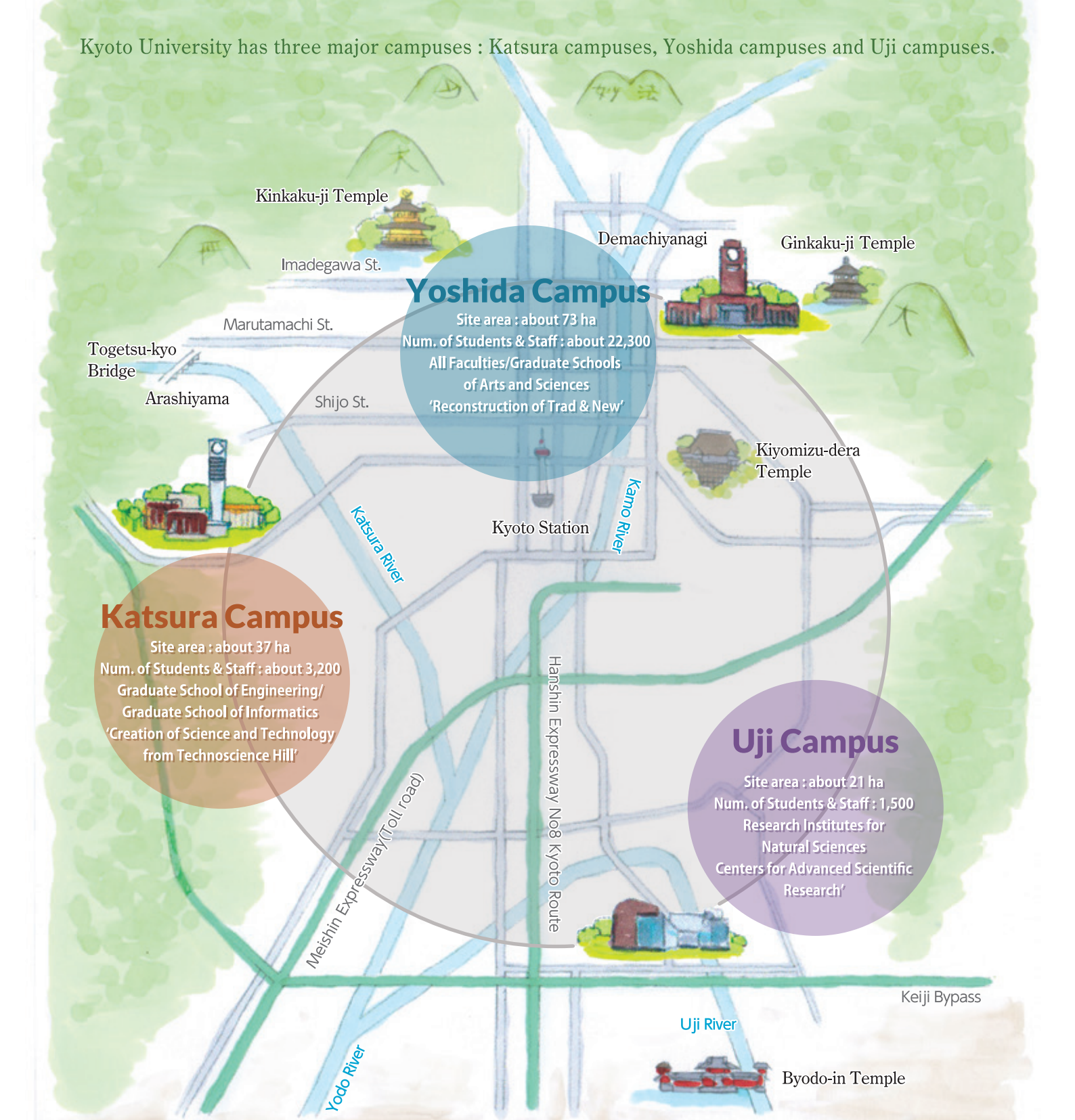
KYOTO UNIVERSITY

Graduate School of Engineering
Faculty of Engineering Outline

2018

Kyoto University has three major campuses : Katsura campuses, Yoshida campuses and Uji campuses.



Contents

Graduate School of Engineering
Faculty of Engineering Outline 2018

1. Greetings from the Dean

Masahiro Ohshima

"Engineering" can be said to be the discipline that produces substances and creates technologies for the purpose of human happiness. To date, engineering has played great roles in the creation of such things as automobiles, aircraft, high-rise buildings, and smart phones. Going forward, it will continue to make essential contributions to our society into the future, generating all kinds of innovations, such as collision-free vehicles, artificial intelligence, and robots. The mission from now on will be to drive the development of science and technology in harmony with the environment, and to create a highly sustainable society. For this purpose, we need well-cultured young engineers and engineering researchers of upstanding character, equipped with advanced expertise and creative capabilities.

Kyoto University has a tradition of "academic freedom" expressed as "independent learning", and a noble spirit of building character through knowledge and appreciation of oneself, expressed as "self-reliance and self-respect". Based on this tradition and spirit, the Faculty of Engineering has long pursued research and education with the goal of cultivating engineers and engineering researchers of the type described above. This stance and the idea of "placing emphasis on disciplinary fundamentals and basic principles" for its education and research have remained unchanged since our founding in 1897. Employing this outlook, we have contributed to society while developing and expanding in response to the needs of the times. We have a sense of mission and determination to continue serving society into the future through pursuit of scientific principles and development of human resources.

With the spirit of engineering, the freshmen and sophomore learn fundamentals of the natural sciences, such as mathematics, physics, chemistry and biology, as well as the subjects of humanity and the second languages as part of the general education program. The classes on the departmental specialty are implemented gradually as the grade progresses. These classes are offered in several styles, like lectures, exercises, field works and laboratory trainings. When the student becomes senior, he/she joins at least one research group and conducts his/her own thesis work individually as a part of graduation requirement. Through the thesis work, the students expose themselves to a cutting-edge research topic, of which answer is unknown and original, and learn how to carry out a research and solve several problems in engineering way.

If you are a student who is considering your student's life in our faculty, you are encouraged to find useful information in this brochure or our website for designing your overall experience in the Kyoto University Faculty of Engineering, exploring questions such as what to study in the faculty, how to lead your life on campus, and what kinds of options you may explore after graduation.

If you are a member of the wider community, I hope that the information of this brochure offers you some further insights into what kinds of research activities are conducted for what purposes in our school and how we are working to contribute to our society.

There are six undergraduate schools in our faculty: Global Engineering, Architecture, Engineering Science, Electrical and Electronic Engineering, Informatics and Mathematical Science, and Industrial Chemistry. Each school provides pages in this brochure and in the website, which outline how these schools' specialized courses are arranged over the faculty's four-year undergraduate program, what kind of curriculum each school offers (Course Trees), and what kinds of graduation research projects their students pursue. Please make use of the information when making your course selections and planning your future directions.

These days, the vast majority (around 90 %) of graduates of our Faculty of Engineering go on to enroll in a Master's program of a graduate school. We have six graduate schools, the Graduate School of Engineering, the Graduate School of Energy Science, the Graduate School of Informatics, the Graduate School of Global and Environmental Studies, or the Graduate School of Management at Kyoto University. They closely collaborate each other for supporting the undergraduate education. Some of those Mater program students then proceed to a three-year Doctoral program. For details of these post-graduate programs, separate brochures and websites are also available, so I would strongly encourage you to refer to them. It is also important to seek information about your career path in the future.

Young persons have infinite potential. I strongly believe in the idea that "future generations are destined for greatness". I hope that all of you reading this will believe in your own value and potential, maintain high ideals and objectives at all times, and climb step-by-step toward the lofty standards that you have set for yourselves. I will be happy if we can be of some support to you in this task.

2. Admission Policy

Faculty of Engineering

Admission Principles

The Faculty of Engineering is committed to building foundations for learning by following the Kyoto University tradition of academic freedom. By longstanding tradition, the university encourages students to explore the world for themselves, free from the influences of preconceived notions which demands a critical attitude toward learning. Under such a guiding principle, the Faculty of Engineering provides its engineering students with top quality engineering education for applying their basic understanding of scientific knowledge to the advancement of technology. Although Engineering is generally considered to be a discipline focused on the application of technology, our Faculty of Engineering emphasizes on the principle of fundamentals for learning based on its belief that a thorough understanding of scientific principles is essential for promoting future applications and advancement of technology on a broad scale.

Admission Policies and Procedures

The Faculty of Engineering welcomes applications from candidates with the following attributes to enroll our programs

1. Successful candidates with a thorough understanding of the subject matter from their secondary-school education and a level of academic ability adequate to the pursuit of an education in scientific fundamentals through the Faculty of Engineering program
2. Successful candidates unfettered by preconceived notions and prepared to understand the essential attributes of natural phenomena by rigorously identifying them firsthand, organizing the information and knowledge they have obtained, and thinking in logical terms.
3. Successful candidates with the foundational language proficiency and communication skills in order to develop the capacity to convey their own opinions and arguments clearly, in either Japanese or other languages.
4. Successful candidates overflowing with the enthusiasm and vitality to creatively pursue new horizons of technology and science.

When selecting candidates for admission, in addition to the examination by the National Center for University Entrance Examinations (Center test), the Faculty of Engineering evaluates the results of university-specific examinations to understand each applicant's basic academic abilities in mathematics, science, English, and Japanese.
When assessing an application with a unique examination (Tokusyoku-Nyushi), the admission teams will identify applicants with outstanding academic capabilities in science and engineering in addition to the abovementioned basic academic abilities. Each Undergraduate School evaluates applicants in accordance with its-Admission Statements-based on (1) applicants' academic transcripts, (2) letters of recommendation, (3) records of outstanding performance in activities, (4) letters of intention (i.e. a proposal letter with a set of future goals for learning) learning design, (5) records of the National Center for University Entrance Examination (Center test), and (6) interviews results.

Graduate School of Engineering

Philosophy and Objectives

The pursuit of the truth is the essence of learning. Engineering is an academic field that impacts the lives of people, and is greatly responsible for the sustainability of social development and the formation of culture. The Graduate School of Engineering at Kyoto University, based on the above premise, is committed to the development of science and technology with an emphasis on the fundamentals and in harmony with the natural environment. At the same time, we aim to assist students in their pursuit of a rich education with specialized knowledge, as well as the ability for its creative application, while nurturing high ethical standards.

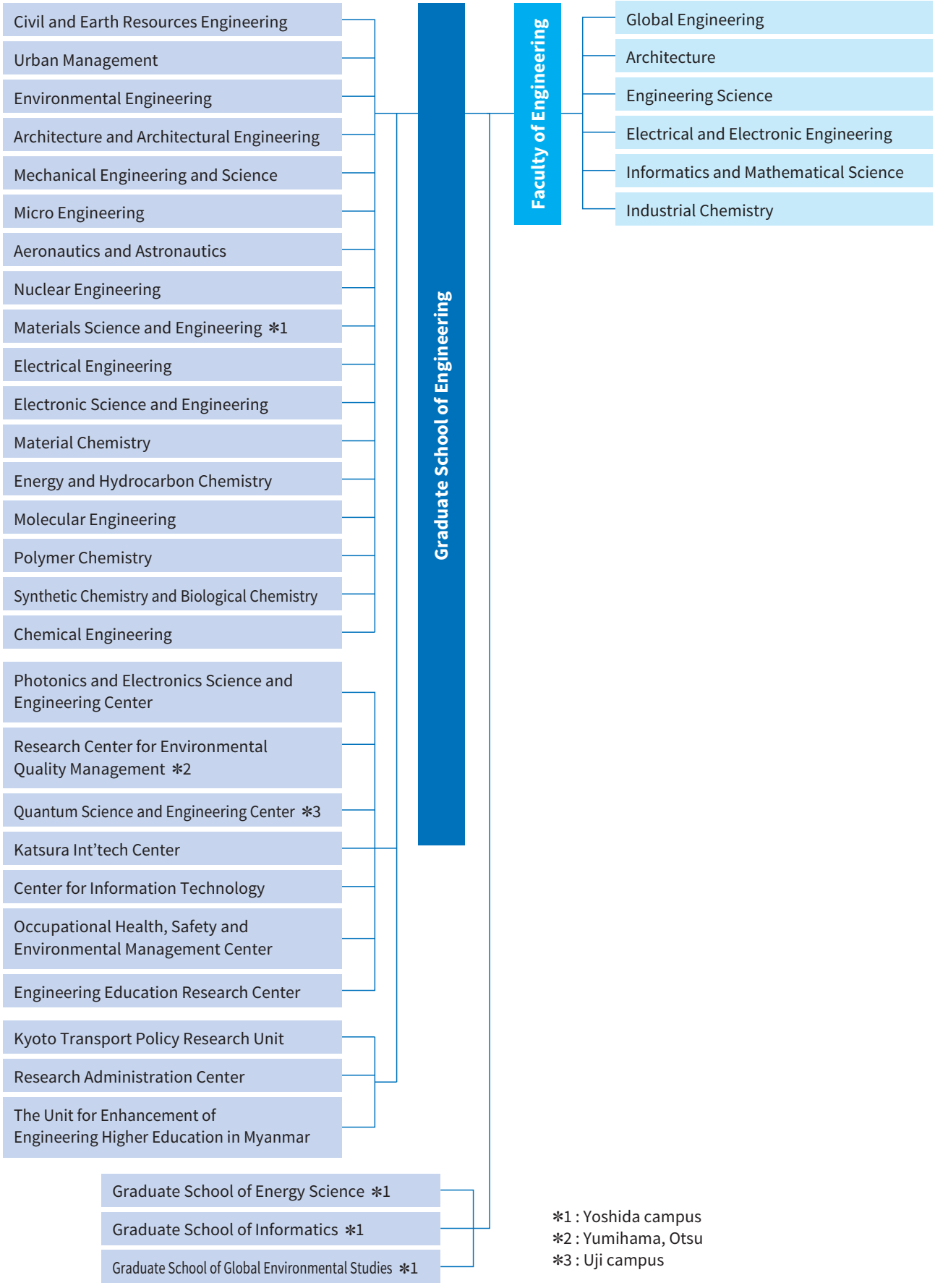
Student Profile

The Graduate School of Engineering welcomes the following students:

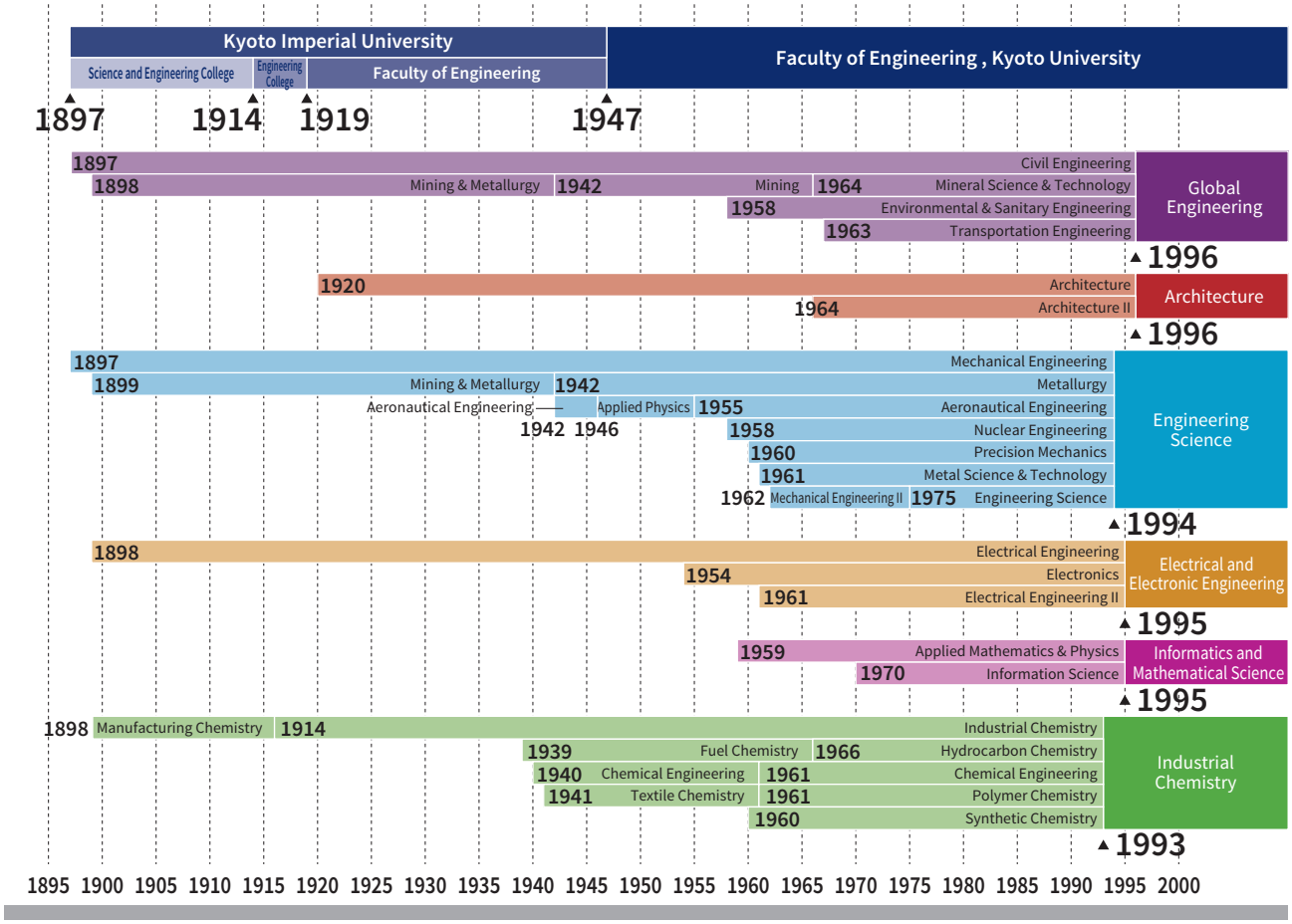
- Individuals who agrees the philosophy and objectives of the Graduate School of Engineering and those who achieve these things actively.
- Individuals who have the basic education to pursue the truth and also have the judgment with logical thinking and beyond established concepts in specialized fields and related fields.
- Individuals who have a strong desire and initiative to pioneer new fields of science technology while integrating knowledge and keeping on solving, regarding the science technology and the social issues.
- Individuals with basic communication ability who understands other opinions and also express own opinions and assertions in an easy to understand.

Entrance examination will be performed individual academic exam, evaluate and select the applicants including English ability, with emphasis on the basic knowledge of specialized field and those who have logical thinking abilities.
In addition to the above mentioned points of view, selection of doctoral course will select applicants with advance on research and explanation ability logically.

3. Organization Chart



4. History



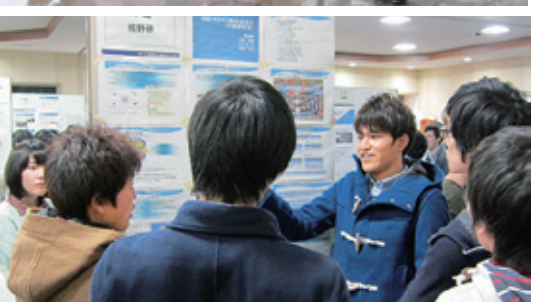
Courtesy of Kyoto University Archives

- Kyoto Imperial University was founded in June 1897 and the College of Science and Engineering was established in September of the same year as the first of several colleges in a confederation of colleges comprising the university.
- In July 1914, the College of Science and Engineering was split into the College of Science and the College of Engineering.
- In February 1919, the system of a confederation of colleges evolved into a system of faculties, and the College of Engineering became the Faculty of Engineering.
- Since its establishment, the Faculty of Engineering has constantly sought to expand and develop in response to the academic and social demands of the times while sharing the same historical timeline as the university. It stands today as the university's largest faculty and is engaged in activities and initiatives that deal with almost all fields of engineering.
- A program of restructuring undertaken by the Faculty of Engineering to reflect a greater focus on graduate schools resulted in the establishment of the School of Industrial Chemistry in 1993, the School of Engineering Sciences in 1994, the School of Electrical and Electronic Engineering and the School of Informatics and Mathematical Science in 1995, and the School of Global Engineering and the School of Architecture in 1996, and heralded the launch of a new Faculty of Engineering for the twenty-first century.

5. Faculty of Engineering

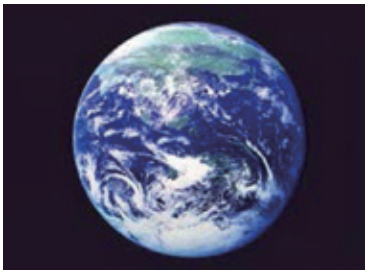
Undergraduate Schools

- Global Engineering
- Architecture
- Engineering Science
- Electrical and Electronic Engineering
- Informatics and Mathematical Science
- Industrial Chemistry



Global Engineering

Overviews



The twentieth century can be characterized by a rapid increase in population, advances in industrial technologies, and mass consumption of natural resources, as well as emerging environmental problems. In the twenty-first century, we must develop solutions for our civilization by reconstructing and combining various fields of study based on new ideas on humanity and the environment – a new global image. We have proposed a "Global Engineering" as a practical science to establish a new discipline and to solve the emerging problems based on the new global image.

Curriculum

The first and second year students must enroll in Natural Sciences courses such as Biology, Chemistry, Earth Science, Physics and Math from the shared curriculum as the basis for engineering. They must also choose Social Sciences subjects such as language study and humanities to gain a broad education. During the transition to the third year of undergraduate studies, the students will be separated into one of three groups: Civil Engineering course, Environmental Engineering Course, and Earth Resources and Energy Engineering Course.

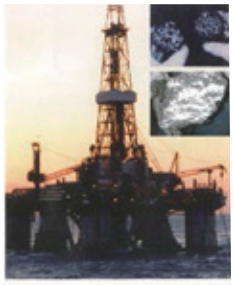
Courses

Civil Engineering

Japanese Civil Engineers have successfully completed the many boastful projects to the world, such as the Kurobe Dam, Seikan Tunnel, Kansai Airport and Akashi Bridge, and realized the dream of people. Civil Engineering contributes to the maintenance and preservation of the infrastructure that is the basis of civilization as well as the creation of safe and pleasant communal spaces in the harmony with nature.

Earth Resources and Energy Engineering

Akashi-Kaikyo Bridge



Research Consortium for Methane Hydrate Resources

The Earth Resources and Energy Science bearing the investigation, development, production and purification of the natural resources must offer appropriate solutions to the problem of civilization crisis. We must contribute to the saving of mineral resources and energy resources, the recycling of them, and the other effective utilization, and also, it must contribute to the development of new resources as well as the development of innovative methods to utilize the Earth crust.

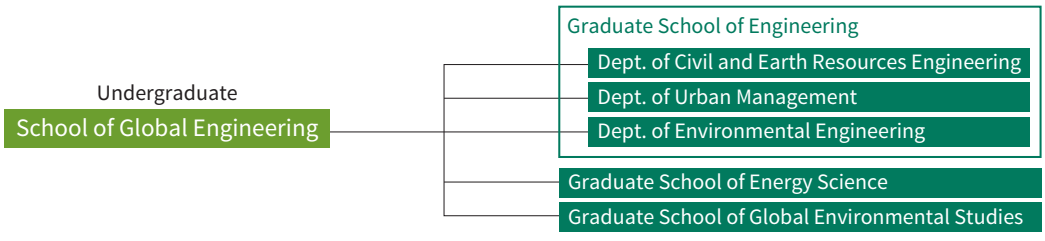
Environmental Engineering

Our health and life are now being threatened by environmental problems in atmosphere, water and soil. Environmental problems are the serious problems that we must tackle for the existence of humankind in this century. Environmental Engineering also aims to produce a harmonious, symbiotic and sound material-cycle society from a long-term and broad-ranged perspective.

International Course

The course will train the next generation of human resources who will design and manage civil infrastructure while considering global environmental issues and civil engineering problems on a global scale. We welcome students from all over the world whose interests are in global development issues as well as regional ones in their home countries, in particular, in Asia and Africa.

Connection to Graduate School



Architecture

Overviews

Architecture, which forms the human environment and nurtures a safe, healthy and comfortable life, emerges through the innovative synthesis of diverse technologies.
The generation of architecture is conceived as a humane skill broadly and deeply rooted in every aspect in our normal life. For this distinctive feature of architecture, we arranged our curriculums to help students simultaneously reaching out these interdisciplinary knowledge in natural, cultural and social sciences.
Career prospects of our graduates have been similarly diverse, and involving in various positions ranging from architects, structural engineers, architectural environmental engineers, construction engineers, architectural administration officers, planners of various development projects and other related executives.

Curriculum

The curriculum of the School of Architecture is divided into three fields, which are namely the Planning and Design, the Structural Engineering, and the Environmental Engineering domains, according to the objects and methodologies of each of these study areas.

Courses

Planning and Design

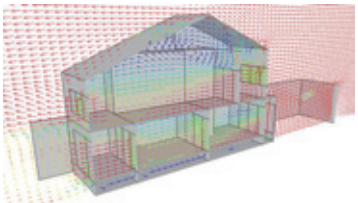
Planning and Design is the field aiming for clarifying the spatial compositional principles in housings, various building complexes and urban-regional spaces, and also for the education and research on the theories and methodologies in architectural planning, urban planning, urban design, project management, etc. In addition, by the process of studying the historical development of architecture revolutions, it is to help nurturing students' insight in space planning and modeling skills for space creation.

Structural Engineering

Structural Engineering is the study of the construction of enduring buildings which can also stand against natural hazards such as earthquakes and typhoons. The progressive advancement of structural engineering technology makes it possible to realize superstructures such as super skyscrapers, all-weather big scale baseball stadiums, etc. In addition, this advancement implies the potential of further expansion of design theories, architectonic methods and construction skills, as well as the opportunity to exercise the potential application of knowledge gained in natural science.

Environmental Engineering

Environmental Engineering is a study to realize comfortable environment and to reduce physiologic and psychological impact on human body in and around buildings, by improving physical environmental parameters such as heat, air, light, sound, etc. One of our recent concerns is an environmental safety problem, due to the increasing correlation between building and urban emission and global environmental crisis. We are now challenging to solve various building and urban environment issues and to reduce environmental load at the same time, by our advanced simulation technology. Our ideal is to nurture solutions through natural, cultural and social sciences.



Connection to Graduate School

Undergraduate
School of Architecture

Graduate School of Engineering
Dept. of Architecture and Architectural Engineering

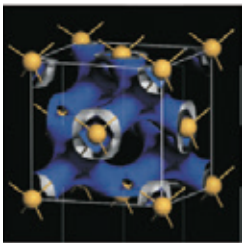
Engineering Science

Overviews

Engineering Science represents a creative, intellectual activity that aims at creating new technology conducive to making humanity's dreams come true, including developing new systems, materials and energy sources and expanding the sphere of human activities into outer space for the 21st century and beyond. Realizing such goals requires overcoming numerous technological challenges, while creating new technology is premised on a mastery of fundamental scholarship. The School of Engineering Science is a place of basic research and education dedicated to these ends.

Curriculum

The School of Engineering Science provides integrated education in its undergraduate course programs:
Mechanical and Systems Engineering Course, Materials Science Course, Aeronautics and Astronautics Course, Applied Energy Engineering Course, and Nuclear Engineering Course.



Courses

Mechanical and Systems Engineering Course

Students in this course must acquire comprehensive knowledge concerning the analysis, design, control, and manufacturing of mechanical systems and their elements, based on fundamentals such as the mechanics of materials, fluid mechanics, thermodynamics, material science, mechanical dynamics, vibration theories, and control theories.

Materials Science Course

The students are expected to acquire fundamentals for understanding processing – structure - property relations in materials. The course works not only on converting natural substances into materials, but also on designing and learning to create the advanced materials that do not even exist in the natural world.

Aeronautics and Astronautics Course

Students are expected to acquire abilities that would allow them to work in a wide range of engineering fields, not limited to aerospace engineering, as well as the ability to further develop these fields acquired through undergraduate studies. Accordingly, this course places emphasis on basic scholarship centered on applied mathematics, dynamics and physics.

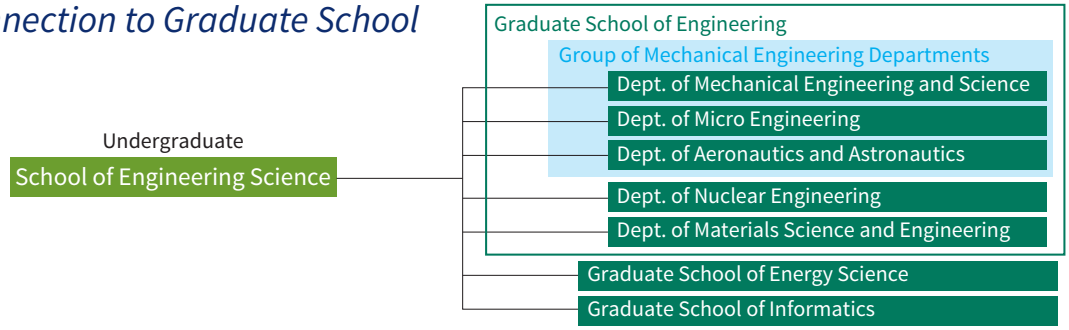
Applied Energy Engineering Course

The Applied Energy Engineering course offers educational and research opportunities to pursue a sustainable society and seek solution to energy problems by learning basic scientific theories and their engineering applications.

Nuclear Engineering Course

The Nuclear Engineering Course provides lectures and experiments concerning effective and safe use of nuclear energy and quantum beams, based on physics approach from a microscopic point of view. This Course aims to develop valuable human resources as researchers and engineers who acquire both microscopic and systematic approaches as a result of their studies and experience.

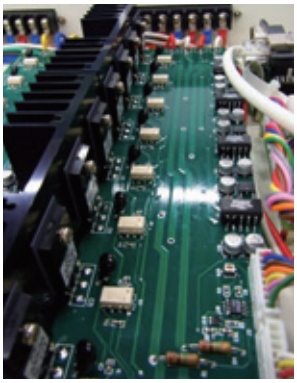
Connection to Graduate School



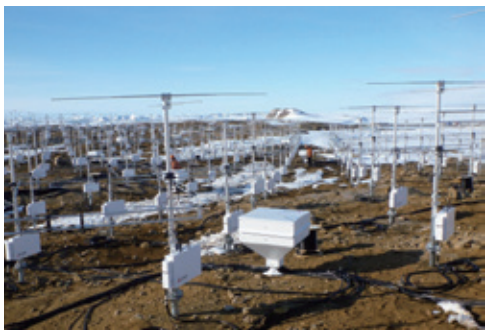
Electrical and Electronic Engineering

Overviews

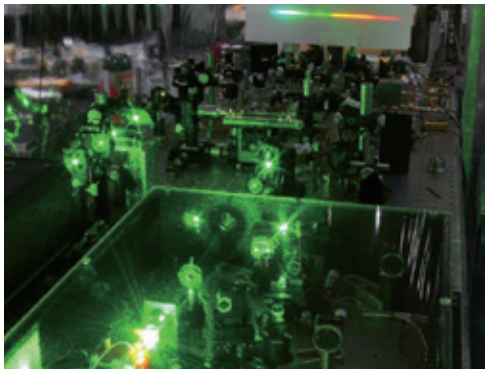
Electrical and electronic engineering is a technology indispensable to the foundation of every industry and social life today. Examples are various electronic/information/communication systems that incorporate large-scale integrated circuits (LSI) and optical/semiconductor devices, and artificial intelligence and control systems that are programmed into home electronics, robots, automobiles, communications satellites, medical and welfare apparatus. In addition to technologies for securing efficient and stable electric power supply, technologies to improve the efficiency of electrical and electronic equipment and promote the harmonious coexistence between human and nature are of increasing importance.



Power integrated circuits (power router) based on SiC



Antenna Array of Antarctic Syowa MST/IS Radar

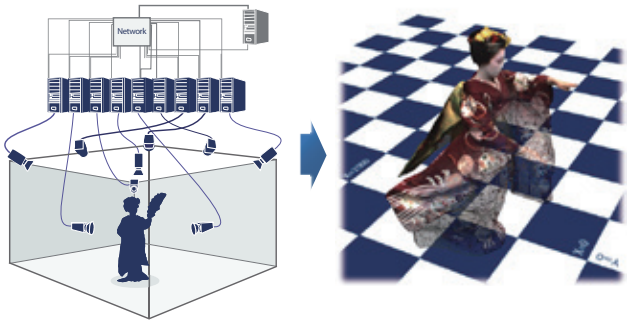


Frequency Standard: “Optical-Frequency Comb”

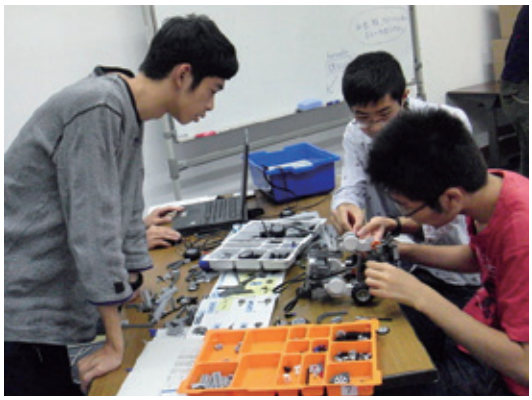
Curriculum

As engineers and researchers, alumni and alumnae of our school have been playing prominent roles in the vast fields, such as energy, communications, informatics, electronic, system control, etc. This can be achieved by mastering a solid scientific foundation and by widening knowledge in the form that it can be applied to solve a broad range of issues. In our school, students learn basic subjects in their first and second undergraduate years and then select their areas of specialty to study in their third and fourth years. The core courses mandatory to all students include: mathematics, physics, electromagnetics, electric and electronic circuit, computer systems, and information processing. Laboratory experiments are systematically integrated into the curriculum from the second year in order to deepen the understanding of each subject. Through the four-year program, students also take liberal arts subjects, such as foreign languages and cultural/social science, to acquire profound and extensive knowledge and thinking.

After studying the above subjects, students in the fourth year engage in latest research topics that the faculty members and graduate students are deeply engaging in.



3D image Generation from Multi-View Images



Students at Electronic Summer Camp: Setting Up a Robot Controlled by a Micro-Computer

Connection to Graduate School

Undergraduate

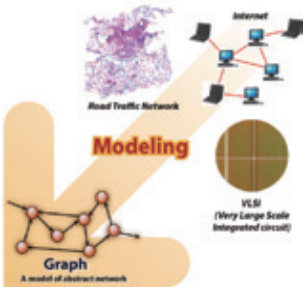
School of Electrical and Electronic Engineering

- Graduate School of Engineering
- Graduate School of Energy Science
- Graduate School of Informatics

Informatics and Mathematical Science

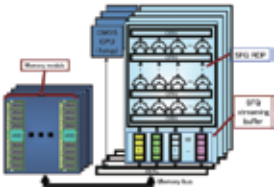
Overviews

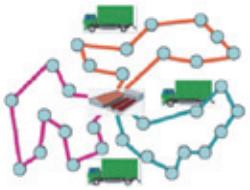
We provide comprehensive education and research, ranging from the basics to advanced fields, aiming at developing the people who pursue the essence of information, which is the foundation of advanced information society, and solve the actual problems of sophisticated systems through the thinking of mathematic science.



Curriculum

Because information science is essentially related to many fields, the education policy of the School of Informatics and Mathematical Science places emphasis on providing students with a broad perspective. Students of this School are taught by the instructors of the Graduate School of Informatics and divided into the Computer Science Course and Applied Mathematics and Physics Course, usually at the end of the first academic year, for more specialized education.

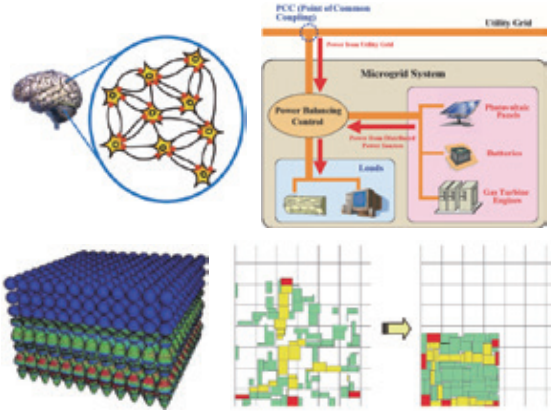




Courses

Applied Mathematics and Physics Course

In the Applied Mathematics and Physics Course, students chiefly study mathematics and physics as the basis of mathematical science, control theory that is the basic field of systems engineering, and operations research that applies the methods of mathematical science, along with such fields as systems theory, optimization theory, and discrete mathematics. Of course the School curriculum includes classes to learn about computers, information and communications required to specifically apply the achievements of study. Applied mathematics and physics is an academic discipline that plays the role of comprehensive engineering while placing emphasis on both the basics and flexible idea development in engineering. This Course aims at developing the academic ability required to achieve this objective.



Computer Science Course

The Computer Science Course offers educational and research opportunities concerning the processing, transmission and accumulation of information, pursuing the question: What is information? Students learn a wide variety of cutting-edge technologies, such as the theories of information and communications; theories of computation; design of logic circuits; design and analysis of algorithms; architectural principles of computer hardware and software and various techniques concerning them; processing of language, audio and image data by computers; artificial intelligence and knowledge engineering; computer networks; information systems and how to build them; and media processing and their various applications. Thus the Course intends to develop engineers and researchers who will play major roles in the information society.

Connection to Graduate School

Undergraduate

School of Informatics and Mathematical Science

Graduate School of Informatics

- Dept. of Applied Mathematics and Physics
- Dept. of Systems Science
- Dept. of Applied Analysis and Complex Dynamical Systems
- Dept. of Intelligence Science and Technology
- Dept. of Social Informatics
- Dept. of Communications and Computer Engineering

Industrial Chemistry

Overviews

The Department of Industrial Chemistry was founded in 1898, and the department branched out to form an additional four departments related to applied chemistry. In 1993, the five departments and one division were integrated into a single undergraduate school to provide a systematic, comprehensive four-year education. Thus, the undergraduate educational curriculum provides students with a broad range of chemistry-related subjects. Each senior student is assigned to one of the research laboratories of six departments and participates in the latest research, such as the synthesis of functional materials, application of biotechnology, and the design of environmentally benign production systems.

Curriculum

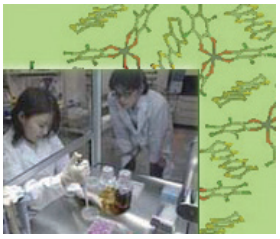
First year students will learn the fundamentals of chemistry, physics and mathematics, in addition to the general subject requirements of Kyoto University. Second year students will take specialized courses and will receive advanced education from the Department's faculty in the areas including physical chemistry, organic and inorganic chemistry, analytic chemistry, polymer chemistry and chemical process engineering. In continuation of the curriculum of the first year and half, students will take courses related to their future specialization in the following three courses from the second semester of the second year. The student ratio of the three courses is 2:3:1. In the fourth year, students will become a member of a research laboratory and conduct specialized research for the completion of their thesis.

Courses

Frontier Chemistry

The Frontier Chemistry Undergraduate Course teaches young people the knowledge and spirit of creation, and aims to nurture the talent that will support the chemistry and industry of the next generation. The Course will systematically educate students in the basic knowledge of chemistry, knowledge of substances/materials, and knowledge in the newest trends of chemistry.

Fundamental Chemistry

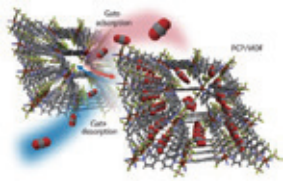


Students in this course learn the basic principles that govern chemical properties and reactivity, together with the necessary experimental techniques. Through this, students will gain an understanding of reactivity and properties on a molecular level, which in turn will let them solve challenging problems in diverse fields of chemistry.

Our goal: To mentor students to become well-rounded, creative, highly-trained researchers with high ethical standards, who appreciate basic research and can lead science in a sustainable manner.

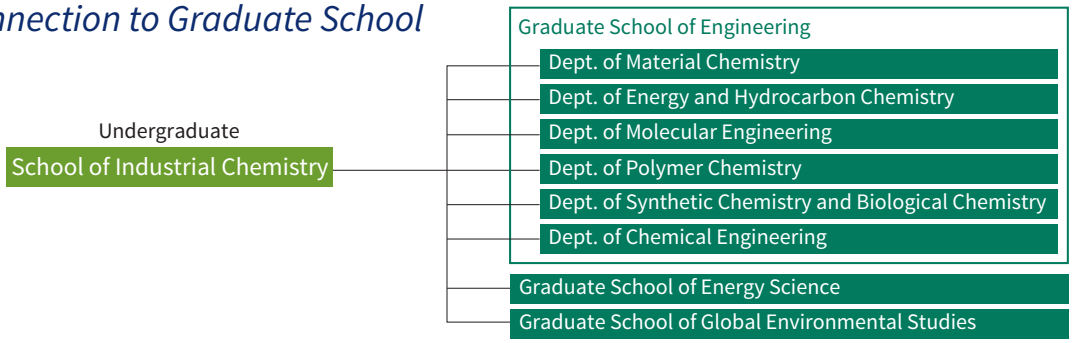
Chemical Process Engineering

This course program is designed to teach students the following three principle axes of investigation: 1) Identify and extract the principle phenomena and variables from a targeted chemical process, 2) Construct generalized models for their essential properties and dynamical characteristics, 3) Design and implement a system that enhances the functional properties of the materials and the processes.



Molecular simulation for gas adsorption on PCP/MOF

Connection to Graduate School



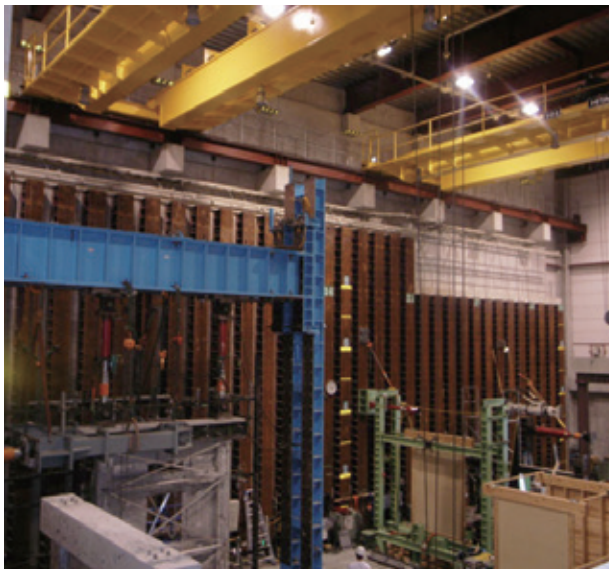
6. Graduate School of Engineering

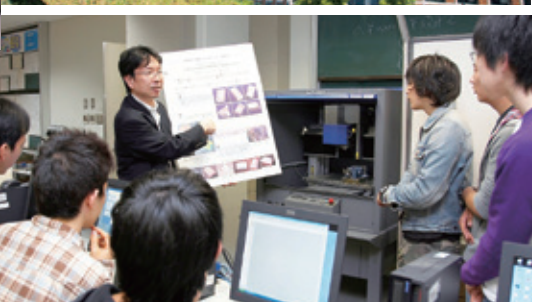
Departments

- Civil and Earth Resources Engineering
- Urban Management
- Environmental Engineering
- Architecture & Architectural Engineering
- Mechanical Engineering and Science
- Micro Engineering
- Aeronautics and Astronautics
- Nuclear Engineering
- Materials Science and Engineering
- Electrical Engineering
- Electronic Science and Engineering
- Material Chemistry
- Energy and Hydrocarbon Chemistry
- Molecular Engineering
- Polymer Chemistry
- Synthetic Chemistry and Biological Chemistry
- Chemical Engineering


京都大學


京都大学





Civil and Earth Resources Engineering

Overviews

The Department of Civil and Earth Resources Engineering aims for technological innovations based on the inheritance, integration, and evolution of the fundamental technology for the development and maintenance of infrastructures, disaster prevention, and the exploration, development, and use of natural resources and energy. We endeavor to contribute from the standpoint of engineering science to establish sustainable development of society and the stable supply of natural resources in harmony with the environment.

Researches

Applied Mechanics

The main focus is on development of mechanical models that can elucidate laboratory tests or field observations, as well as development of numerical methods to predict behaviors of solids, fluids and their interactions. The research fields comprises of stability analysis of mechanical systems, computational fluid/structure dynamics and coastal wave dynamics.

Structural Engineering

The research area covers a wide range of fields about civil structures, using various kinds of materials, such as concrete, steel, composite, FRP and so on. The safety of structures against environmental and natural actions is investigated in conjunction with structural deterioration, maintenance and health monitoring.

Hydraulic Engineering

(Environmental Hydrodynamics): Air-water interaction, vegetation flows, CFD, floodplain hydraulics, urban flooding and measures, river basin management (Hydrology and Water Resources Research): The hydrologic cycle, hydrologic prediction, rainfall-runoff modeling, real-time hydrologic forecasting, hydrologic design, flood disaster mitigation, water resources management.

Geomechanics

Geomaterials support all of the civil structures and environments as a ground. Our research activities focus deals on one hands with constitutive models for geomateials and on the other hand with the interaction between soil and structures through experiments and numerical analyses.

Geoinformatics

Research and education are conducted on methodology for acquisition, processing, and utilization of spatial information for disaster prevention and environmental protection. In particular, we focus on satellite remote sensing, 3-D digital photogrammetry, laser surveying, and geographic information systems.

Urban Infrastructure Design

Urban and landscape Design: This laboratory aims to study on the structure of the landscape based on landscape engineering, cultural climate analysis, and regional planning. Urban Coast Design: We aim for establishment of the methodology of computational science and engineering, to describe various phenomena in civil engineering by Lagrangian Particle Method.

Earth Resources Engineering

The chair formed with three laboratories, “Geophysics”, “Earth Crust Engineering” and “Measurement and Evaluation Technology”, conducts researches to explore and develop natural resources, to evaluate the stability of underground artificial structures and to improve nondestructive testing methods.

Disaster Prevention Engineering (Disaster Prevention Research Institute, DPRI)

The interdisciplinary research covers development of methodologies and engineering techniques for various disaster related aspects such as sediment control, coastal disaster, water front and marine geohazards, geotechnics, hydrosciences such as hydraulics and hydrometeorology, and innovative disaster prevention technology and policy.

Computational Engineering (Academic Center for Computing and Media Studies, ACCMS)

Our research activities cover the following items: 1) modeling for multi-physics problems related to fluid mechanics, 2) development of computational methods based on FDM, FVM etc., 3) high-performance computing with parallelization methods and 4) application of the computational methods to actual engineering problems.

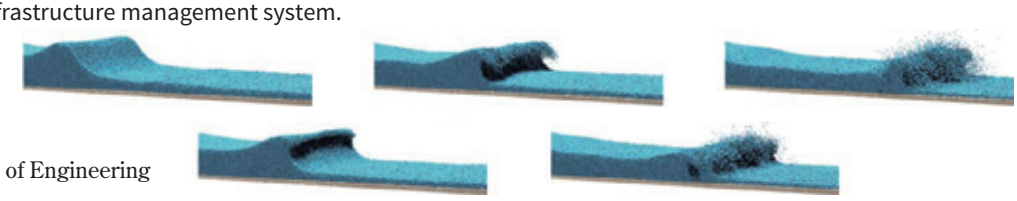
Disaster Risk Management Engineering (West JR)

The goal of our research is to enhance the safety of large scale infrastructures such as road and railway systems by providing proper methodologies in risk management to prevent recent disasters occurring in larger, wider and longer scale than before.

Innovative Techniques for Infrastructures (Laboratory on Innovative Techniques for Infrastructures, ITIL)

(Nexco-West, Nexco Engineering Kansai,Hanshin.Expressway, Hanshin Expressway Technology Center)

Our research mission is to advance roadway management by developing innovative techniques for inspecting invisible (or hardly visible) damage in civil infrastructures such as bridges. Those include such NDT technologies as elastic wave approaches aided by computed tomography visualizing invisible damage, and fiber optics sensing ensuring a long term monitoring, verified their applicability by real road structures. Through the innovative technologies, we contribute to establish the civil infrastructure management system.



Urban Management

Overviews

Urban management is a comprehensive engineering discipline that aims at creating sustainable, safe, and internationally competitive urban systems that can serve as a base for creative human activities. The Department of Urban Management aims to promote knowledge for realizing safe, comfortable, and sustainable cities in which people can lead healthy and fulfilling lives. The department is ambitiously striving to construct state-of-the-art urban systems for advanced information societies, and to cultivate the human resources needed to support them.

Researches

Structures Management Engineering

It is important to maintain our infrastructures, keeping their performance and extending their service life, in order to enhance our social activities and to reduce negative impact on environmental. We are developing technologies for rational design, extending service life, strategic maintenance and management of infrastructures.

Earthquake and Lifeline Engineering

A broad range of researches related to earthquake engineering is studied, from the estimation of strong ground motion, to the investigation of the mechanisms of structural damages and casualties. Our goal is effective earthquake risk reduction and development of effective mitigation measures.

River System Engineering and Management

To resolve problems on water in river basins, we have been developing various kinds of computational models which predict river flows, sediment transport, water environmental issues and mechanical and hydromechanical behavior on subsurface.

Geo-Management

The most important thing for the development of infrastructure is to ensure their safety quantitatively from the standpoint of mechanics at all steps, such as planning, design, construction and management. The focus of the research is put in the geological and geotechnical problems caused by construction as well as natural disasters.

Urban Systems Planning

Chair of Urban Systems Planning consists of two laboratories. Planning and Management Systems focuses upon the economic and management issues related to infrastructure. Urban and Regional Planning focuses upon researches related to transport policy and urban policy, to improve cities's attractiveness and vitality.

Urban Management Systems

In overcrowded urban areas, the developments of new infrastructures, such as railways, rapid transport systems, and energy facilities, is being adjusted in order to employ underground space. Underground space is useful as a solution for the geosequestration of by-products after energy generation. In order to develop new geofronts, the mechanical and hydro-mechanical properties of soils and rock are being studied and their application to tunnel and underground excavations, dam foundations, and slope stability is being researched based on the geotechnical engineering, rock mechanics, and fluid mechanics.

Transportation Engineering and Management

These laboratories study various approaches to design transport networks that maximize benefit for society. Operational issues as well as the various impacts transport systems have on the well-being of a population are considered. This includes aspects such as resilience, safety, reliability, efficiency and wider community aspects.

Earth Resource Sciences

Distribution analyses of mineral, water and energy resources using remote sensing, and mathematical geology, and geochemistry; evaluation and recovery techniques for hydrocarbon and geothermal energy resources; and characterization of rocks and formations including physical properties and in-situ stress from shallow to deep depths.

Urban Regional Disaster Control (Disaster Prevention Research Institute, DPRI)

The interdisciplinary research covers development of methodologies and engineering techniques for natural, social and environmental disaster mitigation, hazard assessment and risk management to establish safe and sustainable urban systems, river and infrastructure.

Environmental Infrastructure Engineering

The laboratory has developed special expertise to address geo-environmental issues, including soil and groundwater contamination, waste disposal and containment, and use of by-products in geotechnical applications.

Environmental Engineering

Overviews

Science progress has brought in substantial prosperity to human beings. Meanwhile, under such circumstance, it is true that many environmental problems have occurred to become the menace to human health and life, and natural ecosystem. In addition, as is typified in global environmental issues like climate change, we are now facing global limits in terms of development. While our society is aging with various values, there still exists another society suffering from such problems as population explosion and unsatisfactory human safety assurance. Now is the time to endeavor overcoming such environmental issues unique to region, to integrally seek for a new sustainable development society.

To respond to the above demands, the Department of Environmental Engineering is promoting education and researches on various environments ranging from individual life space to regional and global environments, closely cooperating with related departments. Our specific missions are as follows: to provide solutions for overt/covert regional environmental issues, to secure the environment supporting health, to create sustainable global and regional environments, and to establish the new environmental science.

Researches

Water Supply, Wastewater Treatment, and Management of Aquatic Environment

Technologies on water include: development of advanced drinking water treatment systems, wastewater treatment technology including stormy events and recovery of nutrients and energy, water reuse technology and establishment of an urban water recycling system, water distribution networks, bioremediation of contaminated soil and groundwater. Risk issues on water include: evaluation of the safety of drinking water, risk assessment of toxic chemicals, management and control of contaminants in the environment, physico-chemical method to remove micropollutants in wastewaters, microbial water quality and control. Researches on water environment include: integrated watershed management, fate and source tracking of micro-pollutants and pathogens in the environment, water quality monitoring technology, assessment method of physiological activity due to emerging micropollutants.

Environmental Modeling and Environmental Health

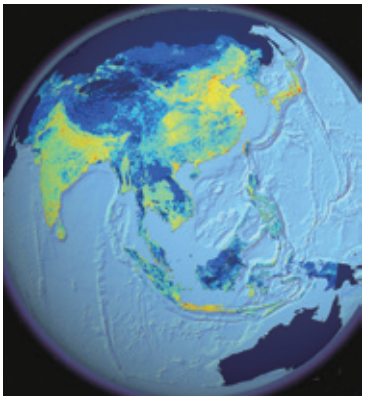
Human activities discharge a huge amount of pollutants and greenhouse gases into the environment, causing climate change, and adverse effects on human health and eco-system. This field includes: the development of integrated assessment models of environment and mainly to support policy making, analysis of long-range transport of air pollutants in the Asian region, the investigation of the detail mechanism of toxicity of environmental pollutants, epidemiology of environmental health effects.

Solid Waste Management

Generation of solid waste is inevitable in our lives. Inappropriate treatment or disposal of solid waste will invite many problems such as bad odors, air pollution, water pollution, etc. Developing procedures to analyze, manage, design and control treatment and disposal systems for solid wastes, including 3R (reduce, reuse, recycle) is necessary in order to establish the sound material-cycle society. Our research topics are as follows, development of the technology about waste proper treatment, recycling and energy recovery, control of trace hazardous substances, and evaluation and optimization of waste treatment and management systems.

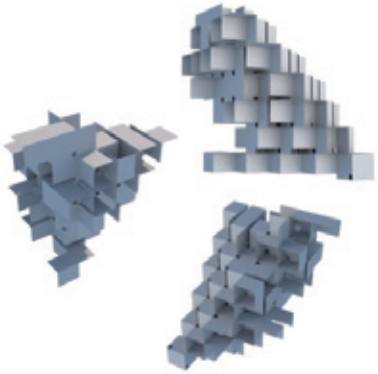
Risk Analysis and Radiological Health Engineering

Health risks of various environmental pollutants, such as heavy metal, pesticides, and radioactivity accidentally released to the environment, are analyzed. Their movements in the environment are evaluated by monitoring and numerical simulation and their exposure levels to the people are estimated. Their toxicities are surveyed using epidemiological approach or state-of-the-art microbiological, genome and proteome analysis. Their management methods and final disposal methods are investigated and developed to establish safe and healthy environment. Radioactive waste management methods are also investigated.



(Top) CO_2 emission map in Asia, (Center) development of new water treatment system, (Bottom) field survey in oversea research site

Architecture and Architectural Engineering



Overviews

Contemporary society requires highly complex functions from architectural design and urban planning. As well as the development of basic and advanced studies, this entails the connection and synthesis of specialized research fields reconsidered from the viewpoint of the relationships between natural and artificial environments. This department aims at a higher education program that promotes both basic and advanced research in order to construct creative methodologies and operational systems, as well as training students to enhance their humanistic skills.

Researches

Regenerative Preservation of Built Environment
Design method and regenerative preservation technology of sustainable built environment

Architecture and Human Environmental Engineering
Design and science for architecture and living environment based on the human cognition and behavior

History of Architecture / History of Architecture
Aiming at the preservation, conservation and revitalization of historical architecture and urban landscapes

History of Architecture /Architectural Theory and Criticism
Analysis of theories and criticisms in historical and contemporary architecture and its related fields such as art and technology

Construction Technology of Building Structures
Toward high-performance and sophisticated concrete buildings

Architectural Environmental Planning / Architectural Environmental Planning
Design methodology to read and to create the built environment as human-environment system

Architectural Environmental Planning / Building Environment Control
Towards eco-friendly and human-oriented architecture inheriting culture

Architectural Design and Theory / Architectural Design and Theory
Expansion of the possibilities of architectural thinking

Architectural Design and Theory / Architectural and Environmental Design
Thinking a new architectural design theory

Structural Engineering of Buildings / Mechanics of Building Structures
Study of response characteristics and development of design methods for building structures based on mechanics and numerical analysis

Architectural Construction Engineering / Architecture System and Management
Development of mathematical method for architecture design & restructuring of fair system for design, construction and management

Architectural Construction Engineering / Space Development and Structural Systems
Development of design and construction technology to build architectural space by steel structure

Built Environment Materials and Structural Systems
Research on application of new materials to architecture and building structural systems in next generation

Housing and Environmental Design
Research and design concerning the optimal relationship between people and the urban residential environment

Sustainable Built Environment Engineering
Control of environment and safety in buildings, built environment and urban spaces

Architectural Environment Systems / Environmental Acoustics
Development of theory and technology for acoustic environment and its control

Architectural Environment Systems / Building Geoenvironment Engineering
Toward design of safer and robuster building structures via innovative seismic-control technologies

Disaster Mitigation Engineering / Earthquake Resistant Engineering
Development of disaster mitigation technologies through studies on earthquake responses of ductile building structures

Disaster Mitigation Engineering / Structural Safety Control
Research and development toward the seismic safety control of buildings and subsequent construction of safe and secure urban spaces

Disaster Mitigation Engineering / Environmental Wind Engineering
Aiming at the creation of wind environmental engineering for disaster reduction and comfort

Space Safety Engineering / Earthquake Engineering for Seismic Safe Design of Structures
Understanding the nature of seismic action to structures to achieve seismic safe environment

Space Safety Engineering / Urban Disaster Reduction Planning
Cultivating a disaster-resilient society

Global Environmental Architecture (Graduate School of Global Environmental Studies)
Design for safe and harmonious human environment rooted in local culture and contexts

Group of Mechanical Engineering Departments

Overviews

Mechanical engineering is a comprehensive discipline concerned with monozukuri (literally, “making things”), which serves as the foundation to support the development of a wide range of industrial fields.
The history of mechanical engineering studies at Kyoto University spans more than a century, dating back to a school of mechanical engineering established when the university was founded in 1897 as the Kyoto Imperial University. Through research and education that has constantly anticipated the evolution of society, the Department of Mechanical Engineering at Kyoto University has been at the center of engineering in Japan. In 2003, the department was designated a “Center of Excellence for Research and Education on Complex Functional Mechanical Systems,” under the 21st Century COE Program of the Ministry of Education, Culture, Sports, Science and Technology, and we are promoting world-leading research through this project. In 2005, to respond comprehensively to the new demands of the era, the Departments of Mechanical Engineering, Engineering Physics and Mechanics, Precision Mechanics and Aeronautics and Astronautics were integrated to form the Group of Mechanical Engineering Departments. This initiative was aimed at establishing an enhanced system of research and education.
The Department of Mechanical Engineering, which serves as the core of the Group of Mechanical Engineering Departments, implements research and education to provide a foundation for mechanical engineering, grounded in the physical sciences, with the aim of promoting future advances in engineering and technology. As a center for the promotion of new project-based research and education initiatives adapted to the demands of a changing world, the Group of Mechanical Engineering Departments includes the Departments of Micro Engineering and Aeronautics and Astronautics as part of an innovative system for meeting today’s challenges in a flexible and focused way.

Mechanical Engineering and Science

Overviews

Long ago, when humans began to walk upright, they carried tools in their hands. Tools served as extensions (instruments) of the human hand. Over time, tools evolved, and even functioned separately from the human hand. At this stage, they came to be known as machines. Machines thus act as extensions of the human body, created to realize the functions that humans require. However, the functions required by humans today are very different from those required 10 years ago, and the machines that deliver these functions have also changed. While the powerful turbines of power plants that produce electric power on a massive scale or the linear motor cars that travel at 500 km/h are still clearly recognizable as machines, new technologies such as fuel cell systems and functional nanostructures, which do not exhibit any visible motion, as well as new concepts like intelligent soft systems, can also be regarded as extensions of the human body—despite the fact that they do not appear as machines in the traditional sense. “Mechanical engineering” is activity that is continually broadening the horizons of “machines”.

Researches

Mechanical Systems Design

Human-machine systems, Systems engineering, Human-centered automation

Manufacturing Systems Engineering

Manufacturing Systems, Optimum Design, Topology Optimization, Design Engineering

Mechanics of Adaptive Materials and Structures

Advanced composite materials, Deformation and fracture, Fracture mechanics, Processing, Elastic wave propagation

Solid Mechanics

Nano/micro-mechanical behavior, Fatigue and creep mechanisms, Thin films and nanostructured materials

Mechanics of Thermal Fluid and Material

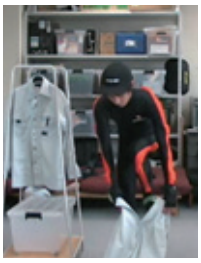
Experimental and Numerical Thermo-Fluids Engineering, Viscoelastic Fluids, Biocells, Microchannel flows

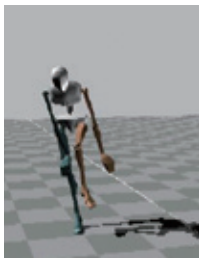
Environmental Fluids and Thermal Engineering

Fluid dynamics, Turbulence, Environmental flow, Multiphase flow, Combustion, Chemical reaction

Fluid Physics

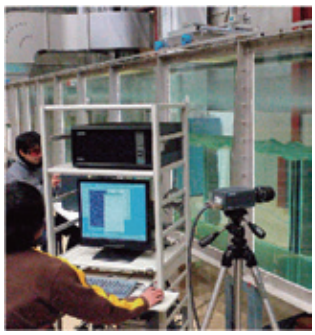
Turbulent heat and mass transfer, Waves in fluids, Stratified fluids, Rotating Fluids





Human behavior analysis and understanding by means of advanced pattern recognition techniques

Magnetically levitated train is developed based on the state-of-the-art mechanical engineering research



Laboratory experiments to investigate the thermal and particle transports through the wind-driven air-water interface

Molecular Fluid Dynamics
Dynamics of low-pressure gas flows, Microscale gasdynamics

Optical Engineering
Development of spectroscopic methods and instruments, Spectroscopy for fusion and other plasmas

Materials Science
Fracture, Nanomechanics, Nano-multiphysics, Metamaterials, In situ experiment, Ab initio simulation

Thermal Science and Engineering
Nano～Macroscale transport phenomena, Combustion, Radiation heat transfer, Turbulence

Vibration Engineering
Mechanism, Robot, Transmission, Actuator, Design, Measurement, Accuracy

Mechatronics
Modeling, Design and control of robot system, Bio-inspired robotics, Interface, Swarm intelligence, Rescue robot systems

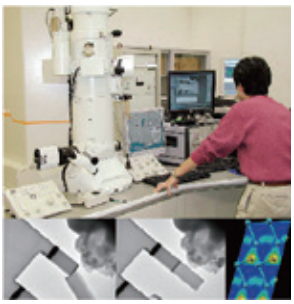
Machine Element and Functional Device Engineering

Medical Engineering
Medical engineering, Tissue engineering, Bio-environment designing, Biomaterial

Advanced Imaging Technology
Analytical imaging, Multispectral imaging, Ultra high resolution system design and development

Materials and Radiation
Nuclear materials, Radiation effects in materials, Interaction with defects and hydrogen or helium in materials, Lattice defect

Physics of Neutron Scattering
Atomic structure, Physical property, Functional material



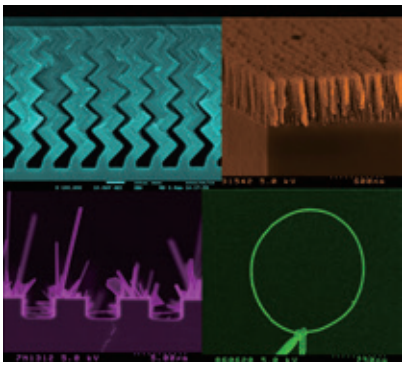
In situ observation and atomic scale simulation to investigate the deformation and fracture mechanics of the nano-scale materials.

Rescue robot

Micro Engineering

Overviews

The Department of Micro Engineering offers an education and research program to elucidate physical phenomena specific to the micro range (i.e., from nanometer to micrometer order) based on a fundamental knowledge of mechanical engineering. Students develop expertise in scientific fields such as quantum engineering, which is required to utilize quantum effects that are expressed at the nanometer level, material and micromechanical engineering at the microscopic scale for creating and processing materials, and system engineering and control engineering to build and freely manipulate nano- and micro-systems. In addition, students will study living organisms, which are assemblies of extremely precise microelectromechanical systems, and learn about biomechanical engineering, which integrates microelectromechanical systems with the fields of living organisms and biotechnology.



Examples of nanomorphology tailored by oblique angle deposition technique

Researches

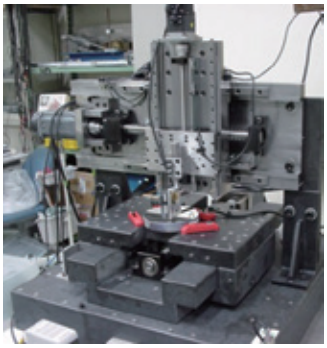
Nanometrix Engineering
On-chip vascular network, Organ-on-a-Chip, Motor proteins, iPSCs (Induced pluripotent stem cells)

Nano/Micro System Engineering
3D Fabrication and material property characterization for Nano/Microsystem, DNA nanotechnology

Nanomaterials Engineering
Quantum beam science, Ion surface interaction, Ion beam analysis, Molecular imaging

Quantum Condensed Matter Physics
Quantum field theory, Quantum electrodynamics, Spin torque, Zeta force, Electron chirality, Stress tensor

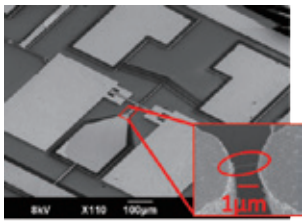
Micro Process Engineering
Control of nanomorphology, Physical self-assembly, Nanowires, Shape-related useful properties



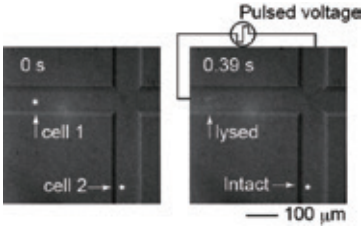
A prototype high-precision machine tool designed and developed to test various positioning-related technologies

Precision Measurement and Manufacturing
Manufacturing, Machine tools, Machining process control, Metrology, High-precision positioning technology

Biomechanics
Molecular, Cellular and tissue biomechanics, Mechanobiology, Adaptation, Mechano-chemical coupling



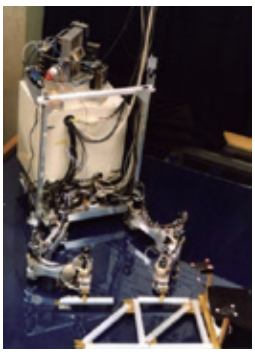
Micro Electro Mechanical Systems to reveal mechanisms of strength and fatigue properties of SWCNT



Fast and selective electrical lysis for single cell analysis; our technique enables simultaneous analysis of RNA and DNA at single cell level

Aeronautics and Astronautics

Overviews
The extreme physical conditions under which aeronautical and astronautical engineering systems must operate pose a wide range of difficult and important challenges. We conduct fundamental research leading to the development of innovative technology to address such challenges. We actively pursue cutting-edge science that will contribute to an understanding of many of the most important problems in urgent need of solutions for a wide range of general engineering purposes. In addition, we are proud of our proven record of providing high-quality education with an emphasis on a strong theoretical background that fosters professionals with a wide range of abilities in developing and applying new technologies.



A robot model of an astronaut-type free-flying space robot that assembles truss structure autonomously

Researches
Dynamics in Aeronautics and Astronautics
Aerospace systems, Dynamics, Control, System design, Autonomy, Motion intelligence, Locomotion

Fluid Dynamics
Complex flows, Two-phase flows, Flapping wing, Kinetic theory, Molecular gas dynamics

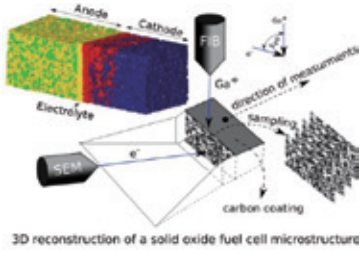
Mathematical Fluid Mechanics
Kinetic theory and fluid mechanics for nonequilibrium systems

Propulsion Engineering
Engineering science for space propulsion, Plasma and ion thrusters, Plasma- and gas-surface interactions

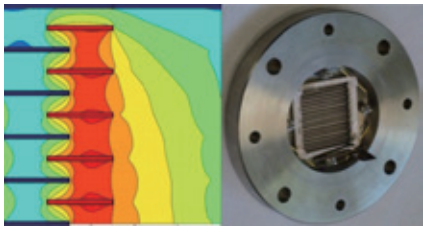
Systems and Control
Control theory, Nonlinear control, System identification, Statistical learning, Aerospace systems

Mechanics of Functional Solids and Structures
Elastic wave propagation, Nondestructive evaluation and structural health monitoring, Origami engineering

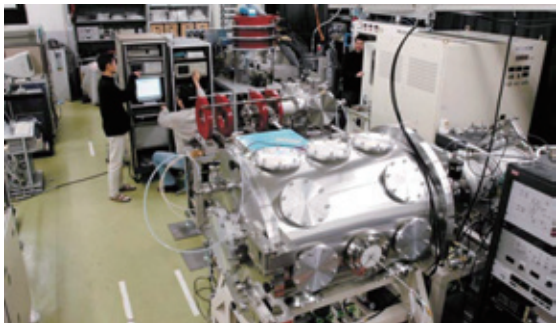
Thermal Engineering
Heat, Mass and Charge Transfer, Energy conversion, Reactions, SOFC, Reformer, Catalytic combustion



Microstructure quantification of porous electrodes for fuel cells



Model pump unit with no moving parts driven by the thermally driven flow in the rarefied gas

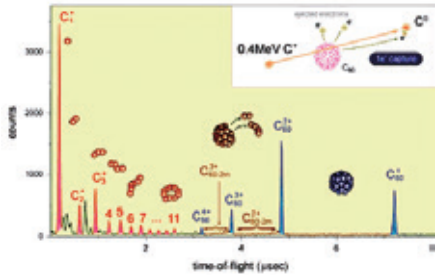


Experimental apparatuses for plasma propulsion and plasma-surface interactions (Super-gasdynamics laboratory in Uji campus)

Nuclear Engineering

Overviews

The Department of Nuclear Engineering is exploring quantum technologies leading to the state-of-the-art science, such as quantum beams, nanotechnology and atomic technology, from a microscopic point of view based on the science of quantum phenomena, such as elementary particles, atomic nuclei, atoms and molecules. The department also strives to establish recycling systems by developing engineering applications to the relevant areas, such as materials, energy, life sciences and the environment.



Researches

Nuclear Energy Conversion

In order to develop economic, environmentally-sound and safe energy systems in the future, we are studying on science and technology of utilizing nuclear energies based on the fundamental understandings of physics of energy production and conversion.

Quantum Engineering System

Aiming at utilization of nuclear fusion energy with magnetically confined plasmas, we are studying transport, global instabilities, energetic particles, and control schemes with electromagnetic waves in fusion plasmas.

Nuclear Materials

Our research topics are mainly focused on safety of nuclear reactors and more reliable disposal of radioactive wastes in terms of nuclear materials and physical chemistry.

Condensed-Matter Chemistry in Actinides

Condensed-matter chemistry in actinides reveals hidden nature of 5f-electrons which encompass application of actinides such as nuclear medicine, MA separation and/or storage etc.

Quantum and Beam Science

Accelerators can provide high-performance and multifunctional particle beams of ions, electrons and photon. Using these particles, we are searching novel mechanisms and atomic processes in particle-induced natural phenomena and applying them to the creation of nature-friendly new systems including analytical and diagnostic tools for materials and human body.

Quantum Science and Engineering

We study quantum phenomena systematically in order to achieve precise understanding, find new principles of physics and explore new interdisciplinary research fields leading to the establishment of safe and recycling-based human society.

Particle Radiation Medical Physics

Medical physics is the general term for the physics and technology which are supporting medicine, especially radiation therapy and particle therapy. Focusing on boron neutron capture therapy (BNCT), we are studying about the irradiation system, dose estimation system, quality assurance and quality control, etc..

Quantum Physics

Quantum theory has successfully explained the behavior and properties of matter to a large extent. However, its peculiar structure is a matter of concern for researchers who have an interest in the foundations of quantum physics. We explore the universal features of quantum theory and search for its logical foundations and applications.

Neutron physics and Engineering

Photons such as x-rays and gamma-rays, and neutrons have no electric charge and can penetrate through materials. With measuring photons or neutrons, we can extract various information inside materials. On the other hand, their high penetrating power tends to be a drawback in detection. Thus, we are also studying on the better ways of measuring them.

Neutron Sources and Applications

We are conducting the following research works: Studies of advanced nuclear reactor and accelerator physics for accelerator-driven neutron source. Investigations of neutron behavior in nuclear fuels and other materials, nuclear reactions, and nuclear transmutation, Development of diagnostic technique for structural integrity of nuclear facilities, and their safety.

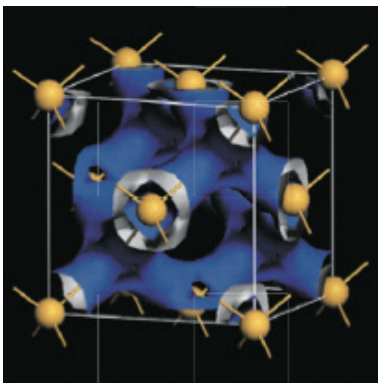
Neutron Optics and Applications

Our site is one of the best in the world as the neutron reflective optical device research & development center. New type neutron scattering spectrometers (VIN-ROSE) for material and life science have been developed in J-PARC using neutron spin interferometry. Neutron imaging in Kyoto Univ. Research Reactor (KUR) is also progressing for wide variety of research fields.

Materials Science and Engineering

Overviews

The department is working on producing novel materials, not only improving existing materials but also creating totally advanced materials based on innovative concept. Our mission is to convert “natural substances” to “materials for human life”. Materials science is a fusion field of physics and inorganic chemistry, and it forms the industrial backbone in the modern society, and its role increasingly becomes important. In order to exert the intrinsic physical/chemical properties of substances as "functions", we are trying to construct new theory and novel technology to materials design in various levels, such as electronic, atomic, molecular, crystal and structural levels. New material advent will surely cause a paradigm shift in development of innovative technologies.



Visualization of electron density distribution in a semiconductor material

Researches

Metallic Materials Design

In-situ x-ray analysis and spectroscopy, phase transformation, picosecond structural dynamics, surface chemistry

Materials Processing

Aquesous Processing of Materials Laboratory

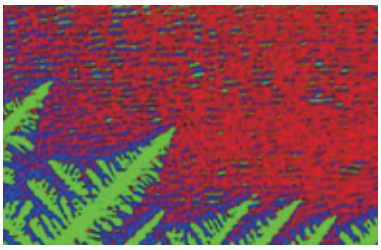
Chemical thermodynamics, Titanium smelting, Fuel cells, Solid State Ionics, Diffusion Theory

Materials Informatics Laboratory

3D micro imaging data analysis, spectrochemistry, quantum physics, statistical thermodynamics

Nanotructural Design of Advanced Materials Laboratory

Photovoltaics based on compound semiconductor, processing of bulk crystals and thin films



In-situ observation of dendrite crystal growth

Basic Studies of Advanced Materials

Atomic level characterization and elucidation of material’s structures and electronic properties

Basic Science of Materials

Materials Design Through Quantum Theory Laboratory

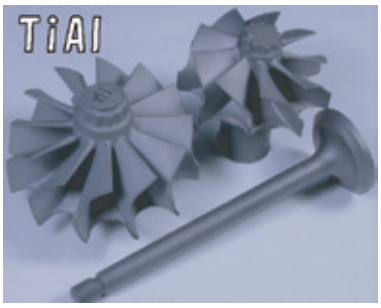
Design and exploration of advanced materials through quantum theory

Property Control of Crystalline Materials Laboratory

Intermetallic compounds, High-temperature structural materials, Dislocation theory, Defect engineering

Structure and Property of Materials Laboratory

Structural Metallic Materials, Deformation and Fracture, Microstructure, Phase Transformation, Bulk Nanostructured Metals



High temperature structural Materials: Turbo charger rotors and an engine valve of TiAl-based alloy

Properties of Advanced Materials

Solidification Dynamics, In-situ and Ex-situ Observations, Microalloying Science, Electro-Magnetic Processing, Scattering by soft X-rays

Materials Properties

Magnetism and Magnetic Materials Laboratory

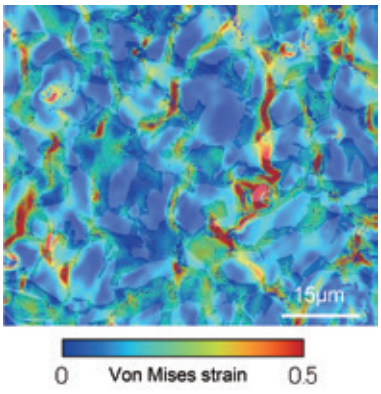
Physics and chemistry of electron correlation and novel quantum phenomena, development of magnetic materials.

Electrochemistry and Hydrometallurgy Laboratory

Electrochemical materials processing, Aqueous and non-aqueous chemistry, Porous electrodes and their application

Nanoscopic Surface Architecture Laboratory

Organic/inorganic interface, Self-assembled monolayer, Scanning probe microscopy for materials science



Local strain distribution in ferrite + martensite dual phase steel during deformation analyzed by digital image correlation technique.

Electrical Engineering

Overviews

The **Department of Electrical Engineering** is formed by four chairs; **"Advanced Electrical Systems Theory", "Fundamentals of Systems", "Biomedical Engineering"** and **"Electromagnetics Engineering"**. The department also has two Cooperating Chairs; **"Radio Engineering"** and **"Information Media Engineering"**. The education and research focuses are from the fundamental concepts and advanced theories of electromagnetics, electric and electronic circuits and system theories, to advanced applications in the fields of signal and electric energy generation, transmission and transformation, superconductive phenomena, large-scale simulations, automatic control and measurement, biological systems, information and multimedia, and space science.

Researches

Chair of Advanced Electrical Systems Theory: The ***Advanced Electrical Systems Laboratory*** pursues advanced research related to electric power conversion and system control engineering. The fields are expanded to power conversion circuits using wide-bandgap semiconductors (SiC), the operation of electric power networks featuring power conversion and system control technology, control technology for micro-electro-mechanical systems (MEMS), and mathematical research on nonlinear dynamics including fluid flow dynamics.

Chair of Fundamentals of Systems: ***Automatic Control Engineering Laboratory*** pursues studies primarily on theoretical aspects of feedback control systems, with time-to-time laboratory scale experiments aiming at practical application of its theoretical developments. The keywords in the research topics include robust control, sampled-data systems, positive systems, time-delay systems, stochastic systems and so on. ***Innovative Systems Theory Laboratory*** deals with theoretical bases commonly required by various fields in electrical engineering.

Chair of Biomedical Engineering: ***Composite Systems Theory Laboratory*** covers a broad range of research such as computational biology, nonlinear dynamical systems, medical control systems, and system optimization. ***Biological Function Engineering Laboratory*** is engaged in research to advance functional biomedical imaging and neuro-engineering through innovation in engineering methodologies which will contribute to basic science and biomedical applications. (Fig.1: Development of an ultra-sensitive optically pumped atomic magnetometer for noninvasive imaging of the human higher brain functions.)

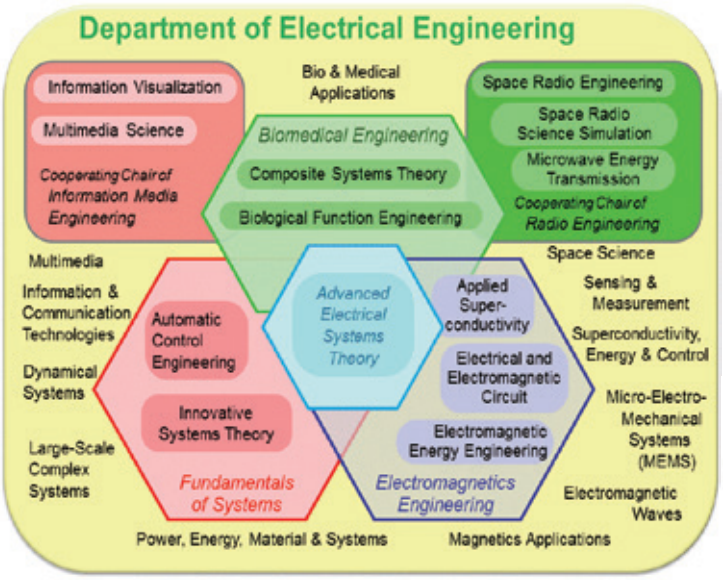


Fig. 1

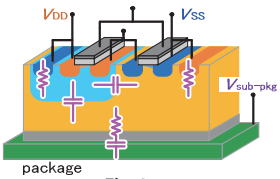


Fig. 3

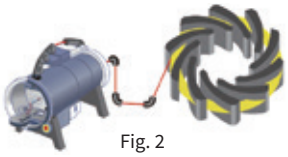


Fig. 2

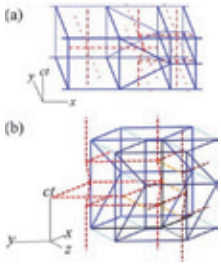


Fig. 4

Chair of Electromagnetics Engineering: In ***Applied Superconductivity Laboratory***, electromagnetic phenomena in superconductors and fundamental technologies for various applications of superconductivity are being studied extensively. An example of applications is the carbon ion accelerator for cancer therapy shown in the figure (Fig. 2). Recent topics in ***Electrical and Electromagnetic Circuit Laboratory*** are extension of the conventional circuit theory and modeling methods to include electromagnetic phenomena, such as parasitic coupling in electronic devices (Fig.3), and control of electric energy flow. In ***Electromagnetic Energy Engineering Laboratory***, the key theories and techniques for computational electromagnetics are studied such as space-time electromagnetic field analysis (Fig. 4) and magnetic material modeling.

Electronic Science and Engineering

Overviews

This Department engages in education and research on advanced science and engineering for creating new materials and devices that serve as the basis of future electronics and photonics in order to establish “more than Moore” and/or “beyond CMOS” technologies. Examples of future prospects of research topics are: (i) novel high-power semiconductor devices, (ii) novel optical devices using compound semiconductors (iii) advanced photonic materials and devices by using quantum effects of electrons and photons, (iv) investigations of various molecular materials and their electronic device applications, (v) quantum computation and communication, (vi) high-temperature superconductivity devices, and (vii) fundamental study on spintronics and its device applications using dissipationless pure spin current.

Recent Research Highlights:

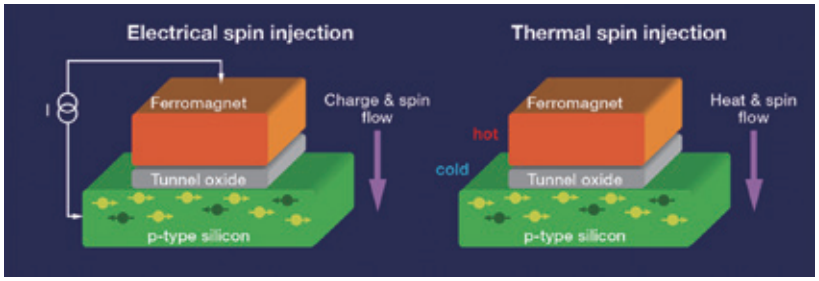
(1) Photonic crystals : In this century, photons take on an increasingly important role in our society, for example: environment-friendly solar energy, next-generation information technology based on high speed optical communication, ultra-high efficient lighting devices, material processing by photons, and quantum information processing using photons. An objective is to control and manipulate “photons” at will, using photonic crystals or photonic nano-structures, to realize the innovative technologies which make the above mentioned applications reality. We believe that our research will open up the next generation information and communication technology and also greatly contribute to the solution in global energy or environmental issues.

(2) Quantum information : Quantum information science tries to harness the fundamental features of quantum mechanics for information processing, communication, and more. We are trying to manipulate the quantum states of photons, or entanglements, using photonic quantum circuits and nanophotonic devices.

(3) White LEDs : Environmental-friendly devices with novel functions are strongly awaited. Phosphor-free white light-emitting diodes (LEDs) have been demonstrated in the structure based on micro-structured InGaN/GaN quantum wells for solid state lightings in the next generation.

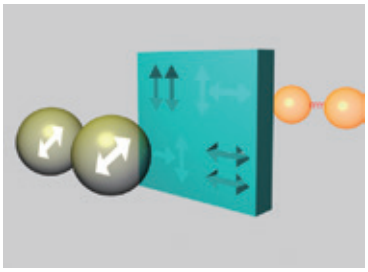
(4) High-power semiconductor devices : High-efficiency electric power conversion is an essential technology for energy saving. Silicon carbide (SiC) is an emerging wide bandgap semiconductor, by which high-voltage, low-loss power devices can be developed. Major subjects of study include material science and device physics of SiC.

(5) Spintronics : Pure spin current, which is a flow of spin angular momentum without charge flow, enables ultra-low energy dissipation information propagation and calculation and plays one of the most pivotal roles in spintronics. The pure spin current can be generated in Si, graphene and Ge at room temperature, and that in topological insulators can be experimentally detected.

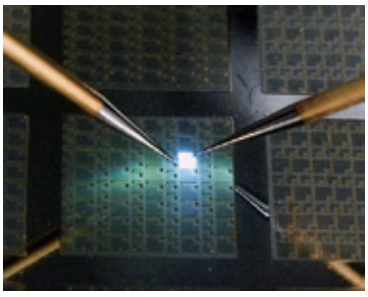


(5) Shikoh *et al.,* Phys. Rev. Lett. 2013.

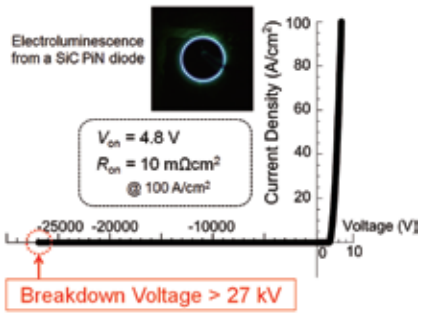
(1) Ishizaki *et al.,* Nature Photonics. 2013. (Cover picture of Vol.7, No. 2, 2013)



(2) Okamoto *et al.,* Science 2009.



(3) Funato *et al.,* APEX 2008.



(4) Kimoto *et al.,* Compound Semiconductor 2014.

Material Chemistry

Overviews

With the rapid development of society on the basis of science and technology, development of new materials is becoming increasingly important. This is because such materials support our contemporary way of life and industrial infrastructure, and expectations for the future roles of leading-edge chemistry are constantly rising.
Chemistry today is undergoing a transformation into an academic discipline that involves investigation of the backgrounds and properties of the molecules that compose substances, in addition to techniques for creating new substances and the search for functions inherent to substances. The Department of Material Chemistry engages in research and education for the purpose of designing materials that have new functions while elucidating their structures and properties at the molecular level, as well as establishing methods of synthesizing those materials, with an emphasis on inorganic, organic and polymer materials.
The Department of Material Chemistry consists of four research units: Design of Functional Materials, Inorganic Material Chemistry (Inorganic Structural Chemistry, Industrial Solid-State Chemistry), Organic Material Chemistry (Organic Reaction Chemistry, Organic Chemistry of Natural Products, Analytical Chemistry of Materials), Polymer Material Chemistry (Polymer Physics and Function, Biomaterial Chemistry), and Nanomaterials (Nanomaterials).

Researches

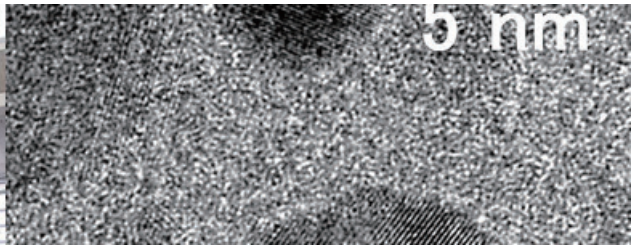
The Department of Material Chemistry covers all the basic chemistry fields ranging from inorganic chemistry, organic chemistry, analytical chemistry, polymer chemistry, bio-related chemistry, and to nano-chemistry, which are rich in variety but in depth in science.
In order to promote the development of new functional materials based on integrated science, the Department engages in intra-departmental and extra-departmental research exchange and is developing a structure for research cooperation. The Department also accepts students and researchers from foreign countries, and actively promotes collaboration with overseas research institutions. In this way, we are undertaking the development of a research and education environment that will make the Department an international research and education center in the field of materials research.

Educational Policy

Chemistry today is undergoing a transformation into an academic discipline that involves investigation of the backgrounds and properties of the molecules that compose substances, in addition to techniques for creating new substances and the search for functions inherent to substances. The Department of Material Chemistry engages in research and education for the purpose of designing materials that have new functions and properties while elucidating their structures and properties at the molecular level, as well as establishing methods of synthesizing those materials, with an emphasis on inorganic, organic and polymer materials.

History

The Department of Material Chemistry was inaugurated in 1993 in a reorganization that focused its activities on the graduate school. The Department's predecessor was the Department of Industrial Chemistry, Faculty of Engineering. The Department of Industrial Chemistry was established within the Kyoto Imperial University College of Science and Engineering as a department with four chemistry chairs, and in September of the following year two courses were inaugurated: Pure Chemistry and Manufacturing Chemistry. Subsequently, in September 1914 the College of Science and Engineering was split into the College of Science (the predecessor of the Faculty of Science) and the College of Engineering (the predecessor of the Faculty of Engineering) and became the Department of Industrial Chemistry, College of Engineering.
The Department of Industrial Chemistry has at all times embraced and supported promising young professors, fulfilling its role as a mother organization that has given birth to the Department of Fuel Chemistry (later renamed the Department of Hydrocarbon Chemistry), the Department of Textile Chemistry (renamed the Department of Polymer Chemistry), and the Department of Synthetic Chemistry (renamed the Department of Synthetic Chemistry and Biological Chemistry).
We take great pride in the fact that, over the years, the Department of Industrial Chemistry has produced many leaders who have contributed to corporations, universities, and research institutions in Japan and around the world in the fields of basic and applied chemistry.



Energy and Hydrocarbon Chemistry

Overviews

The ultimate purpose of chemistry are to clarify the essential nature of unknown chemical phenomena, to find out new knowledge, including materials and chemical reactions, and to transfer the results of these activities so as to improve human life and society.

The Department of Energy and Hydrocarbon Chemistry in the Graduate School of Engineering has designed as educational program for the students who will go on to lead the scientific challenges of the 21st century. This program furnishes students with a sound understanding of the basic principles and knowledge of chemistry, as well as cultivating a scientific way of thinking.

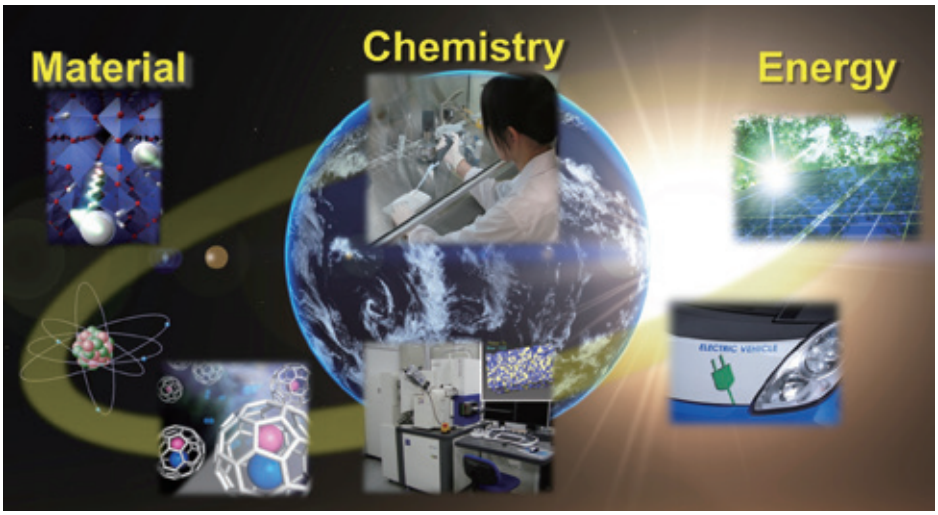
Researches

The civilization in our society was greatly developed in the 20th century; however, the rapid technological developments brought about shortage of natural resources and great stress on the global environment simultaneously. To encourage environment-conscious civilization, it is essential to develop a new paradigm of science and technology. In other words, it is of vital importance to develop new technologies that will achieve the production of high value-added products with minimum use of raw materials and minimum energy consumption, as well as the production and storage of high-quality energy and recycle of chemical resources.

To achieve these objectives, it is our mission to develop cutting-edge science and technology associated with substances and energy. As a science that deals with material transformation and energy conversion, chemistry plays a central role in realizing a sustainable human society. To meet the demands of society, scientists at the Department of Energy and Hydrocarbon Chemistry engage in synergistic advancement of basic and applied chemistry, thereby promoting original and innovative chemical research.

The following researches are under way in this department.

- Chemical reactions related with energy problems
- Research on environmental catalysis and energy-conversion photocatalysis
- Development of new catalysts and photocatalysts
- Development of electrochemical reactions and materials for energy conversion and storage
- Clarification and control of liquid-liquid, solid-gas, and solid-liquid interfacial reaction mechanisms
- Creation of new materials by controlling active species
- Creation of functional π–conjugated systems
- Development of molecular transformations exploiting underutilized resources
- Effective use of radioactive tracers
- Development of advanced batteries and their materials

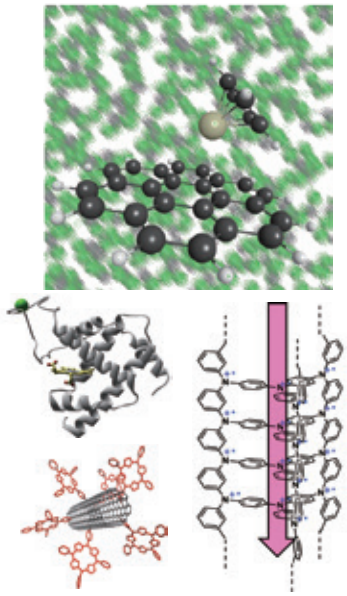


Curriculum

Thirty-five students are admitted to the Master's program after passing the entrance examination. Students who wish to be admitted to the Doctoral program must pass the qualifying examination in the Department. The Department offers advanced courses in energy chemistry, hydrocarbon chemistry, catalyst science, electrochemistry, radiation chemistry, physical chemistry, organic chemistry, and other related areas.

Molecular Engineering

Overviews



The discipline of chemistry is steadily expanding, so that in addition to the conversion of substances, it is increasingly concerned with investigating the physical properties of substances in relation to their electronic structure, molecular arrangements and interactions, and the design of molecules and materials with novel functions. Molecular engineering is an academic field serving to underpin the fundamental science of microscopic phenomena involving atoms, molecules, and polymers by theoretically and empirically elucidating the interactions between atoms, molecules, and polymers and applying the results directly to engineering at a molecular level. The importance of molecular engineering to the frontiers of chemistry is clearly recognized. High expectations are held for the potential contribution of molecular engineering to cutting-edge technology, particularly in Japan. One of the most important areas of research in molecular engineering at present is the development of new materials: for example, new electronic materials; high-performance materials in molecular biotechnology; high-performance organic, inorganic, and polymeric materials; highly selective catalysts; and energy and information-related materials.

The aim of the Department of Molecular Engineering is to train researchers and engineers who can use new concepts in molecular theory to develop useful applications from fundamental science.

Researches

Biomolecular Function Chemistry

Our Lab is devoted to investigate the structures and functions of biomacromolecules, such as proteins and DNAs and to develop physicochemical methodologies for the investigations. Our current interests focus on the methylation of genomic DNA and ubiquitination of intracellular proteins.

Theoretical Chemistry

In our laboratory we are concentrating on developing molecular theory to describe chemical phenomena based on quantum chemistry and statistical mechanics. Current research activities cover the understanding of chemical reactions, chemical dynamics and molecular properties of various chemical processes, especially in the condensed phase.

Quantum Function Chemistry

Our research group is engaged in a wide range of research projects designed to establish (1) the cooperative coupling between the molecular design and theoretical analysis, (2) the organic synthesis, and (3) the elucidation of physicochemical properties of advanced functional organic materials.

Catalysis Chemistry

Our Lab is devoted to clarification of entire mechanism of catalysis and to a design of a new green catalytic system thereby. Our current researches are in situ spectroscopic characterization of catalysts, design of highly active photocatalysts for artificial photosynthesis, development of catalyst materials based on elements strategy.

Photoorganic Chemistry

Our group is devoted to basic and application researches based on organic chemistry and photochemistry. Current interests involve development of photofunctional molecules and nanocarbon materials for artificial photosynthesis, photovoltaic devices, and cellular function control.

Condensed Matter Physical Chemistry

Main objectives of our research group are (1) developing new techniques and methodology for discerning physical properties of molecular materials, (2) design and optimization of molecular systems with concerted electronic, optical, and magnetic properties, (3) developing low-dimensional functional nanomaterials for the future application in optoelectronic and biomedical fields.

Quantum Materials Science

We investigate Quantum Materials for quantum sensing and/or quantum information science. These fields are expected to provide new opportunities - especially with regard to higher sensitivity and precision, faster calculation, and safer communication compared with those operated by classical physics.

Molecular Rheology

This laboratory focuses on molecular origins of rheological properties of various softmatters that include polymers and suspensions. For basic understanding of the materials, rheological, dielectric, optical, and scattering measurements as well as molecular simulations are conducted, and the results are analyzed from a comprehensive point of view.

Organic Materials Science

Our research target is the realization of highly efficient organic LEDs and organic solar cells. The establishment of fundamental science on these devices is another target of our group. For the purpose, we have carried out molecular designs, syntheses, device fabrications, NMR and DNP-NMR analysis, and quantum chemical calculations.

Theoretical Solid State Chemistry

In our Lab, we develop novel concepts in order to design functional molecules such as light-emitting molecules and carrier-transporting molecules from the view of vibronic (electron-molecular vibration) couplings. They are also applied for chemical reactivities of large molecules such as fullerenes, nanotubes, and solid surfaces.

Porous Physical Chemistry

Our group develops porous microstructures using an assortment of organic, inorganic and physical chemistry tools. These materials target the global targets of reduced carbon emissions and water scarcity. Our unique approach serves as a remarkable screen from the various potential chemistries available to those that are realistic for impact.

Polymer Chemistry

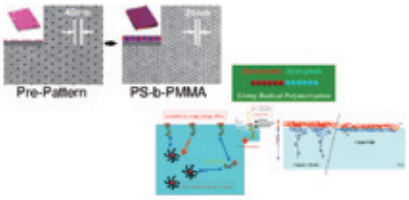
Overviews

The Department of Polymer Chemistry, recognizing the importance and potential of polymers and macromolecules, aims at fundamental research and integrated education to cover every facet of polymer chemistry and science: synthesis, reactions, structures, physical properties, and functions. Via its close partnership with neighboring disciplines in chemistry, physics, and biology, the research contributes to discoveries and innovations in science and technology that better the world for all of us. With its first-rate curricula, facilities, and faculty, the education cultivates creative and competent researchers and engineers of polymer science and relevant advanced studies.

Researches

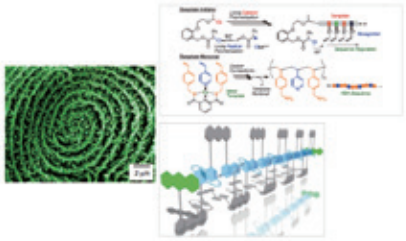
Advanced Polymer Chemistry

Education and research aiming at the design of next-generation polymers having novel unique functions. Synthesis and evaluation of functional heteroatom-containing conjugated polymers by novel transition metal catalysts. Nanostructure-control and functionalization of various block copolymers and development of techniques for nanostructure analysis.



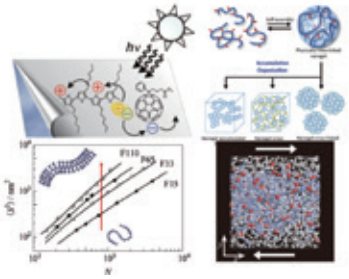
Polymer Synthesis

Aims and Activities of the Polymer Synthesis Group: Exploration of novel reactions and designed catalysts for polymer synthesis; clarification of polymerization mechanisms; physico-chemical analysis of the structure and functions of newly synthesized polymers; development of polymer materials precisely designed in a molecular scale; and research and education in general principles and fundamental chemistry in polymer synthesis.



Polymer Physics

Research and Education in Polymer Physics Group: studies on structures and properties in a wide variety of polymeric systems such as solution, blends, gels, rubbers, amorphous, crystals, and liquid crystals, aiming for deep understanding of the polymeric systems through the molecular-level investigation of the relationships between their forming processes and transition mechanisms, and between their assembled structures and functions.

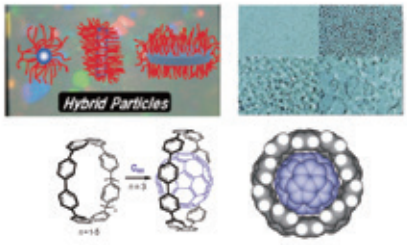


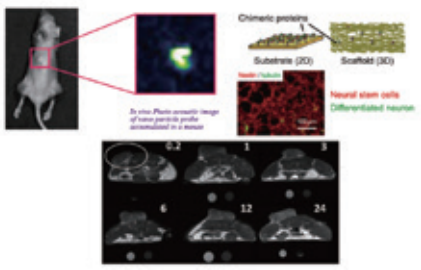
Polymer Design

Education and research related to molecular design of functional polymers: in particular, functionalization of polymers by chemical reactions and analysis of static/dynamic structure in a micro to macro scale by e.g., electron microscopy and X-ray/neutron/light scattering techniques.

Biomedical Polymers

Education and research regarding basic biology and medicine as well as clinical medicine on the basis of polymer material sciences. The projects of interest are biomedical materials for surgeries (general surgery, ophthalmology, orthopedic surgery, neurosurgery or dentistry, etc.) and internal medicines as well as polymeric materials for regenerative medicine and for DDS of drug and gene therapy, prophylaxis, and diagnosis.

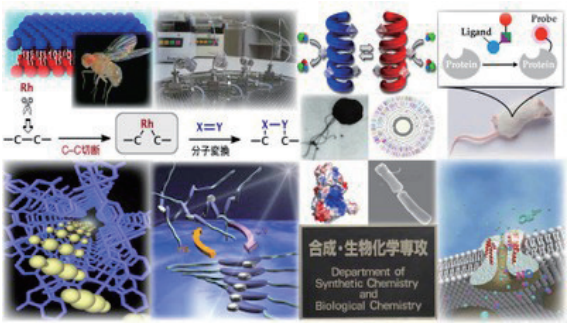




Synthetic Chemistry and Biological Chemistry

Overviews

The mission of the Department of Synthetic Chemistry and Biological Chemistry is to drive advances in synthetic and biological chemistry through the promotion and application of fundamental science, as well as to establish this interdisciplinary field.
Our department is also striving to promote sound and balanced views of nature and life, and to help establish new industrial platform technologies for the development of a sustainable society.



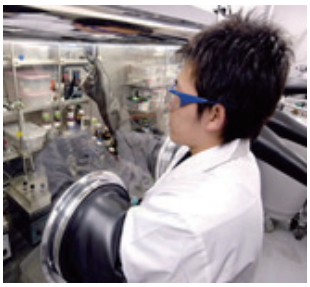
Researches

Chair of Organic System Design

Laboratory of Organic System Design tackles the design and production of new chemical reactions and materials that can serve as a basis for the creation of useful materials for 21st century society, and the development of efficient material transformation techniques.

Chair of Synthetic Chemistry

Laboratory of Synthetic Organic Chemistry is focused on time integration and space integration of reactions (one-pot and flow synthesis) using unstable reactive intermediates generated by various methods including electron transfer reactions and organometallic reactions to enhance the power and speed of organic synthesis.
Laboratory of Functional Coordination Chemistry works to promote the design and synthesis of dynamic and adaptive structures of coordination polymers/and metal-organic frameworks toward new porous materials, ion conductors and catalysts.



Laboratory of Physical Organic Chemistry aims at understanding the correlation between structure and properties in organic molecules and tries to develop new organic functional materials for application in electronics and optics.
Laboratory of Organometallic Chemistry tries to develop new synthetic methodology using transition metal catalysts, and particularly, is focused on the selective activation of carbon–carbon bonds, carbon–hydrogen bonds, and carbon–nitrogen bonds of readily available starting materials.

Chair of Biological Chemistry

Laboratory of Bioorganic Chemistry is focused on creating novel chemistry useful for live cell and in vivo research in molecular level, with the following aims--the development of chemo- and bio-sensors, imaging probes, and methodology for selective protein labeling and regulation of protein, innovative semi-wet supramolecular biomaterials for control of biomolecules and live cells.
Laboratory of Molecular Biology focuses on the elucidation of cellular response mechanisms in various types of living tissue, such as the cerebral nervous system, under native conditions, and also studies the molecular motion of bio-signals, using molecular biology and cellular engineering techniques, for the purpose of exploring the chemical basis of the causes of disease.
Laboratory of Biorecognition Chemistry is focused on the molecular motion of components in biological membranes, and also aims at elucidating the molecular basis of various physiological/pathophysiological events such as cellular morphogenesis, energy metabolism, and muscular dystrophy.

Laboratory of Biochemical Engineering is focused on the physiology and metabolism of microorganisms. Genome sequence data and genetic technology are utilized in elucidating the function of unknown genes and in engineering microbes with improved or novel metabolic capacity.

Technical Service Office

State of the art instrument infrastructure supported by technical staff offers researchers and students access to a wide range of analytical technologies (such as NMR and MS) and the necessary technical expertise. The office also provides the assistance in information technology.

Chemical Engineering

Overviews

The department is actively pursuing educational and research activities to develop chemical products and processes that address society's growing technological needs in a sustainable manner. Chemical engineering is particularly suited for such a demanding task. One of the main features of chemical engineering is that it can extract the relevant phenomena of a given process, evaluate its dynamical characteristics, and proceed to develop methodologies that enable advanced functionality, as well as optimize the production efficiency of the materials involved.

Researches

Transport Phenomena

Our research targets include soft materials (colloids, polymers, membranes) as well as active matter systems (soft tissues and swimming microorganisms). We aim to develop theoretical models that can be used to simulate these systems based on physical principles.

Surface Control Engineering

We focus on the engineering for nanoscale confined space to exploit interfacial phenomena. Current research topics include simulation and modeling of phase behavior in nanopores, self-assembly of colloid particles, synthesis of functional particles with micro- and nanoreactors.

Chemical Reaction Engineering

CRE Laboratory focuses on modeling of functional materials production processes, electro chemical processes, coal conversion processes, etc. New reaction processes and materials are being developed based on understandings of the chemical structure, reactions, and processes.

Separation Engineering

We are developing methodologies and materials for separation and purification operations. The current research activities cover adsorption, drying, nanocarbons, dielectrophoresis and molecular dynamic simulation.

Energy Process Engineering

We focus on the development of the technology for renewable energy production and high-efficiency energy conversion/utilization. Specifically, we design and fabricate next-generation photovoltaic devices and hydrogen-energy systems, etc.

Materials Process Engineering

We are developing new material processing technologies for creating new functional materials such as polymer foams or metal-plated plastics. Our research mainly focuses on controlling the material structures as well as developing the optimal processing devices and techniques.

Process Control and Process Systems Engineering

Process Systems Engineering (PSE) is a research area where the systematic methodology for realizing an innovative production system is investigated. PSE covers all aspects of design, operation, control, planning, and logistics for the process industries.

Environmental Process Engineering

We are developing several environmentally benign technologies based on new conversion methods. The current research activities cover micro reaction technology, biomass conversion and catalytic reaction toward a new industrial paradigm in sustainable society.

Particle Technology

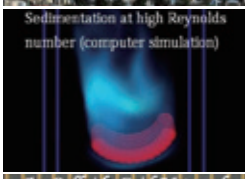
Analysis of the dynamic behavior of particles and evaluation of powder properties such as particle adhesion and electrification are important for fine-particle handling. Our research is focused on analyzing the phenomena and on developing new handling methods.

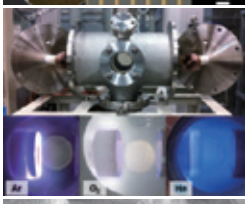
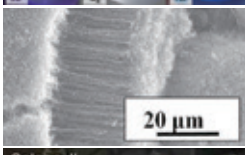
Environment and Safety Engineering

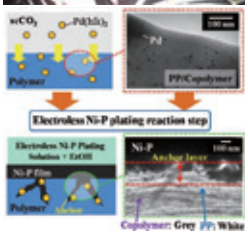
The focus of our research is the development of the technology for environmental preservation and safety life: Oxidative decomposition of organic pollutants utilizing active radicals generated by chemical reagent or plasma; Removal of heavy metal ions by magnetic nano-particles.

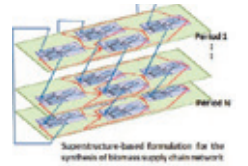
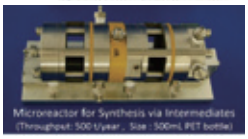
Soft Matter Engineering

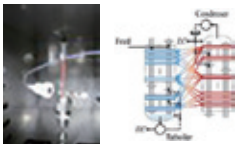
Our research group focuses on the combination of separation and reaction technologies with energy conservation principles to enhance the energy performance of current processes by means of process intensification (PI).



7. Research and Educational Facilities and Centers

Photonics and Electronics Science and Engineering Center

Support for advanced ion beam technology deployment in interdisciplinary and multidisciplinary areas

Through the use of ions, kinetic energy and chemical activity can be freely controlled and materials in a vacuum can be manipulated, making it possible to control the micro-properties of matter. Taking advantage of this characteristic of matter, the Photonics and Electronics Science and Engineering Center engages in cutting-edge ion beam technology research based on the synthesis of new materials used in a variety of fields ranging from electronics, electricity, machinery, and medicine to the production of high-performance thin-film devices such as very-large-scale integrated circuits. Noteworthy among these pursuits, the cluster ion beam technology developed at the Center is attracting attention in Japan and abroad as a novel process that promises to open up new applications for ion beams.

Research Center for Environmental Quality Management

Control, evaluation, and mitigation of environmental quality

The Research Center for Environmental Quality Control (RCEQC) was inaugurated in 1995 with three research and educational divisions: Environmental Quality Control, Environmental Quality Evaluation, and Environmental Quality Mitigation. The main objectives of the Center are to integrate the relevant fields of engineering and to become an advanced educational and research institution by investigating the direct and indirect adverse effects of environmental pollutants on human health and the ecosystem.

Quantum Science and Engineering Center

Supporting nanoscale science research using particle beam accelerators

The Quantum Science and Engineering Center (QSEC) was established in April 1999 with the aim of promoting the use of quantum beams, seeking new phenomena induced by quantum beam irradiation and investigating nuclear engineering for establishing the safe energy system. For this purpose, the center provides four accelerators to researchers, and studies nanoscale material science under extreme conditions and nuclear fuel cycle technology including actinide science.

Katsura Int'tech Center

Creating new world-leading technologies that transcend the framework of conventional technical specialization

The center is composed of multiple research divisions, consisting of groups of researchers from different departments and graduate schools. It pursues cutting-edge strategic research and implements research exchanges with external organizations from a global perspective. Furthermore, the center features five laboratories ("open labs") that are expected to develop substantially over the coming years. These labs are being used by a variety of project groups.

Center for Information Technology

The construction and operation of IT systems for educational activities, research, and administrative affairs

The Center for Information Technology was established in 2002 with the aim of efficiently managing the information system of the Graduate School of Engineering, Kyoto University. The Center is responsible for the construction and management of IT systems for all educational, research, and administrative affairs, as well as for information security and literacy instruction. The Center also contributes to university-wide information systems by developing novel IT systems.

Occupational Health, Safety and Environmental Management Center

Ensuring a comfortable environment for the people studying and working in the Graduate School of Engineering

The aim of the center is to fashion an ideal environment for education and research, with careful consideration to environmental protection, safety, and public health. In this effort, the center complies strictly with the Industrial Safety and Health Law and other applicable health and safety-related laws, and is working systematically towards sustainable environmental protection. The center supports the education and research activities of the Graduate School of Engineering through the allocation of specialist academic and technical staff in the areas of work management, work environment management, and health and safety management, and the implementation of work environment monitoring and systems for handling of chemical substances.

Engineering Education Research Center

Inspiring engineering leaders for tomorrow

The center fosters the next generations of engineers by supporting their learning which reinforces the development of international leadership skills. The center offers a wide range of multi-disciplinary courses that are tailored to the needs of engineering students at both undergraduate and graduate levels. These courses empower the engineering students who desire to acquire the knowledge and skills for stepping up to the leadership roles. The center also provides the opportunities for faculty members and post-graduate students to participate in faculty development programs which promote active learning in engineering.

Research Administration Center

Supporting and promoting research activities in Graduate School of Engineering

The Center with URAs(*) was established in December 2012. The URAs support to apply for government and industry research funding, promote research projects, and arrange joint research opportunities for matching research seeds with industry needs.

* University Research Administrator

8. Statistics Data

1 Statistics of Academic & Administrative Staff

Academic Staff

As of May. 1, 2018

Departments & Institutes	Academic Staff				Total
	Professors	Associate Professors	Junior Associate Professor	Assistant Professors	
Civil and Earth Resources Engineering	13	13	2	9	37
Urban Management	8	12		7	27
Environmental Engineering	3	5	2	4	14
Architecture and Architectural Engineering	13	9		10	32
Mechanical Engineering and Science	12	7	3	9	31
Micro Engineering	4	4	2	2	12
Aeronautics and Astronautics	7	3	3	5	18
Nuclear Engineering	6	5	2	3	16
Materials Science and Engineering	10	13		10	33
Electrical Engineering	8	2	1	4	15
Electronic Science and Engineering	6	7		6	19
Material Chemistry	8	5	2	6	21
Energy and Hydrocarbon Chemistry	8	5	1	8	22
Molecular Engineering	5	4	1	5	15
Polymer Chemistry	5	6	1	5	17
Synthetic Chemistry and Biological Chemistry	7	6	2	9	24
Chemical Engineering	8	6	2	7	23
Photonics and Electronics Science and Engineering Center	1		2	2	5
Research Center for Environmental Quality Management	2	1		1	4
Quantum Science and Engineering Center		2			2
Engineering Education Research Center			5		5
Total	134	115	31	112	392

Administrative Staff

As of May. 1, 2018

Departments & Institutes		Admin. Staff	staff Technical staff	Total
Civil and Earth Resources Engineering	C Cluster Office	22	3	43
Urban Management			2	
Environmental Engineering			2	
Architecture and Architectural Engineering			2	
Mechanical Engineering and Science			5	
Micro Engineering			1	
Aeronautics and Astronautics				
Nuclear Engineering			2	
Materials Science and Engineering			4	
Global Engineering	Global Engineering Office	3		3
Architecture	Architecture Office	2		2
Engineering Science	Engineering Science Office	3		3
Electrical Engineering	A Cluster Office	15		22
Electronic Science and Engineering				
Material Chemistry				
Energy and Hydrocarbon Chemistry			1	
Molecular Engineering			1	
Polymer Chemistry			1	
Synthetic Chemistry and Biological Chemistry			3	
Chemical Engineering			1	
Electrical and Electronic Engineering	Electrical and Electronic Engineering Office	3		3
Industrial Chemistry	Industrial Chemistry Office	4		4
Informatics and Mathematical Science			1	1
Katsura Int'tech Center			2	2
Center for Information Technology			3	3
Occupational Health, Safety and Environmental Management Center			5	5
	Katsura Campus Office	60	4	64
	Yoshida Campus Office	7	1	8
Total		119	44	163

2 Statistics of Current Undergraduate & Graduate Students

Graduate School

As of May. 1, 2018

Academic Year / Departments	Master's Course		Doctoral Course						Total	
	Year 1	Year 2	Year 1		Year 2		Year 3			
			April	October	April	October	April	October	April	October
Civil and Earth Resources Engineering	84	88	8	6	8	2	13	9	201	17
Urban Management	69	62	20	7	9	8	16	7	176	22
Environmental Engineering	37	45	6	6	6	8	12	9	106	23
Architecture and Architectural Engineering	80	83	8	1	12	3	15	4	198	8
Mechanical Engineering and Science	62	64	7	4	5	1	14	3	152	8
Micro Engineering	30	29	3	1	3	0	3	2	68	3
Aeronautics and Astronautics	29	26	3	0	1	0	5	0	64	0
Nuclear Engineering	22	21	7	0	9	0	9	3	68	3
Materials Science and Engineering	45	42	9	3	6	2	8	2	110	7
Electrical Engineering	46	44	9	1	5	1	5	2	109	4
Electronic Science and Engineering	31	34	7	0	7	1	4	2	83	3
Material Chemistry	33	32	4	1	6	0	8	0	83	1
Energy and Hydrocarbon Chemistry	40	42	6	2	6	2	9	0	103	4
Molecular Engineering	36	34	7	0	9	0	7	0	93	0
Polymer Chemistry	46	51	10	0	7	1	9	2	123	3
Synthetic Chemistry and Biological Chemistry	34	31	5	0	6	0	7	2	83	2
Chemical Engineering	43	39	2	1	3	1	6	2	93	4
Total	767	767	121	33	108	30	150	49	1913	112
(Katsura area)	722	725	112	30	102	28	142	47	1803	105
(Yoshida area)	45	42	9	3	6	2	8	2	110	7

Undergraduate

As of May. 1, 2018

Academic Year / Undergraduate Schools	Year 1	Year 2	Year 3	Year 4	Total
Global Engineering	193	186	187	251	817
Architecture	82	84	82	103	351
Engineering Science	242	241	241	312	1036
Electrical and Electronic Engineering	135	138	134	180	587
Informatics and Mathematical Science	96	93	100	149	438
Industrial Chemistry	242	242	241	314	1039
Total	990	984	985	1309	4268

3 Statistics of Research Students, International Students and Guest Scholars

As of May. 1, 2018

	Status / Depts.	Japanese Students				International Students			International Research Students					Guest Scholars			Total
		Research Students	Research Fellows	Special Auditors	Special Research Students	Faculty	Master's Course (Graduate school)	Doctoral Course (Graduate school)	Research Students	Research Fellows	Special Auditors	Special Research Students	Short-term International Students	Guest Scholars	Guest Research Associates	Visiting Research Scholars	
Graduate School of Engineering	Civil and Earth Resources Engineering	1					35	23	5						2		66
	Urban Management						20	39	4					2	2		67
	Environmental Engineering						16	31	1				1	2	3		54
	Architecture and Architectural Engineering	1					17	9			2	2			2		33
	Mechanical Engineering and Science		2				14	11	1		2	2			1		33
	Micro Engineering		1				3	5	2					1			12
	Aeronautics and Astronautics						2	3	1					1			7
	Nuclear Engineering						1	5						1	2		9
	Materials Science and Engineering						8	17	2			1		4	2		34
	Electrical Engineering		1				9	9							1		20
	Electronic Science and Engineering		1				5	1				1			1		9
	Material Chemistry	1	1				2	3	1						1		9
	Energy and Hydrocarbon Chemistry		1				6	6							1		14
	Molecular Engineering						4	5	1						4		14
	Polymer Chemistry						4	9						1			14
	Synthetic Chemistry and Biological Chemistry						2	2						1	3		8
	Chemical Engineering						9	4			1				1		15
Faculty of Engineering	Global Engineering					58					1						59
	Architecture					6					1		1				8
	Engineering Science					24					5						29
	Electrical and Electronic Engineering					17					3						20
	Informatics and Mathematical Science					21					4					1	26
	Industrial Chemistry					26							4				30
	Total	3	7	0	0	152	157	182	18	0	19	6	6	13	26	1	590

As of May.1,2018

	International Students			International Research Students				Guest Scholars			Total
	Faculty	Master's Course (Graduate school)	Doctoral Course (Graduate school)	Research Students	Special Auditors	Special Research Students	Short-term International Students	Guest Scholars	Guest Research Associates	Visiting Research Scholars	
Asia											
Bangladesh			3	1							4
Cambodia		2	1								3
China	92	95	73	9	2	4	1	5	9		290
Hong Kong		2									2
India	2	1	6					4	3		16
Indonesia	9	7	13	1	2						32
Kazakhstan			1								1
Korea	21	11	21	2	2			1	1		59
Macau	1										1
Malaysia		2	8								10
Mongolia	4		1								5
Myanmar		2	11					1			14
Nepal		1	4	2							7
Pakistan			3								3
Philippines	1			1							2
Singapore	1				1						2
Taiwan	1	5	5		1				2		14
Thailand	7	5	5		1						18
Viet Nam	3	1	6								10
Middle East											
Afghanistan			1								1
Iran		1	5								6
Oman		1									1
Turkey	1		2						1		4
Europe											
Bulgaria			1								1
France			1		2	1	5		2	1	12
Germany					2	1					3
Greece		1									1
Italy			1		1				1		3
Netherlands			1		1				1		3
Russia		1									1
Spain									1		1
Switzerland									1		1
U.K.				1				1			2
Africa											
Burkina Faso		1									1
Cameroon		1									1
Democratic Republic of the Congo		1									1
Egypt	5	1	2								8
Kenya		1									1
Liberia		1									1
Morocco		1									1
Mozambique									1		1
Senegal		1									1
Uganda		2									2
Zimbabwe		1									1
North America											
Canada	1	1			2						4
Mexico		1									1
U.S.A.		2	1		1			1	3		8
Latin America											
Bolivia			1								1
Brazil	3	1	1		1						6
Colombia			1								1
Costa Rica		1									1
Panama			1								1
Peru		1	2	1							4
Oceania											
Fiji		1									1
Total	152	157	182	18	19	6	6	13	26	1	580

4 Budgets

Category	F/Y2015 (¥1000)	F/Y2016 (¥1000)	F/Y2017 (¥1000)	Note
Personnel expenses	5,792,475	5,796,942	5,460,001	
General expenses	1,775,626	1,868,212	1,836,314	
Revenues from Sponsored Research	3,504,200	3,100,530	2,346,682	
Revenues from Collaborative Research	742,486	695,710	640,392	
Revenues from Donations for scholarships	322,146	427,058	355,432	
Academic Consulting	35,172	20,675	33,485	
Subsidies for Scientific Research (Income)	2,534,890	2,561,599	2,432,064	
Other subsidies (Income)	61,926	114,112	72,401	
Other large-scale projects (Income)	1,258,443	787,550	765,351	Cooperative projects with other departments in large-scale project etc.

9. Award Winning Researchers in Kyoto University

Kyoto University is acknowledged as one of the most accomplished research-oriented universities in Asia. The validity of that reputation is testified by the accolades conferred on our alumni and researchers, most notably 9 Nobel Prize laureates who undertook vital research during their time at the university. In addition to those awards, several other Kyoto University faculty members have received respected accolades, including two Fields Medalists and one recipient of the Gauss Prize.

Nobel Prize

in Physics
- Hideki Yukawa (1949)
- Shinichiro Tomonaga (1965)
- Makoto Kobayashi (2008)
- Toshihide Maskawa (2008)
- Isamu Akasaki (2014)

in Chemistry
- Kenichi Fukui (1981)
- Ryoji Noyori (2001)

in Physiology and Medicine
- Susumu Tonegawa (1987)
- Shinya Yamanaka (2012)

Fields Medal
- Heisuke Hironaka (1970)
- Shigefumi Mori (1990)

Gauss Prize
- Kiyoshi Ito (2006)

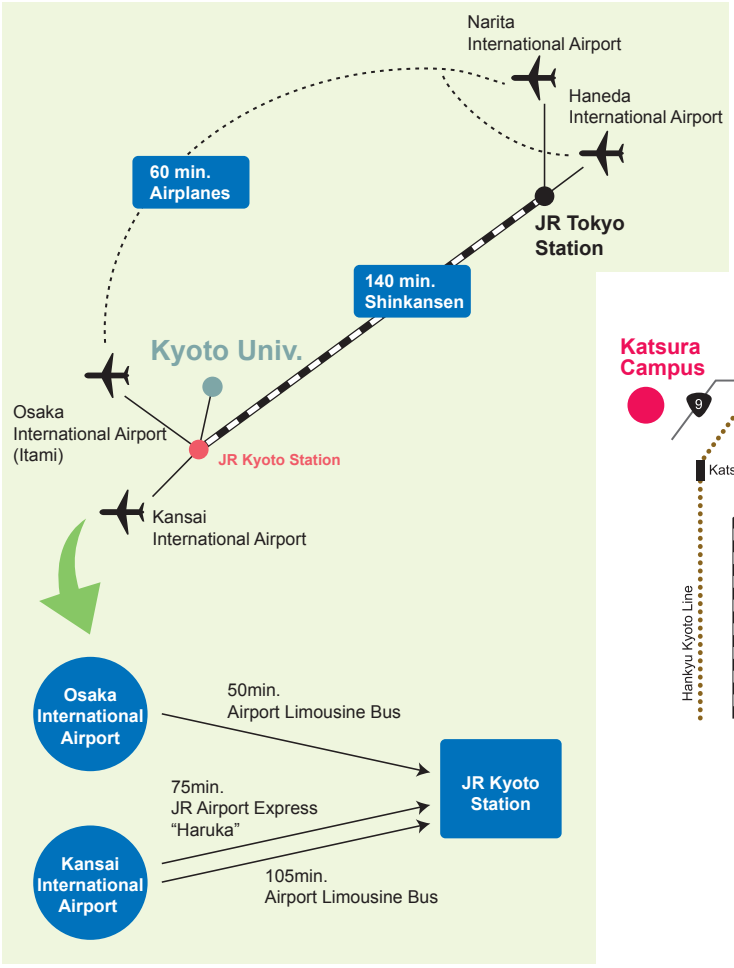
Lasker Award
- Susumu Tonegawa (1987)
- Yasutomi Nishizuka (1989)
- Yoshio Masui (1998)
- Shinya Yamanaka (2009)
- Kazutoshi Mori (2014)

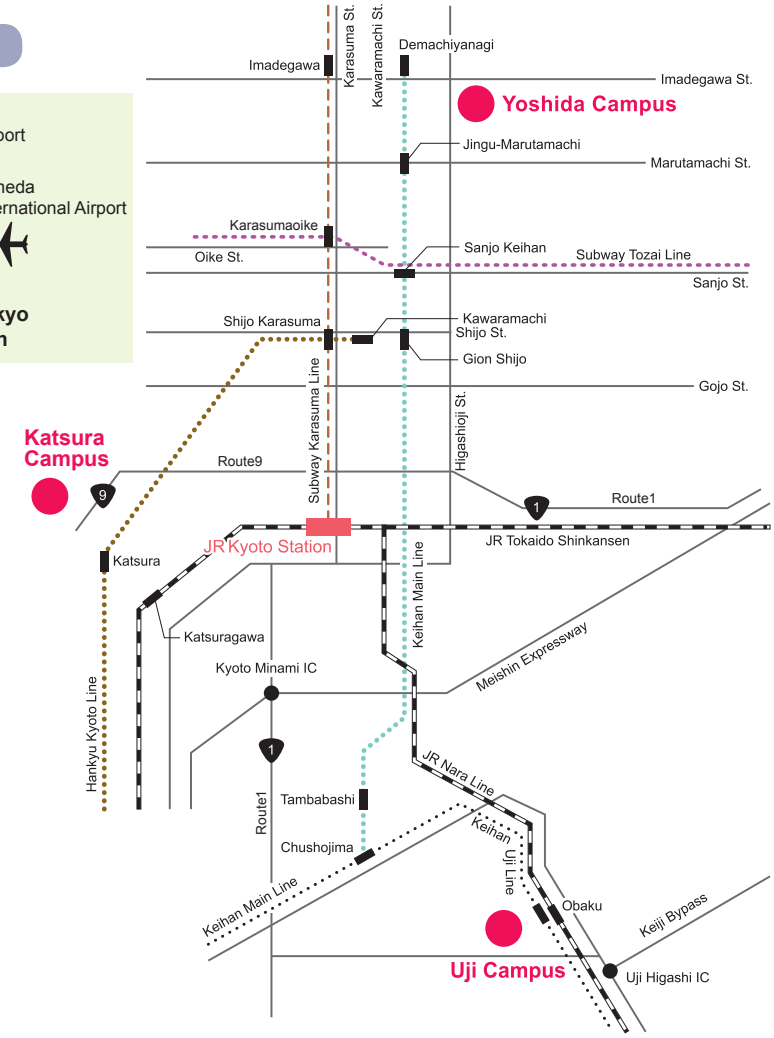
Japan Prize
- Makoto Nagao (2005)
- Masatoshi Takeichi (2005)

Kyoto Prize
- Chushiro Hayashi (1995)
- Kiyoshi Ito (1998)
- Alan Curtis Kay (2004)
- Isamu Akasaki (2009)
- Shinya Yamanaka (2010)

10. Campus Map

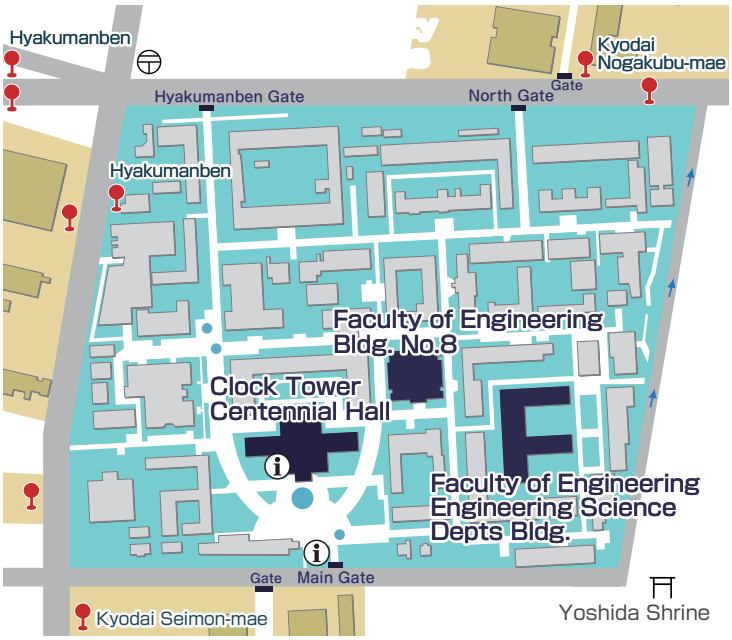
Access from International Airports





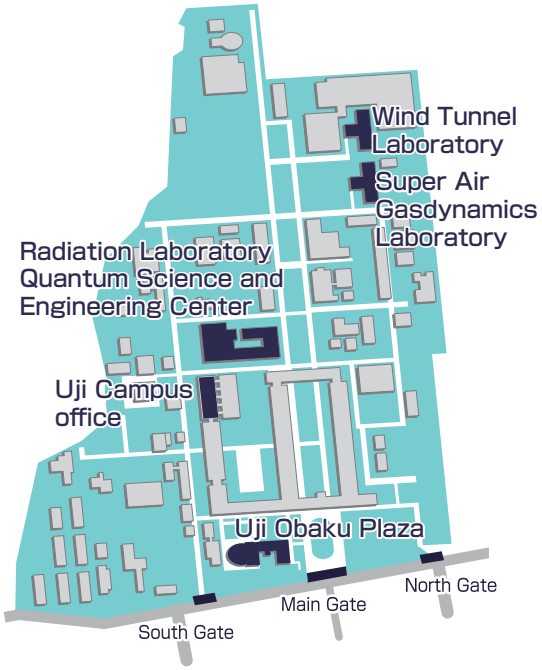
Kyoto University Yoshida Campus

Yoshida-Honmachi, Sakyo-ku, Kyoto 606-8501



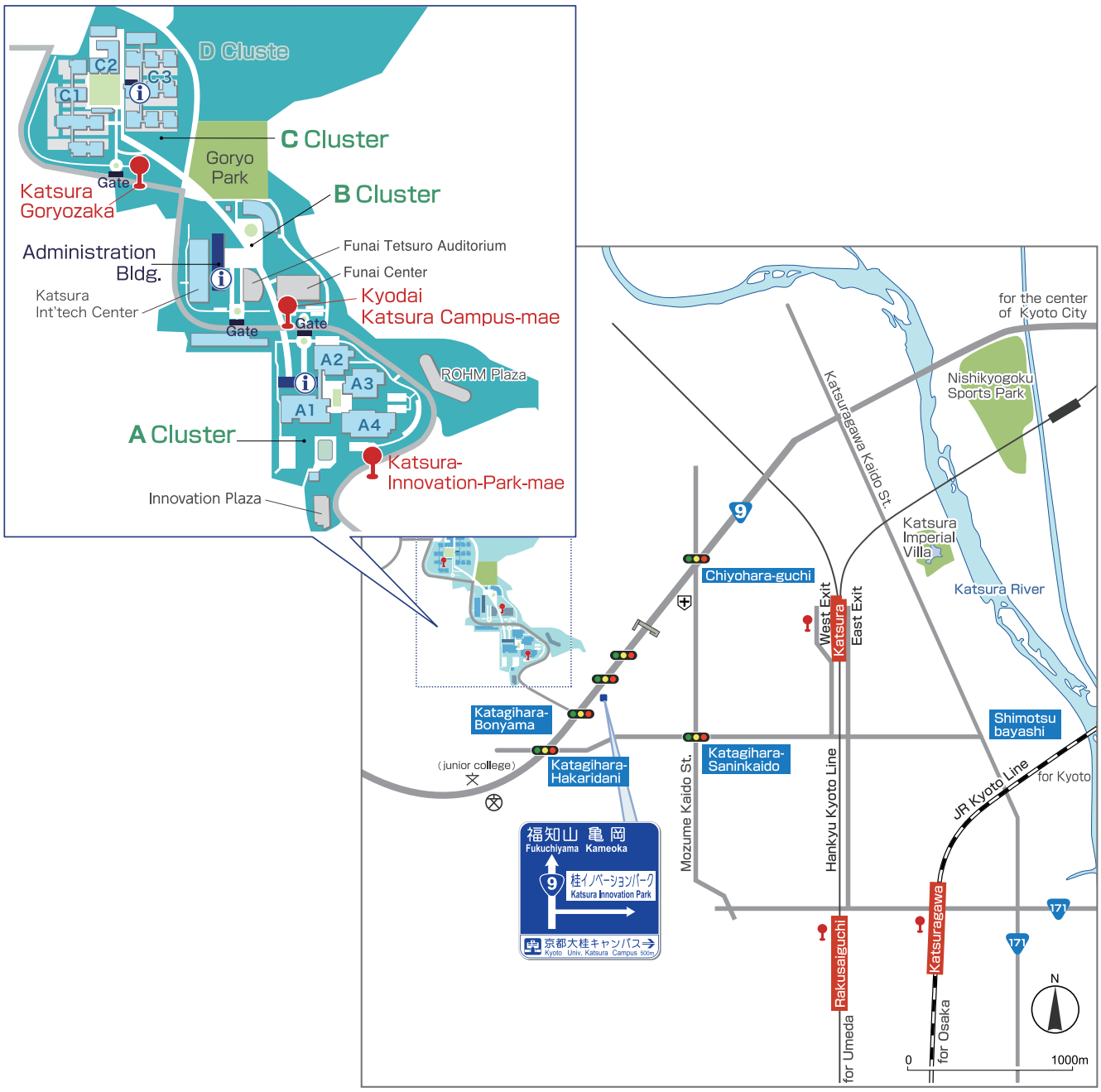
Kyoto University Uji Campus

Gokasho, Uji, Kyoto 611-0011

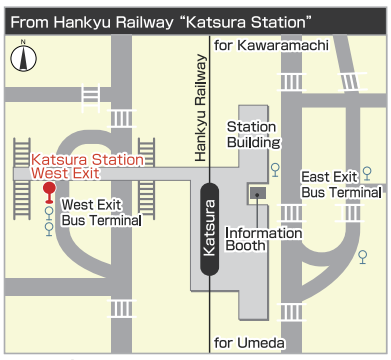


Kyoto University Katsura Campus

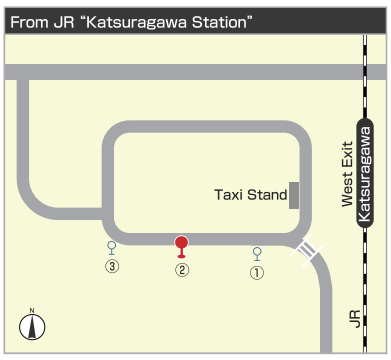
Kyoto daigaku-Katsura, Nishikyo-ku, Kyoto 615-8530



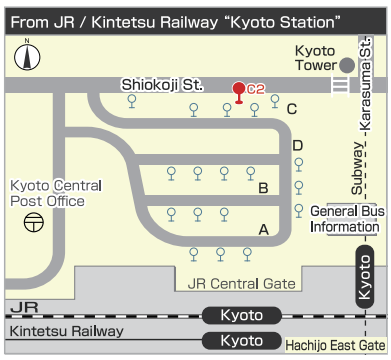
【 Bus Stop Information 】



Katsura Station West Exit
Bus Stop "Katsura Station West Exit"/ 1
City Bus West6(西6) "for Katsurazaka-Chuo"
Keihan Kyoto Bus No. 20·20B "for Katsurazaka-Chuo"



Katsuragawa Station West Exit
Bus Stop "Katsuragawa Station"/ 2
Yasaka Bus No.6 "for Katsurazaka-Chuo"



JR Kyoto Station JR Central Gate
Bus Stop "Kyoto Station Bus Terminal"/ C2
Keihan Kyoto Bus No. 21·21A "for Katsurazaka-Chuo"

KYOTO UNIVERSITY
Graduate School of Engineering
Faculty of Engineering
Outline 2018-2019

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