Tokyo
University of
Science

6-3-1 Niijuku, Katsushika-ku, Tokyo 125-8585 Japan
http://www.tus.ac.jp/

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Science

FACULTY OF ENGINEERING
GUIDE BOOK 2023

April 2023

Message from the Dean

Yukishige Kondo

Professor of Industrial Chemistry
Dean of Faculty of Engineering

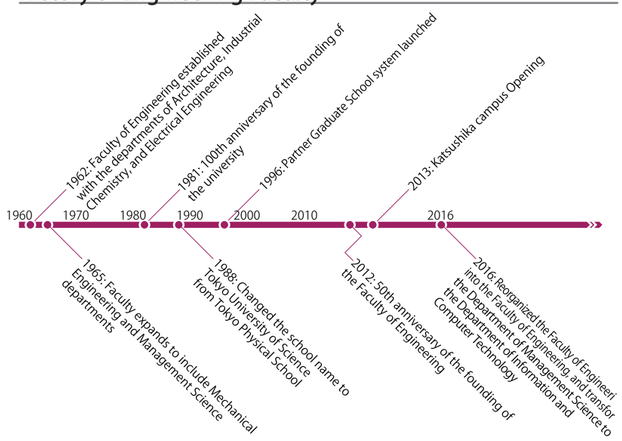
Development of human resources that work all around the world

The Faculty of Engineering was founded and started as three departments in 1962. At present, we have five departments (Architecture, Industrial Chemistry, Electrical Engineering, Information and Computer Technology and Mechanical Engineering) with an under graduate enrollment of over 2,000 students.

The aim of the Faculty of Engineering is to cultivate human resorces with leadership capabilities, who have mastered the education, techniques, and research methods necessary for employment in the field of engineering, who can interpret academic and practical issues from an interdisciplinary standpoint, and who are capable of resolving such issues. They will also possess sound judgment with regard to society and personal responsibility, and can contribute to cultural maintenance and development.

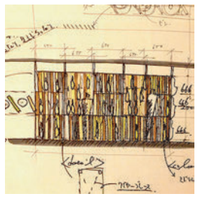
In order to achieve this objective, education in the Faculty of Engineering consists of studies regarding fundamental theories in various specialized science and technology fields through lectures, laboratories, discussions, and graduate-level research. Furthermore, rather than focusing only on science and technology, the faculty also offers instruction on widespread knowledge, common sense and ethics necessary for engineers. The faculty also provides general education to serve as a foundation for comprehensive judgment and decision-making abilities, and maximizes the environmental conditions of an urban campus to deliver inter disciplinary, international, and intellectually rigorous ideas.

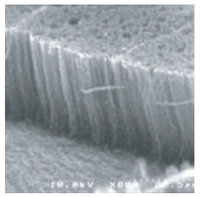
History of Engineering Faculty

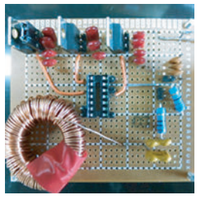


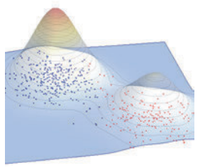
Departmental Outline

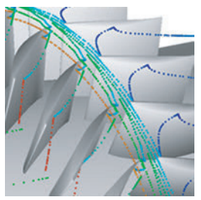
	Academic Programs	Keywords
ARCHITECTURE Katsushika Campus ▸p.03	• Design and Planning • Environment • Structural Engineering	Urban design and preservation; steel structures; building diversity; construction method; building structures; seismic engineering seismic isolation/damping; architecture of urban/living environments; wavelet analysis; thermal environment/air conditioning/ventilation
INDUSTRIAL CHEMISTRY Katsushika Campus ▸p.05	• Physical Chemistry • Chemical Engineering • Inorganic/Analytical Chemistry • Organic Chemistry • Hybrid Chemistry	Synthetic chemistry; power generation and storage devices; solar energy conversion; functional molecular catalysts; environmentally friendly processes; functional nanomaterials; high-sensitive chemical measurement; surfactant assembly; hybrid materials
ELECTRICAL ENGINEERING Katsushika Campus ▸p.07	• Communication and Information • Energy and Control • Material and Electronics	Signal processing; communication for a new generation of networks; image processing; human security; technology and robotics; intelligent control due to shape processing; power electronics; semiconductor optical devices; communication systems; communication signal processing technology
INFORMATION AND COMPUTER TECHNOLG Katsushika Campus ▸p.09	• Social design • Data science • Software design • Intelligent systems	Information media; Human communication; Data mining; Bioinformatics; Big data; Optimization; Information networks; Artificial Intelligence; High performance computing; Computer vision
MECHANICAL ENGINEERING Katsushika Campus ▸p.11	• Thermal and Fluid Dynamics • Material and Structural Mechanics • Intelligent Systems and Mechanical Dynamics • Manufacturing, Machine Design Tribology	Control of micro- and nano-fluidic systems; heat/thermal fluid simulation and vehicle dynamics; strength of generation; film material; thin-film technology; mechanical properties; damage evaluation; fluid engineering; robotics and mechatronics; sustainable tribology; destruction; fluid lubrication technology





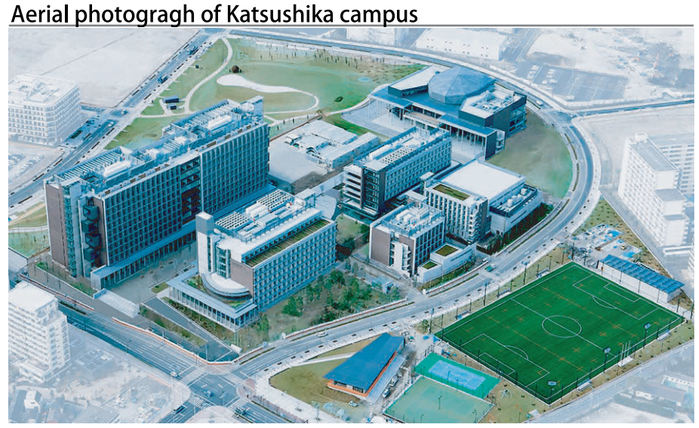






Campus MAP

Aerial photogragh of Katsushika campus



FACULTY OF ENGINEERING
DEPARTMENT OF ARCHITECTURE

Architecture plays a major role in all areas of human life

Principle of Department

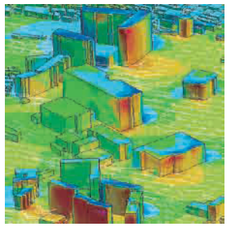
The Department of Architecture covers the following subject areas: urban history and culture, human environment, construction technology, and building safety. The department works to address both domestic and global issues by drawing on the most up-to-date research from the field of architecture. Our educational programs encourage students to acquire expert knowledge in all areas, including design, drawing, and IT literacy. Further, we offer students a number of services to assist them to achieve their educational and career goals, such as trans-grade presentations and discussions of architectural design, career education services where they can draw on the experiences of professional architects (including alumni members), regional research programs, and international exchange programs.The department is committed to developing students problem solving, communication, and administrative skills.
The Department of Architecture is divided into three sections , namely, Planning, Environment, and Structure Divisions. This allows students the opportunity to specialize in any of these areas while collaborating with the other disciplines in order to deepen their knowledge of architecture.

Section1: Design and Planning

Section1 provides various approaches to contemporary architecture and design by analyzing built environments in relation to human activities, thereby offering opportunities for professional development and advanced research. We address practical issues by creatively and intelligently integrating art, technology, and various research fields, including architectural design, city planning, urban spatial analysis, computation, building technology, and the history of architecture and cities.

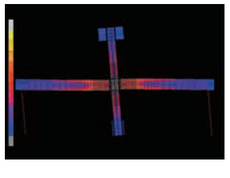
Section2: Environment

Indoor and outdoor microclimates are formed by building envelopes, mechanical equipment, and outdoor weather conditions. This section, the Environmental Division, explores methodologies for analyzing the impact of building design on indoor and outdoor environment through computer analysis and experiments. Additionally, we conduct research on innovative design to reduce energy consumption through ventilation, heating/cooling, and lighting equipment.



Section3: Structure

In Japan, many structures have experienced various types of natural and human disasters, such as earthquakes, typhoons, tsunamis, snow, fire, and vehicle attacks. The aim of the third section, the Structural Division, is to examine structures that exceed maximum safety requirements when subjected to external stress. To accomplish this, one must first understand the relevant structural characteristics and resistance mechanics, and then adopt the applicable structural systems and materials.



Section1: Design and Planning

Professor **Momoyo Gota**
Expertise: Architecture and Urban Planning
Research: Architectural/City Planning, Architectual Design
Major Topics: Mathmatical analysis of spatial forms in architecture and cities, survey and analysis of urban dwellings worldwide

Associate Professor **Madoka Kayanoki**
Expertise: History of Architecture, Preservation and Restoration of Architecture
Research: History of Modern Architecture
Major Topics: History of Modern Architecture in Japan and East Asia,

Associate Professor **Kaon Ko**
Expertise: Architectual Design
Research: Architectual Process, Craft, 1:1 Fabrication
Major Topics: Development of the architectual process through interactions between craftsmanship and industrialization

Assistant Professor **Soichiro Omura**
Expertise: Architectual Design
Research: Theory of Architectural Design
Major Topics: Architect: Kazuo Shinohara

Assistant Professor **Sota Adachi**
Expertise: Architectural Planning
Research: Transformation of Housing and Cities
Major Topics: Transformation process of coal mining cities

Professor **Taku Sakaushi**
Expertise: Architectural Design
Research: Architectural sociology, Architectural philosophy, Architectural aesthetics
Major Topics: Architect: Kazuo Shinohara, Teiichi Takahashi, Architectural firm: Nikken Sekkei, Design survey and field: Fujiyoshida city

Professor **Yoshihiro Hirotani**
Expertise: Architectural Design
Research: Implementation of architectural design, Architecture and art, Furniture design
Major Topics: Development of an approach and method to collaborate with creators in different areas, Urban living back to the soilConsultation and coordination of an art event

Associate Professor **Ryohei Kumagai**
Expertise: Building Construction
Research: Restoration/Rehabilitation, Housing Stock Management
Major Topics: Building construction and the restoration/ rehabilitation of modern architecture

Assistant Professor **Shingo Saito**
Expertise: Architectual Design and Theory
Research: Genetic and Generic Architecture
Major Topics: Archives of Modern Architecture

Assistant Professor **Aki Hayakawa**
Expertise: Architectural planning, Environmental Psychology
Research: Childcare facility planning, children's places
Major Topics: Architectural spaces that support children's independent activities. Self-care space for children.

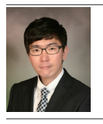
Section2: Environment

Professor **Takashi Kurabuchi**
Expertise: Building Environments, Building Equipment, Computational Fluid Dynamics
Research: Indoor Air Quality and Ventilation
Major Topics: The "sick house" problem, promoton of energy conservation in homes throgh ventilation

Professor **Toshihiro Nonaka**
Expertise: Environmental Engineering
Research: Natural Ventilation and Ventilative Cooling
Major Topics: Effective use of natural ventilation in densely populated areas

Assistant Professor **Kohei Terashima**
Expertise: Environmental Engineering
Research: Energy supply system for buildings using solar energy
Major Topics: Environmentally friendly energy supply system using PV/T(Photovoltaic/Thermal) solar panel

Professor **Tetsuo Nagai**
Expertise: Environmental Engineering
Research: Thermal Systems Involving Buildings and Air Conditioning Systems
Major Topics: Dynamic optimization of air conditioning operation controls using the heat capacity of the building frame



Assistant Professor **Jeongi Kim**
Expertise: Environmental
Research: Heating
Major Topics: Factor analysis of Heating and Colling energy consumption

Section3: Structure

Professor **Osamu Takahashi**
Expertise: Structual Design and Engineering
Research: OIL-DAMPER BRACE for Construction First in the World
Major Topics: Development of base-isolation device with high performance and small size

Professor **Takumi Ito**
Expertise: Structual Engineering
Research: Steel Structures, Structual Resilience
Major Topics: Structual resilience of steel and hybrid structures when exposed to severe natural/manmade disasters.

Assistant Professor **E Ridengaoqier**
Expertise: Structual Engineering
Research: Concrete Engineering, Earthquake Engineering
Major Topics: Quality evaluation of pervious concrete

Assistant Professor **Natsuhiko Sakiyama**
Expertise: Structual Engineering
Research: Steel Structure, Structural Health Monitoring
Major Topics: Structural health monitoring with IoT devices using energy harvesting technology

Professor **Keiichi Imamoto**
Expertise: Building Materials Engineering
Research: Concrete engineering, Reinforced concrete, Timber engineering
Major Topics: Conservation of RC Buildings, Recycling of Building Materials,

Associate Professor **Masaki Kato**
Expertise: Structural Engineering
Research: Fire Resistance Performance, Seismic Performance
Major Topics: Redundancy of Structural Frame in Fire. Repairing and Reinforcing Method after Fire/Earthquake.

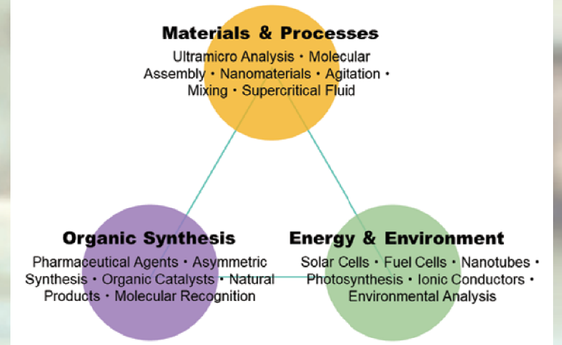
Assistant Professor **Yinli Chen**
Expertise: Structural Engineering
Research: Active Structural Control, Base isolation
Major Topics: Vibration Control and Response Estimation of high-rise base-Is with Active Structural Control

Field of Key Engineering

Professor **Makoto Yamakawa**
Expertise: Structural Engineering, Applied Mathmatics for Architecture
Research: Applied Mechanics, Structural Optimization
Major Topics: Structural design methods based on mechanics and mathmatical analysis

FACULTY OF ENGINEERING
DEPARTMENT OF INDUSTRIAL CHEMISTRY

Chemistry is ubiquitous.



Departmental Aim

Mission

Industrial chemistry covers a wide range of chemistry applications, such as the production and development of substances and materials, waste product treatment, energy conversion, and environmental analysis. The department strongly encourages young students to become expert researchers and engineers. Our curriculum supports this goal by placing a premium on chemistry practices, experiments, and cutting-edge research activities.

“Industrial Chemistry Is Fun!”

Look around you: You will notice that all products, including electronic devices, automobiles, food, cosmetics, clothes, and medicines, are produced using chemicals. Industrial chemistry pursues the development of substances that enrich our daily lives and investigates safe and efficient processes to produce these useful substances. In addition, the discipline addresses global warming and environmental pollution issues. In light of these attributes, industrial chemistry is essential for the construction of sustainable societies. In this department, we conduct educational and research activities as part of a fulfilling curriculum to cultivate experts who can respond to these social demands.

Physical Chemistry Division

The division investigates the synthesis and properties of substances through physical chemistry techniques and methods, thermodynamics, and equipment measurements. The division consists of three research groups: the Kondo, Kawai, and Imura groups. The Kondo group has been pursuing the solution properties and self-assemblies of functional surfactants, particularly fluorinated surfactants, and stimuli-responsive surfactants. Meanwhile, the Kawai group has diligently investigated the fabrication and manipulation of nanomaterials, including metal nanoparticles, nanowires, and nanorods. The Imura group has conducted the fabrication and catalytic application of anisotropic metal nanocrystals.

Chemical Engineering Division

Chemical engineering applies physicochemical and biological knowledge to the production of materials for current and future needs using mathematical methods. The two research groups in this division, the Otake and Shono groups, have focused their studies on the development of a new field of reaction for the effective production of such materials. Studies range from pure materials science to the engineering aspects of production processes.

Inorganic/Analytical Chemistry Division

The two research groups in this division, the Kunimura and Tanaka groups, conduct education and research in the field of inorganic and analytical chemistry. The Kunimura group mainly conducts research on the development of analytical X-ray techniques using a weak X-ray source and corresponding applications. The Tanaka group’s research activities focus on the development of electricity generation and storage devices, such as fuel and secondary cells.

Organic Chemistry Division

This division researches and develops organic chemistry at the molecular level, to facilitate, control, and make safe the syntheses and reactions of organic compounds. The division consists of two research groups, led by Dr. Imahori and Dr. Sugimoto. Imahori’s group has developed technologies for switching and controlling chemical reactions by applying stimuli-responsive catalysts. Sugimoto’s group is currently investigating the chemical fixation of CO_2 into useful organic chemicals and polymeric materials, as wellas well as the exploitation of effective catalysts for organic reactions.

Hybrid Chemistry Division

This division investigates the preparation of functional materials using both organic and inorganic components, as well as the hybridization of theoretical and technological findings of studies in physical, organic, and inorganic chemistry. The division consists of three research groups: Hashizume group, Nagata group and Uetani group. The Hashizume group has engaged in the preparation of organic-inorganic hybrid materials for use in biomedical or surface coating applications, with a focus on the design of hybrid interfaces. The Nagata group has thoroughly investigated the utilization of solar energy, such as the fabrication of organic solar cells with light-harvesting dyes, and systems that extract hydrogen from water using photocatalysts based on artificial photosynthesis. The Uetani group focuses on developing highly functional materials using nanocellulose extracted from biomass.

Physical Chemistry Division

Professor **Takeshi Kawai**
Division: Physical Chemistory
Research: Colloid and Interface Science
Major Topics: Fabrication, characterization, and surface modification of nanomaterials and their applications

Professor **Yukishige Kondo**
Division: Physical Chemistory
Research: Colloid, Soft Nanoparticles
Major Topics: Synthesis and solution properties of novel funtional surfactants

Associate Professor **Yoshihiro Imura**
Division: Physical Chemistory
Research: Colloids, Nanomatirials
Major Topics: Fabrication and catalytic application of metal nanocrystals

Assistant Professor **Shiho Yada**
Division: Physical Chemistory
Research: Colloid and surface chemistry
Major Topics: Solution properties and nanostructure of moleccular assembles

Chemical Engineering Division

Professor **Katsuo Otake**
Division: Chemical Engineering
Research: Chemical Engineering
Major Topics: Chemical engineering, supercritical fluid, and polymer processing

Professor **Atsushi Shono**
Division: Chemical Engineering
Research: Mass Transfer Operation, Reaction Engineering, Mixing
Major Topics: Structual control of fine particles, dehydrogeneration of organi hydrates, and fluid dynamics of two immiscible liquids in micro-c channels

Jr. Associate Professor **Hiroaki Matsukawa**
Division: Chemical Engineering
Research: Physical properties
Major Topics: Phase equilibrium, thermodynamic equation of state, and supercritical fluid

Assistant Professor **Yuya Murakami**
Division: Chemical Engineering
Research: Materiaal Engineering
Major Topics: Nanoparticles, Fluid dynamics

Inorganic/Analytical Chemistry Division

Associate Professor **Yumi Tanaka**
Division: Inorganic/Analytical Chemistry
Research: Ionic Conductors, Ceramics
Major Topics: Development of energy-conversion materials based on inorganic and solid-state chemistory

Associate Professor **Shinsuke Kunimura**
Division: Inorganic/Analytical Chemistry
Research: X-ray Spectrometry
Major Topics: Development of highly sensitive X-ray spectrometric methods using a low-power X-ray source

Assistant Professor **Suguru Iwasaki**
Division: Inorganic/Analytical Chemistry
Research: Functional materials, Materials Science
Major Topics: Design of functional materials via solid-state diffusion

Organic Chemistry Division

Professor **Hiroshi Sugimoto**
Division: Organic Chemistry
Research: Polymer Synthetic Chemistry, Organic Synthetic Chemistry
Major Topics: Chemical fixation of carbon dioxide, and design and utilization of functional molecules with molecular chirality

Associate Professor **Tatsushi Imahori**
Division: Organic Chemistry
Research: Organic Synthetic Chemistry
Major Topics: Development of stimuli-responsive molecular catalysts and their applications to sustainable chemical transformations

Assistant Professor **Masayoshi Honda**
Division: Organic Chemistry
Research: Polymer Synthetic Chemistry, Heterogeneous Catalysts
Major Topics: Chemical fixation of carbon dioxide, and synthesis of biomass derived monomers

Hybrid Chemistry Division

Professor **Mineo Hashizume**
Division: Hybrid Chemistry
Research: Organic-inorganic Hybrid Materials
Major Topics: Design and fabrication of organic-inorganic hybrid interfaces at the molecular level

Associate Professor **Morio Nagata**
Division: Hybrid Chemistry
Research: Solar Energy Conversion Chemistry
Major Topics: Development of solar energy utilization technologies, such as organic solar cells and artificial photosynthesis

Jr. Associate Professor **Kojiro Uetani**
Division: Hybrid Chemistry
Research: Cellulose Nanomaterials, Polymer Composites
Major Topics: Design of Nanocellulose-based functional materials

Assistant Professor **Takuya Sagawa**
Division: Hybrid Chemistry, Catalystic Chemistry
Research: Hybrid Materials, Biomass COnversion and Biorefinery
Major Topics: Development of spolymer-based hybrid materials

FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING

Technological innovations for human happiness

Departmental Aim

The Department of Electrical Engineering, Faculty of Engineering, is composed of three fields: Communication and Information, Energy and Control, and Material and Electronics. All three divisions are involved in the latest research related to electrical, electronic, and information engineering. The Department offers undergraduate program as well as graduate programs in support of M.S. and Ph.D. degrees. Currently, almost 80% of undergraduate students who study in the Department continue on to pursue their M.S. and engage in further research. The Department consists of 12 research groups, including 19 teaching and research faculty members, who supervise about 550 undergraduate and graduate students in the department.

Communication and Information Division

Communication and information technology has become an indispensable part of human lives, owing to the rapid propagation of cellular phonesand the Internet. Further, these technologies are continuously evolving because of advances in communications technology, such as terrestrial digital broadcasting, CDMA (Code Division Multiple Access) and OFDM (Orthog onal Frequency - Division Multiplexing). People often want to securely send a variety of information, such as audio or video data, to people who live far away. Many steps must be completed to accomplish such transmission, which means there are many opportunities for improvement. How can we improve communications technology to allow people to connect to remote locations whenever they want? How do we create a method for detecting and correcting errors in communication systems? How can we ensure information security? Further, the compression of massive amounts of digital information on computers is one of the principal challenges of our research. As analyses, syntheses, and recognition have made the greatest contribution to progress in the audio and video fields, further improvement can be expected by merging LSI (Large Scale Integration) technology.

Energy and Control Division

The Division focuses on two main categories of study: energy and control engineering. Electricity is clean energy; however,countermeasures related to electricity generation, transmission, and accumulation have become important issues. As such, this section of the Division mainly conducts studies on electricity generation, individual electricity sales, and effective power plant operations to reduce energy waste at the electricity generation stage. In contrast, intelligent computerized controlling is in high demand by industries dealing with robotic and vehicle systems. We mainly conduct studies of robots' autonomous motion and flight through automatically captured environmental information and the development of close communication between robots and humans.

Material and Electronics Division

This field aims to discover and create new materials, and develop new electrical and optical technology from their use. The D ivision has two categories: devices and systems. Studies of devices mainly align with the following themes: 1) Analysis, design, and prototyping of various high-frequency circuits constructed from micro-wave diodes and transistors, and 2) creation of bulk crystals and thin-film single crystals for compound semiconductors used in various optics devices, and the estimation of their electric and optical properties. Studies of systems mainly align with the following themes: 1) Creation of high-repetition ultra-short fiber lasers, which are required to construct advanced photonic networks, and 2) development of ultra-high-speed optoelectronic information transfer and processing systems.

Communication and Information Division

Professor **Takayuki Hamamoto**

Expertise: Image Engineering, Semiconductor Engineering
Research: Intelligent Image Sensing and Processing, Computer Vision
Major Topics: Computational image sensors and their application in image processing and recognition systems

Professor **Takahiro Yoshida**

Expertise: Sensing Signal Processing, Electromagnetic Compatibility, Electrostatics, Biometrics
Research: Audio/image/Biomedical Signal Processing, Electroacoustics, Electrostatic Discharge, Biometrics
Major Topics: High-resolution Audio Measurement/Analysis, EMC on Electrical Audio/Wearable Device, Sleep Stage Detection, Edge-AI for IoT, System-level ESD, Biometric Authentication

Associate Professor **Kazuki Maruta**

Expertise: Communication Engineering
Research: Wireless Communication, Digital Signal Processing
Major Topics: MIMO Systems, Adaptive Array Signal Processing

Assistant Professor **Maki Arai**

Expertise: Communication Engineering
Research: Wireless Communication, Antennas and Propagation
Major Topics: MIMO Systems and Antennas, Millimeter-wave Transmission

Professor **Mikio Hasegawa**

Expertise: Communication Systems, Nolinear Sciences, Optimization
Research: Cognitive Radio Networks, Chaos and NonlinearSystems
Major Topics: Optimization of radio resource usage; Computing using chaos; Communications using nonlinear dynamic system theories

Associate Professor **Shunichi Sato**

Expertise: Image Engineering
Research: Image Information Processing, Computer vision
Major Topics: Multi-view image processing, Wavefront coding

Jr. Associate Professor **Yoshihiro Maeda**

Expertise: Image Engineering
Research: Image Processing, High-Performance Computing
Major Topics: Parallel image processing, real-time image processing

Energy and Control Division

Professor **Hirotaka Koizumi**

Expertise: Power Electronics
Research: Resonant Power Converters, PV Inverters, Energy Harvesting
Major Topics: Development and analysis of power electronic circuits

Professor **Osamu Sakata**

Expertise: Medical Engineering, Agricultural Engineering
Research: Biomedical Signal/Image Processing, Intelligent Sesing & Control
Major Topics: Medical diagnostic equipment; Intelligent agriculture system; Foodnproduct design baseed on electronics

Professor **Masayoshi Wada**

Expertise: Robotics, Mechatronics, Measurement and Control
Research: Intelligent mechanics / Mechanical systems Power engineering / Power conversion / Electric machinery Control engineering / System engineering
Major Topics: Active-caster omnidirectional mobile robots joystick car drive system Electric vehicle

Assistant Professor **Yusuke Yamanoi**

Expertise: Mechanical Engineering and Intelligent Systems
Research: Cybernetic Devices, Medical and Welfare Devices, Human–Machine Interface
Major Topics: Myoelectric Hand, Functional Electrical Stimulation, Human Augmentation, Biomedical Signal Recognition

Professor **Yuzuru Ueda**

Expertise: Power and Energy Engineering
Research: Renewable Energy Integration, photovoltaic Systems
Major Topics: Photovoltaic systemanalysis; Demand-side energy management

Professor **Nobuyuki Yamaguchi**

Expertise: Power Systems Engineering and Applied Economics
Research: Optimal Power Flow, Wide Area Monitoring and Control, Demand Response, Electricity Market
Major Topics: Smart grid and electricity system reform

Assistant Professor **Jindan Cui**

Expertise: Energy management system(EMS)
Research: Solar power system, Storage battery optimal operation, reserve power of PV generation and supply and demand balance
Major Topics: Headroom control and battery operation for solar power plant. Zoning wheeling charge systems.

Assistant Professor **Kenta Nagano**

Expertise: Robotics, Mechatronics
Research: Control, Actuators
Major Topics: Wheel/legged mobile robots, Actuators with high back-drivability

Material and Electronics Division

Professor **Takayuki Kawahara**

Expertise: Electronic Circuits/Device Engineering
Research: Sustainable/Intelligent Processing Electronics
Major Topics: Artificial intelligence (AI) circuits (Ising machine), Sensor information AI processing, Spintronics (AI logic, memory), Quantum computer (quantum computation method)

Associate Professor **Yutaka Fukuchi**

Expertise: Optical engineering
Research: Nonlinear optics and their applications
Major Topics: Optical communication; Fiber laser; Optical signal processing

Professor **Shizutoshi Ando**

Expertise: Electrical and electronic materials engineering
Research: Energy conversion materials, Thin-film solar cells, Wavelength
Major Topics: Development of thin-film solar cells without Si and improvement of their conversion efficiency

Assistant Professor **Daiki Shiratori**

Expertise: Applied Quantum Physics, Photonics
Research: Ionizing radiation induced luminescence materials, Phosphors
Major Topics: Development of heavy element based glass scintillators and radio-photoluminescence materials

FACULTY OF ENGINEERING
DEPARTMENT OF INFORMATION AND COMPUTER TECHNOLOGY

Information for tomorrow

Departmental Aim

Information engineering is indispensable for the realization and evolvement of a fertile human society. In this Department, we aim to develop new principles and techniques to aid the creation, communication, and processing of diverse media information. In doing so, our ultimate goal is to contribute to the establishment of a bountiful future society, as well as the building of a firm foundation that enables nature, people and society to prosper in harmony.

We combine various technologies from such fields as networking, software development, and mathematics, to create information systems that efficiently support human activities and help in the building of a safe and secure society. To more effectively do so, we classify our studies into four streams: Social Design, Data Science, Software Design, and Intelligent Systems. These streams form the pillars of our research and education.

General Education Program

We provide an educational program that enables students to acquire a wide field of view as well as specialized knowledge. We aim to nurture a firm foundation in information engineering techniques, as well as abilities to grasp both physical and mathematical aspects of objects. Up to the third year, the comprehensive professional education program offers courses that enable students to acquire well - balanced knowledge of the four streams, cultivating skills in developing creative systems and problem -solving. In the final year, students choose one of the laboratories, in which they conduct specialized research for their graduation. This allows them to cultivate an academic foundation to become technology specialists with richness of spirit, who can truly contribute to society.

Social Design Division

This Section is mostly concerned with designing systems from the vantage of social engineering. Social systems related to education, product distribution, medicine and health, aging issues and disaster relief are the main focus, and the enrichment of information media for efficient communication, as well as the creation of new business models are the important issues to be treated.

Data Science Division

The Data Science Division focuses on the effective use of statistics to deal with natural and social phenomena surrounded by uncertainties. Techniques for dealing with big data, data mining, medical statistics, bioinformatics, and financial econometrics, that is, methods that treat data in a scientific manner, are the main areas of research.

Software Design Division

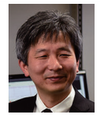
This Section is oriented toward the founding of highly secure, high performance information networks which can support our increasingly diverse information society. Main research areas include distributed processing, cloud techniques, user interfaces and algorithm design.

Intelligent Systems Division

The Intelligent Systems Division is mainly concerned with the design of human-friendly systems possessing intelligence. Main areas of research are development of intelligent robots and software, signal processing of biometric information, as well as the creation of novel media techniques.

Social Design

Professor **Takako Akakura**
Expertise: Educational Technology
Research: e-Learning, e-testing
Major Topics: Development of e-learning systems; Authentication of examinees on e-testing



Professor **Yukinobu Taniguchi**
Expertise: Information Technology
Research: Visual Media Processing
Major Topics: Image/video content analysis and its applications; Automatic video indexing systems for efficient search

Data Science

Professor **Takashi Sozu**
Expertise: Biostatistics
Research: Biostatistical Methodology
Major Topics: Design and analysis of clinical trials; Alternatives to animal experiments

Associate Professor **Tomohiko Shinozaki**
Expertise: Biostatistics
Research: Statistical casual inference
Major Topics: Adjustment for time-varying confounding; Dynamic treatment regimes

Associate Professor **Go Irie**
Expertise: Computer Science, Media Information Processing
Research: Pattern Recognition, Machine Learning, Media Understanding
Major Topics: Audiovisual object and scene understanding; Open Set and Open World recognition; Multimedia applications

Software Design

Professor **Hiroyuki Yashima**
Expertise: Telecommunications
Research: Construction of Reliable Communication Systems
Major Topics: Design of optical code division multiplex systems and error-correcting codes

Associate Professor **Masaya Fujisawa**
Expertise: Communication/Network Engineering
Research: Coding Theory, Information Security
Major Topics: Algebraic codes; digital signatures; secure computation

Associate Professor **Yoshiko Ikebe**
Expertise: Mathmatical Programming
Research: Discrete Optimization
Major Topics: Stability in supply chain networks

Jr. Associate Professor **Yuya Okadome**
Expertise: Intelligent Robotics
Research: Behavior modeling, motion planning
Major Topics: Motion/gesture generation; Human-robot interaction; Data Collection

Assistant Professor **Ahmad Akmal Aminuddin**
Expertise: Computer Science
Research: Information Security; Cyptography
Major Topics: Security and privacy in cloud computing; Big date security; Secure computation; Searchable encryption

Assistant Professor **Yuki Nishida**
Expertise: Discrete mathmatics
Research: Combinatorial optimization
Major Topics: Optimization in max-plus algebra; Matching theory

Intelligent Systems

Professor **Kozo Fujii**
Expertise: Computational Mechanics, Aerospace Engineering
Research: Computational Fluid Dynamics, Numerical Algorithms
Major Topics: Wide area of CFD applications; Plasma actuators; Noise reduction; Design exploration

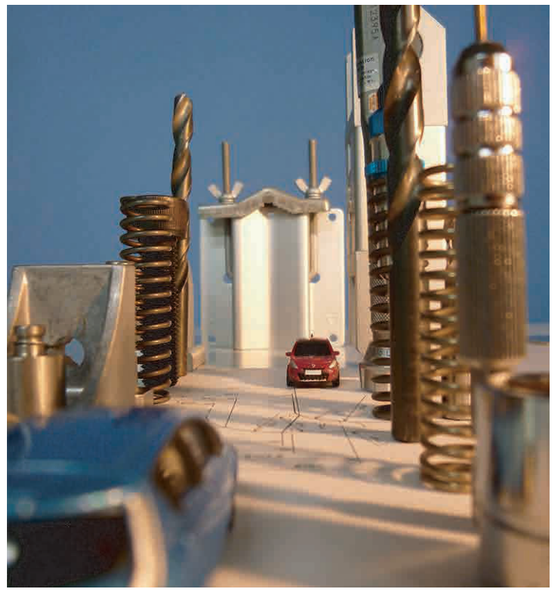
Professor **Toru Ikeguchi**
Expertise: Mathmatical Engineering
Research: Nonlinear Dynamical Systems and Chaos
Major Topics: Nonlinear time series analysis, Complex networks, Neuroscience

Associate Professor **Kazuaki Nakamura**
Expertise: Perceptual information processing
Research: Pattern recognition, Machine learning, Artificial intelligence
Major Topics: Image recognition and generation, Multimedia security, Attacks on AI systems and their defens

Associate Professor **Tomoaki Tatsukawa**
Expertise: Design Exploration
Research: Evolutionary Computation
Major Topics: Algorithms for multi-and many-objective optimization

Assistant Professor **Takeru Aoki**
Expertise: Computational Intelligence
Research: Time-series Forecasting
Major Topics: Time-series Forecasting Algorithms

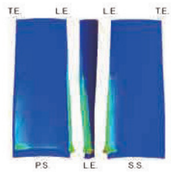
Engineering for a sustainable society

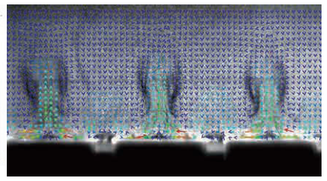


Departmental Aim

Mechanical engineering encompasses a broad range of knowledge and technology for the analysis, design, manufacture, and maintenance of various industrial products and mechanical systems, including vehicles, airplanes, robots, computers, power plants, and petroleum refineries. Research activities in the Department can be divided into four core sections: thermal and fluid engineering; material and structural mechanics; intelligent systems and mechanical dynamics; and manufacturing, machine design, and tribology. By focusing on a distinct theme, students can contribute to future scientific and technological advancements, and assist in the development of industries that contribute to a sustainable society. The objective of the Department's educational program is to develop students with sophisticated engineering skills who can lead in advancing science and technology, and who can creatively, confidently, and responsibly address the full range of society's problems.

Thermal and Fluid Engineering Division



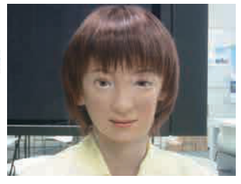


The Division aims to clarify the physics of heat/mass transfer and fluid flow, and to develop advanced knowledge and new machines based on these physics. The research area covers a wide variety of engineering systems, such as aircraft, cars, power generation plants, and medical devices.

Material and Structural Mechanics Division

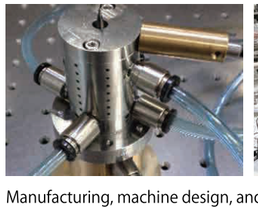
Fracture and structural mechanics are used to devise essential solutions for designing and manufacturing components of machines and structures. The Division is active in both domestic and international societies and has been working diligently to solve various problems related to machine and structure integrity and sustainability. The research topics cover a wide range of strength-of-materials issues in fields such as engineering, medical science, and environmental engineering.

Intelligent Systems and Mechanical Dynamics Division



Motion is essential for human life. In turn, the quality of human life can be improved by controlling the motion and dynamics of humans and machinery. The Intelligent Systems and Mechanical Dynamics Division researches motion-related areas, such as robot and automobile sensors modeling, dynamics, and control, with the aim of enhancing human comfort and convenience.

Manufacturing, Machine Design and Tribology Division



Manufacturing, machine design, and tribology play an important role in the sustainable development of industrial products. Research topics in the Division range from physical and chemical phenomena that occur at the interface of machine elements, to practical investigations of such areas as industrial product design and manufacturing.

Thermal and Fluid Engineering Division

Professor **Makoto Yamamoto**
Expertise: Computational Fluied Engineering
Research: Multi-physics CFD Simulation, Gas Turbines
Major Topics: Numerical simulations of icing, erosion, and deposition phenomena in jet engines

Professor **Hitoshi Ishikawa**
Expertise: Fluied Mechanics
Research: Bluff Body Aerodynamics, Flow Control, Turbulence
Major Topics: Control of flow separation, vortex structure in the wake, flow around live treess

Professor **Hiroshi Gotoda**
Expertise: Thermal Engineering
Research: Combustion Dynamics, Dynamical Systems Theory, Complex Networks Theory
Major Topics: Numerical simulations of icing, erosion, and deposition phenomena in jet engines

Professor **Masahiro Motosuke**
Expertise: Thermal Engineering
Research: Micro/nanoscale Thermofluied Science, Microfluidics, BioMEMS
Major Topics: Lab-on-a-chip technology, nanoparticle handling and sensing, advanced optical sensing of transport phenomena at the interface

Assistant Professor **Yoshiyasu Ichikawa**
Expertise: Thermal and Fluied Engineering
Research: Flow Control and Measurement, Microfluidics, Aerodynamics, Heat Transfer
Major Topics: Complex fluid structure measurement and control in multi-scale flow phenomena from microchannels to airplane

Assistant Professor **Yusuke Nabae**
Expertise: Fluid Mechanics
Research: Wall turbulence, Computational Fluid Dynamics, Flow control
Major Topics: Turbulence control, direct numerical simulation, and large-eddy simulation

Assistant Professor **Soichiro Fujimura**
Expertise: Fluid and Biomedical Engineering
Research: Computational Fluid Dynamics, Geometrical and Imaging Analysis
Major Topics: Blood flow simulation and machine learning model to predict or analyze pathomechanism and surgical planning of aneurysm

Assistant Professor **Yu Nishio**
Expertise: Fluid Mechanics
Research: Flow Instability, Turbulent Flows, Unsteady Aerodynamics
Major Topics: Leading edge receptivity, boundary layer transition, and aerodynamic gust loads on small aircraft wings

Material and Structural Mechanics Division

Professor **Masayuki Arai**
Expertise: Material Mechanics
Research: Solid Mechanics, Damage Mechanics, Interfacial Fracture Mechanics
Major Topics: Reliability evaluation and repair techniques for damaged structure

Professor **Kuniharu Ushijima**
Expertise: Fluied Mechanics
Research: Bluff Body Aerodynamics, Flow Control, Turbulence
Major Topics: Control of flow separation, vortex structure in the wake, flow around live treess

Assosiatte Professor **Ryo Inoue**
Expertise: Structural materials, Fracture mechanics, Experimental mechanics
Research: Advanced composite materials, Fracture mechanics, Optical measurement
Major Topics: Fabrication and reliability evaluation of composites, Microstructure and mechanical properties of structual materials, Mesurement system at high templature

Assistant Professor **Yuxian Meng**
Expertise: Material Strength
Research: Additive manufacturing, Surface modification
Major Topics: Laser metal deposition, Repair techniques for damaged structures, Coatings

Intelligent Systems and Mechanical Dynamics Division

Professor **Hiroshi Kobayashi**
Expertise: Mechatronics and Robotics
Research: Real-world Human Support Systems, Image Processing
Major Topics: Muscle suits, active walker, intelligent image cognition, and human-robot communication

Associate Professor **Ryuzo Hayashi**
Expertise: Material Dynamics, Control
Research: Vehicle Control, Driver Assistance Systems
Major Topics: Collision avoidance by autonomous steering

Associate Professor **Takuya Hashimoto**
Expertise: Mechatronics and Robotics
Research: Human-Robot Interaction, Biomechanics
Major Topics: Communication robots, medical diagnosis support systems, and training and rehabilitation systems

Assistant Professor **Kenta Matsumoto**
Expertise: Mechatronics and Robotics
Research: Biomechanics, Wearable Device
Major Topics: Analysis off golf swing, measurement of human motion mechanical simulation of elastic deformation

Assistant Professor **Keisuke Kitano**
Expertise: Mechatronics and Robotics
Research: Biomechanics, Sensor-fusion
Major Topics: Measurement and analysis of hand and human motion in daily life, work, sports and rehabilitation.

Manufacturing, Machine Design and Tribology Division

Professor **Shinya Sasaki**
Expertise: Surface Engineering
Research: Tribology, Surface Modification, Mechanical Design
Major Topics: Surface texturing for improving tribological properties, ionic liquids as novel lubricants, and measurement of nano-mechanical properties

Associate Professor **Masaaki Miyatake**
Expertise: Precision Engineering, Tribology
Research: Fluid-lubricated Bearings, Non-contact Handling Devices
Major Topics: High-speed air-lubricated spindles for machine tools

Assistant Professor **Kaisei Sato**
Expertise: Surface Engineering
Research: Tribo-chemical reaction, Mechanochemistry, Atomic force microscopy
Major Topics: In-situ observation of reaction film on friction interface using atomic force microscopy