

# School of Engineering



東京工業大学  
Tokyo Institute of Technology



# School of Engineering

— Creating new industries and advancing civilization —

Engineering contributes to civilization – the framework that guarantees the happiness of human being – and creates technologies that make human lives richer and more comfortable.

## • Message from the Dean •



The School of Engineering is the largest educational and research organization in Tokyo Institute of Technology with more than 200 faculty members from five different research fields of engineering: Mechanical Engineering, Systems and Control Engineering, Electrical and Electronic Engineering, Information and Communications Engineering, and Industrial Engineering and Economics, which are considered as the core fields of engineering. Through the innovative educational curricula established by the educational reform in 2016, we are fostering creative engineers, researchers, and educators who can play an active role globally, and promote world-class research activities. This booklet introduces the wide range of research fields in the

School of Engineering, and lists the research topics of each faculty member.

In order to meet the needs of society, the research fields of the departments are first divided into some research groups, and then the research groups are divided into research subgroups consisting of a small number of faculty members. These research subgroups focus on specialized research areas. In addition to this classification, there are three interdisciplinary research groups, the Smart Power Grid Group, the Integrated IoT Technology Group, and the Human Centric Group in order to respond to global research issues, such as the SDGs. These interdisciplinary research groups are composed of faculty members of related departments. Through this research organization, we will promote not only human resource development in each research group and creative research by faculty members, but also research collaborations between industry and academia, as well as international joint research with some of the world's top universities and corporations.

We hope that you will look forward to the education and research of the School of Engineering that will contribute to our future society.

**Tomohiko UYEMATSU**  
Dean, School of Engineering

## Steering Committee

Hideaki FUJITA, Associate Dean for Education

Kotaro INOUE, Associate Dean for Finance and Campus Management

Tetsuya SUEKANE, Associate Dean for Planning and Safety

Daisuke KURABAYASHI, Associate Dean for Research, International Affairs, and Public Relations

Masahiro YAMAGUCHI, Associate Dean for General Affairs and Human Resources



# Departments and Research Groups in School of Engineering

Department	Graduate Major	Group	Field
Mechanical Engineering	Mechanical Engineering Energy Science and Engineering* Engineering Sciences and Design* Human Centered Science and Biomedical Engineering* Nuclear Engineering *	Thermo-fluid	Energy Engineering, Power and Propulsion Engineering, Environmental Thermo-fluid Engineering
		Materials and Processing	Advanced Production Engineering, Advanced Functional Materials, Structural Safety and Security Technology
		Mechanical System	System Design, Dynamics, Advanced Machine Elements, Microsystem
		Mechno-frontier	Aerospace Systems , Biomedical Engineering, Human Centric Design, Multiscience
		Intelligent System	Robotics, Human-Machine Interface, Intellectual Mechano-platform
Systems and Control Engineering	Systems and Control Engineering Engineering Sciences and Design*	Control Theory	Intelligent Robot, Cyber Physical Systems, Complex Network Systems
		Advanced Measurement	Mechanical Design and Functional Evaluation, Computer Vision and Image Processing, Applied Measurement Using Acoustic and Radio Waves
		System Analysis	Nonlinear and Stochastic Dynamics, Computational Mechanics, Power Systems for Transportation
		System Integration	Bio-robot, AI-robotics
Electrical and Electronic Engineering	Electrical and Electronic Engineering Energy Science and Engineering* Human Centered Science and Biomedical Engineering* Nuclear Engineering*	Circuit	Integrated Circuit
		Photonics, Ultrasonics, and Communications	Wireless Communications, Photonics, Ultrasonics
		Device	Compound Semiconductor Device, Quantum Functional, Intelligent Device, Terahertz Device, Green Device
		Electronic Materials	Energy Electronics, Spintronics, Nano- and Bio-photonics, Organic Electoronics, Integrated Electronics, Bioelectronics
		Electric Power and Energy	Electric Power System, Power Electronics, Electric Machinery, Plasma and Environment
Information and Communications Engineering	Information and Communications Engineering Human Centered Science and Biomedical Engineering*	Human Information Systems	Sensory Information Processing, Intelligent Information Processing, Media Information Processing, Biological Information Processing
		Signal Processing	Media Signal Processing, Inverse Problems
		Communication, Networks, and Security	Communication Systems, Information Theory and Security, Communication Networks
		Integrated Circuit and Computer	Digital Integrated Circuits, Analog Integrated Circuits
		Integrated Information and Communications	Distributed Information and Advanced Communication Systems
Industrial Engineering and Economics	Industrial Engineering and Economics Engineering Sciences and Design*	Corporate System Creation	Corporate Governance System , Management Strategy /Marketing
		Advanced Management and Paradigm Creation	Industrial System, Human Centered System, Operations management
		Analysis Method Creation	Operations Research, Mathematical Sciences and Informatics, Econometrics, Cyber Physical System
		Economic Science	Macroeconomics/Cliometrics, Microeconomics/Game Theory, Humanomics, Global Environmental Research

\* interdisciplinary graduate majors that span multiple schools or departments

Interdisciplinary Research Groups	Integrated IoT	Wireless Communication
		Integrated Circuit
		Cyber Physical System
		Integrated Robotics
	Human Centric	Humanomics
		Human Centric Design
		Sensory Information Processing
		Cybernetics
	Smart Power Grid	Renewable Power Generation
		Electric Power Conversion
		Electric Power Control
		Electric Energy Storage

Interdisciplinary Research Groups

Mechanical Engineering

Systems and Control Engineering

Electrical and Electronic Engineering

Information and Communications Engineering

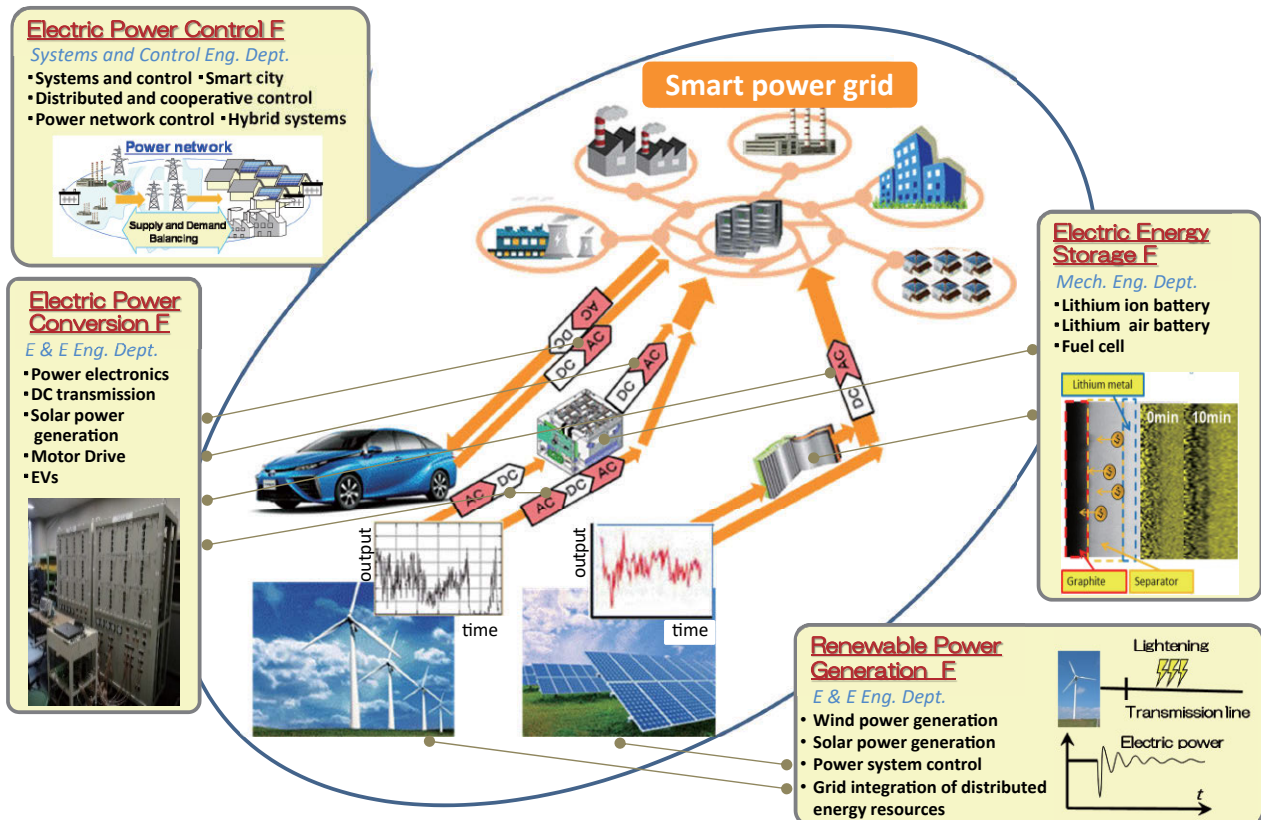
Industrial Engineering and Economics

# Interdisciplinary Research Groups

## Smart Power Grid Group

## Advanced usage of renewable energy

To accelerate the advanced usage of renewable energy based on the research and development on distributed and cooperative control with a core of power electronics and secondary batteries, the School of Engineering organizes Smart Power Grid Group beyond the framework of Departments, and various research activities are conducted.



## Faculty

### Smart Power Grid Group

#### Electric Power Conversion Field



**Hideaki Fujita, Professor**

Power electronics, Electric machinery, Photovoltaic inverters, Micro hydropower generation



**Makoto Hagiwara, Associate Professor**

Application of power electronics to next-generation electric power systems, battery energy storage systems, electric vehicles and renewable energies.



**Kenichiro Sano, Tenure-track Assistant Professor**

Power electronics in electric power systems: High voltage DC transmission for offshore wind farms, transient analysis of power systems, power qualities in distribution systems

### Smart Power Grid Group

#### Renewable Power Generation Field



**Kenichi Kawabe, Tenure-track Assistant Professor**

Power system engineering/Power engineering/Wind power/Photovoltaic power/Energy storage/Power electronics-based devices/Mathematical Programming

### Smart Power Grid Group

#### Electric Power Control Field



**Jun-ichi Imura, Professor**

Control theory of harmonized power systems accepting massive renewable energy of photovoltaic/wind power, Design theory of global power systems with power markets



**Takayuki Ishizaki, Associate Professor**

Distributed power systems stabilization based on retrofit control and electricity market design under high penetration of storage and renewable energy resources

### Smart Power Grid Group

#### Electric Energy Storage Field



**Shuichiro Hirai, Professor**

X-ray, MR In-situ measurements and numerical simulations of fuel cell, lithium battery, lithium air battery, etc.



**Takashi Sasabe, Associate Professor**

Investigation into transport phenomena within electrochemical devices, like fuel cell and Li-ion battery by using nano/micro X-ray imaging and CFD modeling



**Manabu Kodama, Assistant Professor**

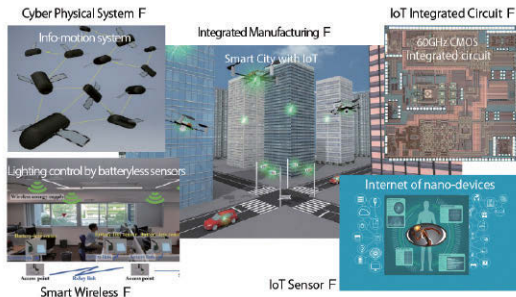
Operando X-ray CT Internal Structure Measurement of Fuel Cell and All Solid-state lithium-ion Battery. Study of High Efficiency Energy Conversion with Multi-physics (Electrochemistry-Thermodynamics-Two phase flow) Large Scale Numerical Simulation.

# Interdisciplinary Research Groups

## Integrated IoT Group

Super smart society realized with IoT

In order to realize super smart society using IoT technology, we are conducting research activities with a department-transverse research group in the school of engineering.



## Faculty

### Integrated IoT Group

#### Cyber Physical System Field



**Masayuki Fujita, Visiting Professor**

Our Research lies in Cooperative Control and Distributed Learning in Human Robotic-Network Teaming with Visual Feedback.



**Takeshi Hatanaka, Associate Professor**

Distributed control/optimization/learning for Cyber-Physical Systems including buildings, data centers and microgrids

### Integrated IoT Group

#### Integrated Manufacturing Field



**Koichi Suzumori, Professor**

Development of new actuators and their application to biomimetic robots, soft robots, body support wears, tough robots and micro robots.



**Hiroyuki Nabae, Assistant Professor**

Study on component technologies with a focus on new actuators, and their application to micro robots and mechatronics devices



**Tomohisa Tanaka, Associate Professor**

Development of new production technologies by using high-frequency vibration and laser energy, development of practical devices with additive manufacturing technology



**Jiang Zhu, Assistant Professor**

Digital engineering, Intelligent manufacturing system, advanced machining and measurement system

### Integrated IoT Group

#### IoT Sensor Field



**Mutsuko Hatano, Professor**

Quantum sensors and power devices using widegap semiconductors, Developing wide-field technologies from materials to systems for energy and medical applications



**Takayuki Iwasaki, Associate Professor**

Quantum sensing and quantum emitter using atomic-scale structures in diamond toward next-generation low-loss power devices and biological/medical applications



**Keigo Arai, Assistant Professor**

Precision sensing and imaging via quantum manipulation of spins in diamond/From development of new measurement protocols to applications in life science and electronics for the IoT era

### Integrated IoT Group

#### IoT Integrated Circuit Field



**Kenichi Okada, Professor**

Millimeter-wave Wireless Transceiver / 5G / Battery-less IoT Wireless Sensor Node / CMOS Integrated Circuits / PLL / Atomic Clock / Terahertz Communication & Sensing & Imaging



**Atsushi Shirane, Assistant Professor**

5G, IoT, Satellite Communication, Wireless Communication, Wireless Power Transfer, Machine Learning

### Integrated IoT Group

#### Smart Wireless Field



**Jiro Hirokawa, Professor**

Millimeter-wave high-efficiency planar antenna, 2D beam-switching circuit, fast analysis for antenna design, 2D orthogonal multiplexing



**Takashi Tomura, Tenure-track Assistant Professor**

Research based on electromagnetic engineering: large-scale EM analysis, near-field communication system, satellite on-board & wireless power transmission antenna



**Kazuhiko Fukawa, Professor**

Transmission and network techniques for wireless communications by developing digital signal processing, adaptive filters, and statistical based algorithms.



**Yuyuan Chang, Assistant Professor**

Mobile communication, millimeter-wave communication, MIMO system, MU-MIMO system, user scheduling, wireless sensor networks



**Kei Sakaguchi, Professor**

Wireless communication engineering  
5G/IoT/Millimeter-wave/Wireless energy transmission  
Connected car/Automated driving



**Tran Gia Khanh, Associate Professor**

Gbps-class wireless backbone network, Radio resource management using AI, IoT networks employing drones



**Teruya Fujii, Specially Appointed Professor**

Wireless transmission technologies for the 5th and 6th mobile communication system / The 3D cell layout and network cooperation control / HAPS Cellular system / Cellular drone repeater system for disaster.



**Hideki Omote, Specially Appointed Associate Professor**

5th and 6th mobile communication system / Radio propagation for the 5th, 6th mobile communication system and HAPS Cellular system / International standardization of mobile radio propagation



**Yukihiro Okumura, Visiting Professor**

Next generation mobile communication system / Radio access technologies / Radio Access Networks / Mobile Radio Applications

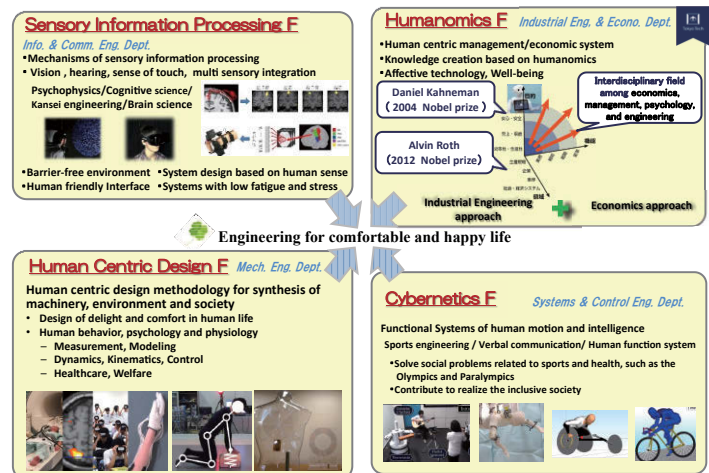


# Interdisciplinary Research Groups

## Human Centric Group

We are working to create and develop the field of Human centric engineering from the various points of view, such as design, humanomics, human information processing, cybernetics.

## Human centric engineering



## Faculty

### Human Centric Group

#### Human Centric Design Field



**Masafumi Okada, Professor**

Robot design and control from mathematical or physical point of view, and its application to human motion instruction.



**Wataru Hijikata, Associate Professor**

Study on medical device and mechanical system based on mechatronics and biomedical engineering. Development of implantable power generator, artificial heart, wireless power transfer, control of muscle contraction.



**Ken Masuya, Assistant Professor**

Study on the robots that coexist and cooperate with human beings in human environments.



**Yoshifumi Nishida, Professor**

Methodology on observing daily behavior of persons who faces the physical and cognitive changes, and designing a daily life system that enables to maintain quality of life based on data-driven ergonomics and statistical mathematics.



**Emiko Uchiyama, Assistant Professor**

Constructing methodology to understand how humans process information and how to execute motions from their perception. Modeling and statistically analyzing human information processing mechanism based on designed physical measurements.



**Yusuke Sugahara, Associate Professor**

Mechanism, design and control of robots and mechanical systems. Bipedwalking vehicle, stair-climbing wheelchair, Aero-Train, human-powered robotics, cable-driven parallel robots, mechanism of mobile robots.

### Human Centric Group

#### Sensory Information Processing Field



**Hirohiko Kaneko, Professor**

Visual information processing, Psychophysics, Space perception, Stereopsis, Binocular disparity processing, Multisensory integration, Eye movements, Perceptual adaptation



**Takehiro Nagai, Assistant Professor**

Psychophysics/affective engineering/color engineering/color perception/material perception/image processing based on properties of human visual perception



**Rumi Hisakata, Assistant Professor**

Psychophysics/Human visual processing/Binocular vision and 3D perception/Motion perception/Visual illusions/small eye movements/visual stability



**Yasuharu Koike, Professor (Biointerfaces Unit)**

Computational Neuroscience, Human Motor Control Theory, Human interface: Brain Machine Interface, Analysis of subjective feeling based on computational model



**Natsue Yoshimura, Associate Professor (Biointerfaces Unit)**

Brain activity information decoding (motor control, emotion, language, etc)/Brain-machine interfaces / Machine learning/ EEG/fMRI



**Hiroyuki Kanbara, Assistant Professor (Biointerfaces Unit)**

Computational Neuroscience: We proposed computational model for neural motor learning of reaching movements.

### Human Centric Group

#### Humanomics Field



**Dai Senoo, Professor**

Theory of Organization, Strategy, Knowledge Management and Information Systems. Main projects are Creative Office, Open Innovation and Business Ecosystem.



**Emiko Fukuda, Associate Professor**

Industrial economics/experimental economics/numerical analysis of game theory model/congestion management/security and disaster-relief service



**Bach Quang Ho, Assistant Professor**

My research analyzes service as a component of the society, and focuses on service systems that achieve well-being, especially those that transform people's behavior and attitudes and promote their growth.

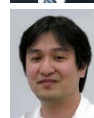
### Human Centric Group

#### Cybernetics Field



**Motomu Nakashima, Professor**

Modeling of human motion in sports, optimization of human motion as well as design and development of optimal tools and equipment using simulation and humanoid robot



**Kazuhiro Nakadai, Specially Appointed Professor**

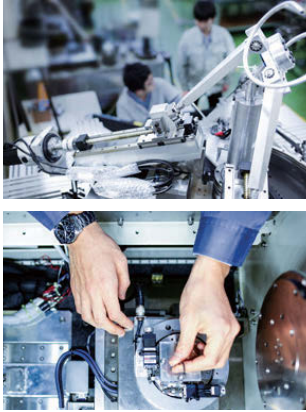
Key research topics are robot audition and computational scene analysis, and wide areas are covered such as robotics, signal and speech processing, AI, and machine learning.



**Akisue Kuramoto, Assistant Professor**

Biomechanical analysis of worker posture/Anomaly detection in work movement/Optimal work environment design/Biological measurement/Surrounding environment recognition technology for transportation systems

# Department of Mechanical Engineering



Education and research at the Department of Mechanical Engineering is designed to discover new phenomena, principles, and methods and to create new machinery capable of achieving a balance between humanity and the environment.

Students at the Department of Mechanical Engineering acquire advanced, specialized knowledge in the field of mechanical engineering and much more. By teaching students how to identify and solve problems, and by instilling in them the abilities they need to communicate with people around the world, our aim is to cultivate individuals who will be active in industry and academia, and contribute to maintaining and improving Japan's competitiveness on the global stage into the future. In the excellent education and research environment, discover your own potential alongside faculty who work on the frontier of mechanical engineering.



**Takayoshi Inoue**  
Department Chair

## Research

The Department of Mechanical Engineering is actively working toward expanding the fundamental areas of study and research in the field of mechanical engineering. The department is building an educational/research framework that thoroughly displays the strengths of mechanical engineering as an integrated technological field, thereby contributing to the advancement of research into advanced energy applications, advanced functional materials, digital manufacturing, and other such areas. In addition, we are producing outstanding results in the fields of robotics and advanced manufacturing technologies, both of which share strong ties with industry, and are putting forth great effort in frontier fields such as aerospace and medical engineering. Moreover, we promote safe, secure technological development from a mechanical engineering viewpoint, as we conduct research and development aimed at achieving human-centric design. From the perspective of societal collaboration, our department (as a member of the Industry-University Cooperation Office in the School of Engineering) serves as an intermediary and provides a forum to bring together faculty working on a wide variety of research projects, allowing us to contribute more to society through discoveries made in the field of mechanical engineering.

## Education

The Department of Mechanical Engineering offers courses such as Engineering Mechanics, Mechanics of Materials, Thermodynamics, Fundamentals of Fluid Mechanics, Mechanical vibrations, and Machine Elements and Machine Drawing. Through courses like these, student learn how to analyze the behavior of mechanical systems, and gain the knowledge they need to integrate that understanding into the creation of new mechanisms. In addition to these disciplines, which serve as the core of mechanical engineering, students set their sights on a broad array of research fields, including control, robotics and mechatronics; precision engineering; mechanical design; processing, production and materials; biomedical and welfare engineering; design engineering; space engineering and more. Students learn not only how to analyze various phenomena theoretically; they also learn how to apply that knowledge to solve issues that arise in engineering. Our aim is to cultivate individuals capable of devising innovative mechanical systems that will help humanity achieve balance with its environment.

In addition to the undergraduate program, the department offers graduate programs in Mechanical Engineering, Energy Science and Engineering, Engineering Sciences and Design, Human Centered Science and Biomedical Engineering, and Nuclear Engineering.

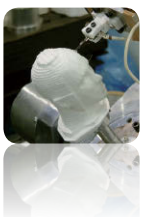
## Research Groups and Fields of Research



### Thermo-fluid Group

Utilizing thermodynamics and fluid dynamics to blaze a trail in the fields of energy and environmental technology

Energy Engineering Field  
Power and Propulsion Engineering Field  
Environmental Thermo-fluid Engineering Field



### Materials and Processing Group

R & D into safe and secure technologies for mechanical structures, and advanced materials and processing technologies

Advanced Production Engineering Field  
Advanced Functional Materials Field  
Structural Safety and Security Technology Field



### Mechanical System Group

Researching dynamic system theory and its application in everything from large-scale me-chemical systems to robots and MEMS

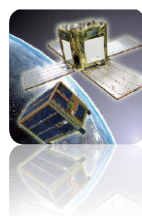
System Design Field  
Advanced Machine Elements Field  
Dynamics Field  
Microsystem Field



### Intelligent System Group

Research and Development of Advanced Intellectual Mechanical System

Robotics Field  
Human-Machine Interface Field  
Intellectual Mechano-platform Field



### Mechno-frontier Group

Research and Development of frontiers of mechanical engineering

Aerospace Systems Field  
Biomedical Engineering Field  
Human Centric Design Field  
Muliscience Field

## Faculty

LANE: Laboratory for Advanced Nuclear Energy    MSL: Laboratory for Materials and Structures  
 FIRST: Laboratory for Future Interdisciplinary Research of Science and Technology  
 GSIC: Global Scientific Information and Computing Center

### Thermo-fluid Group

#### Energy Engineering Field



**Tetsuji Okamura, Professor**

The field is refrigeration and cooling engineering, e.g. a cryogenic thermo-syphon for superconducting magnet and a room-temperature magnetic refrigerator.



**Yoshihiro Okuno, Professor**

Applications of magnetohydrodynamic technology, especially a high efficient MHD electrical power generation with non-equilibrium plasma flow.



**Tetsuya Suekane, Professor**

Study on multiphase flows in porous media in geological storage of carbon dioxide and enhanced oil recovery based on X-ray microtomography and digital rock physics.



**Katsunori Hanamura, Professor**

Near-field radiation transfer and its application to power generation, analysis of anode for high power density SOFC, and development of DPF for next generation.



**Seiji Okawa, Associate Professor**

Aiming for energy saving technology development, active control of freezing of supercooled liquid, cold insulator for transportation systems of refrigerated food, materials for equipment startup in cold area.



**Hiroshige Kikura, Associate Professor (LANE)**

For safety improvement and advancement of nuclear reactors, we are researching thermal hydraulics, fluid measurement, nuclear safety, robot remote measurement.



**Takao Nagasaki, Associate Professor**

Applications and fundamentals of thermo-fluid dynamics mainly focused on liquid-vapor phase change such as heat pipe, heat pump, cavitation and heat exchanger.



**Tetsuo Sawada, Assistant Professor (LANE)**

Study on safety of fast reactors, development of advanced nuclear energy systems, study on safety of fusion energy systems



**Hideharu Takahashi, Assistant Professor (LANE)**

Research themes are thermal hydraulics for safety and advancement of nuclear reactors, decommissioning, waste treatment and disposal, decontamination.



**Tsutomu Hozumi, Assistant Professor**

Study on active control methods of supercooling and measurements of thermal properties for cold reserving materials, heat storage materials and foods.



**Hirotatsu Watanabe, Assistant Professor**

Chemical reaction and transport phenomena in energy conversion of carbon resources for low-carbon society.

### Thermo-fluid Group

#### Power and Propulsion Engineering Field



**Hidenori Kosaka, Professor**

High efficiency mobility systems, high efficiency, clean internal combustion engines, investigation of combustion via laser diagnostics, combustion control.



**Mamoru Tanahashi, Professor**

Physics and modeling of turbulence, turbulent heat/mass transfer and turbulent combustion in gas turbine combustors and internal combustion engines.



**Shuichiro Hirai, Professor**

X-ray, MR In-situ measurements and numerical simulations of fuel cell, lithium battery, lithium air battery, etc.



**Takashi Sasabe, Associate Professor**

Investigation into transport phenomena within electrochemical devices, like fuel cell and Li-ion battery by using nano/micro X-ray imaging and CFD modeling.



**Susumu Sato, Associate Professor**

Improvement of environment load in transportation system, high efficiency after-treatment system, alternative fuel engines



**Masayasu Shimura, Associate Professor**

Investigation of turbulent flow and combustion in gas turbine and internal combustion engines using laser diagnostics and simulations. Development of combustion control methods.



**Jun Hasegawa, Associate Professor (LANE)**

Fundamental researches on generation of high-brightness quantum beams composed of ions, clusters, neutrons, or EUV light, and their applications in the field of fusion energy.



**Manabu Kodama, Assistant Professor**

Operando X-ray CT Internal Structure Measurement of Fuel Cell and All Solid-state lithium-ion Battery. Study of High Efficiency Energy Conversion with Multi-physics (Electrochemistry-Thermodynamics-Two phase flow) Large Scale Numerical Simulation.



**Yuki Minamoto, Tenure-track Assistant Professor**

Investigation into fundamental physics of turbulent combustion using theoretical and computational approaches, and mathematical modelling for industry use.

### Thermo-fluid Group

#### Environmental Thermo-fluid Engineering Field



**Takayuki Aoki, Professor (GSIC)**

Challenge to exa-scale simulation of gas-liquid and solid-gas-liquid multiphase flows by means of GPU-accelerated supercomputers.



**Takayoshi Inoue, Professor**

Heat transfer and its control under the extreme conditions, such as ultra low temp. to high temp., micro to macro, zero-gravitational to strong centrifugal field.



**Feng Xiao, Professor**

Computational fluid dynamics, high-fidelity numerical methods for various complex flows, development of practical numerical models for real-case applications.



**Masami Kadonaga, Specially Appointed Professor**

Fundamental research and simulation of evaporation/penetration/drying/dot-formation for inkjet printing.



**Ryo Onishi, Associate Professor (GSIC)**

Integrated technologies of simulation and processing for utilizing the environmental Big Data/Numerical simulations of environmental multi-phase turbulence.



**Takushi Saito, Associate Professor**

Development of heat transfer control technology using nano-materials  
 Analysis of transport phenomena including interface  
 Advanced material processing technology using heat



**Koichi Kato, Specially Appointed Associate Professor (Lecturer)**

Fundamental research and simulation of evaporation/penetration/drying/dot-formation for inkjet printing.



**Tatsuya Kawaguchi, Assistant Professor**

Experimental and numerical investigation of multiphase and transport phenomena and their interaction by means of the optical techniques.



**Yuji Suzuki, Assistant Professor**

Research and development of heat transfer devices based on the heat pipe technology for the thermal control of space equipment and so on.



## Materials and Processing Group

### Advanced Production Engineering Field



**Masahiko Yoshino, Professor**  
Nano/micro Manufacturing, Metalforming, Machining  
Development of functional materials /surfaces.



**Yuko Aono, Associate Professor**  
Laser modification of mechanical and chemical property, Digital manufacturing with shape and function design, Fabrication and application of functional film.



**Tomohisa Tanaka, Associate Professor**  
Development of new production technologies by using high-frequency vibration and laser energy. Development of practical devices with additive manufacturing technology.



**Takahisa Yamazaki, Associate Professor**  
Joining by various heating source, dissimilar materials like carbon based materials and heat resistant metals are joined using advanced material filler based on the change of interfacial energy in joining process.



**Hayato Yoshioka, Associate Professor (FIRST)**  
Research on Nano-machining and Nano-measurement technologies based on originally developed precision mechanical elements and controllers.



**Jiang Zhu, Assistant Professor**  
Development of new technology for freeform surface machining and measurement, digital manufacturing and intelligent manufacturing.



**Shingo Tajima, Assistant Professor (FIRST)**  
Research on optimal trajectory generation for high-speed and high-precision control with multi-axis and robot machining



**Yuki Nakagawa, Assistant Professor**  
Development of hot forming process of ultra-high strength steel and CFRP for reduction in weight of transportation, manufacturing of high performance parts having tailored property

## Materials and Processing Group

### Advanced Functional Materials Field



**Naoto Ohtake, Professor (FIRST)**  
Main field of interest is materials processing and technology, including plastic forming, fabrication of hard carbon films and their application to industrial uses.



**Chiaki Sato, Professor (MSL)**  
Research on the mechanical aspects of carbon fiber reinforced composite material (CFRP) and adhesively bonded joints between CFRP and dissimilar materials frequently used for transportation such as automobiles and aircraft.



**Atushi Hirata, Professor**  
Ultraprecision polishing, coating, laser processing, tribology and material characterization with micro/nano materials for surface function design.



**Shinji Tanaka, Specially Appointed Associate Professor**  
Tribological technologies for hydraulic equipment of construction machinery, such as visualization of lubrication condition of real machine, lubrication analysis, evaluation of sliding characteristics of sliding materials and lubricants.



**Yu Sekiguchi, Assistant Professor (MSL)**  
Design, strength evaluation and strength improvement of adhesively bonded joints, especially reversible adhesives mimicking gecko.



**Yuki Hirata, Assistant Professor (FIRST)**  
Synthesis and evaluation of amorphous carbon film by plasma process / Elucidation of coating mechanism by numerical simulation and control its properties



**Satoshi Momozono, Assistant Professor**  
Fundamental researches of tribology and tribological applications for reduction of mechanical loss, wear and unexpected behavior caused by frictional characteristics.

## Materials and Processing Group

### Structural Safety and Security Technology Field



**Hirotugu Inoue, Professor**  
Research topics in the field of mechanics of materials: non-destructive testing (infra-red thermography, ultrasonic), impact problem, and inverse analysis.



**Kazuaki Inaba, Associate Professor**  
Research and design of various scale machines and structures from viewpoints of mechanics and material sciences; eg. composites, automobiles and power plants.



**Masatoshi Kondo, Associate professor (LANE)**  
Fusion reactor engineering, Fast reactor engineering, Liquid metal technology, Material compatibility



**Motoki Sakaguchi, Associate Professor**  
Research in mechanics of materials, especially focusing on deformation and fracture of high temperature materials for jet engine application.



**Yu Kurokawa, Assistant Professor**  
Non-destructive evaluation and flaw size measurement by ultrasonic testing. Flaw evaluation, stress analysis, and fatigue limit evaluation by infrared thermography.



**Yoshiro Suzuki, Assistant Professor**  
Artificial intelligence, deep learning, medical imaging, structural optimization, and composite material.

## Mechanical Systems Group

### Dynamics Field



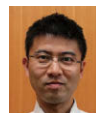
**Masaaki Okuma, Professor**  
Research of theoretical, experimental and hybrid CAE for analysis, design and utilization of machinery and structural dynamics.



**Hiroki Takahara, Professor**  
Focusing on the mechanism of vibration, we conduct research on the nonlinear vibration of fluid-related vibration, dynamics of uncertain systems, etc. We aim at improving the function, reliability and safety of mechanical structures.



**Hiroshi Yamaura, Professor**  
Research on dynamics, control and tribology of machinery for construction machinery, earthmoving machinery, vehicles, rover, mechatronics equipment, etc.



**Yutaka Nakano, Associate Professor**  
We are studying the generation mechanisms of self-excite vibrations and their suppression (e.g. friction vibration, chatter, and so on).



**Ikuma Ikeda, Assistant Professor**  
Active noise control with low sampling frequency, analysis and suppression of human tremor.

**Mechanical Systems Group****Advanced Machine Elements Field****Nobuyuki Iwatsuki, Professor**

Kinematics and dynamics of robotic mechanisms, functional material actuator, estimation of machinery noise and structural optimization to reduce noise.

**Tsune Kobayashi, Specially Appointed Professor**

Analysis and design of contact and deformation condition of mechanical elements such as gears, screws and so on, development of drive-train system of automotive vehicles.

**Seiichiro Hara, Associate Professor**

Sensing method of surface texture and machining information, processing and evaluation of measurement information, design applying quality and sensitivity engineering, modeling of surface texture.

**Shigeki Matsumura, Associate Professor (FIRST)**

Research on dynamics and energy saving of power transmitting system.

**Daisuke Matsuura, Specially Appointed Associate Professor**

Analysis and design of mechanical elements, robotics, mechatronics, visual measurement and servoing, noncontact manipulation and welfare device development.

**Takao Yasui, Assistant Professor**

A study on improvement of lesson content and the self-taught type e-learning system based on survey on comprehension degree of machine drawing standard.

**Mechanical Systems Group****Microsystem Field****Kazuhiro Yoshida, Professor (FIRST)**

Development of innovative mechano-devices/systems such as new actuator systems for advanced soft microrobots that perform power-needed tasks in micro space.

**Joon-wan Kim, Associate Professor (FIRST)**

Micro hydraulic pressure sources integrating MEMS technology with Electro-conjugate fluid (ECF) and its application systems.

**Intelligent System Group****Robotics Field****Koichi Suzumori, Professor**

Development of new actuators and their application to biomimetic robots, soft robots, body support wears, tough robots and micro robots.

**Yukio Takeda, Professor**

Mechanical systems design, kinematics, mechanisms, machine elements, robotics, industrial robot, assistive device.

**Gen Endo, Associate Professor**

Design and development of practical robot and mechanical system. Study on mobile robot, decommissioning robot, super redundant manipulator, tendon-driven robot, welfare robot.

**Mitsuru ENDO, Specially Appointed Associate Professor**

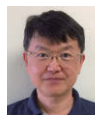
Human Collaborative Robot, Light-weight Actuator, Mechatronics.

**Hiroyuki Nabae, Assistant Professor**

Study on component technologies with a focus on new actuators, and their application to micro robots and mechatronics devices.

**Intelligent System Group****Human-Machine Interface Field****Takako Yoshida, Associate Professor**

Brain science, human perception and psychophysics, visuo-haptic multimodal man-machine interface, attention/inattention.

**Mechno-frontier Group****Aerospace Systems Field****Akira Todoroki, Professor**

Mechanics of materials and mechanics of composite materials; new fabrication process of composites and novel products of 3D printed composites.

**Saburo Matunaga, Professor**

Concept creation, fundamental research, design, development, launch and operation of World first revolutionary space systems and robotic aerospacecraft.

**Takanori Iwata, Visiting Professor**

Guidance, navigation, control & dynamics of aerospace systems (e.g. spacecraft attitude & orbit control systems, estimation systems, components), spacecraft design, and project management/systems engineering.

**Hiraku Sakamoto, Associate Professor**

Thorough investigating dynamic structural analysis methods for lightweight and flexible structures, we aim at generating innovative space structure systems.

**Hiroto Tanaka, Associate Professor**

Biomechanics and fluid dynamics of swimming/flying animals. Bioinspired swimming/flying robots.

**Hiroki Nakanishi, Associate Professor**

Research on mechanism, dynamics, and control for advanced space systems including space robotics, orbital service, astronaut support, and micro/nano satellites.

**Hiroshi Furuya, Associate Professor**

Structural analysis and design of space structures, spacecraft systems, and deployable structures for space development.

**Yoshihiro Mizutani, Associate Professor**

Non-destructive testing, structural health monitoring/evaluation/control for aerospace vehicles, chemical/power plants, automobiles and large construction machines. Application of AI to the above issues.

**Atsushi Noda, Visiting Associate Professor**

Planning & research for next space system, small satellite and space robot, and its technology roadmap development

**Satoru Ozawa, Visiting Associate Professor**

Satellite system (communications satellite / earth observation satellite), design, analysis and verification of large deployable reflector, nonlinear finite element method, flexible multibody structural analysis, synthetic aperture radar, flight software, FPGA



## Mechno-frontier Group

### Biomedical Engineering Field



**Toru Omata, Professor**

Grasping/manipulation with robot hands, surgical robots for manipulation in human body, and cell culture devices for cancer study, etc. using MEMS technology.



**Tadahiko Shinshi, Professor (FIRST)**

Medical mechatronics and micro/nano mechatronics based on magnetic force control.



**Takeshi Hatsuzawa, Professor (FIRST)**

MEMS/NEMS application and development to bio-assay and diagnosis devices by interdisciplinary technology including mechanical and bio engineering.



**Yasuko Yanagida, Professor (FIRST)**

Development of MEMS/NEMS and bioMEMS devices applied for bioscience, medical engineering and environmental analysis.



**Tadashi Ishida, Associate Professor**

Biomicrofluidic devices for drug discovery and medical applications by the combination of nano/micro technologies and cellular characteristics.



**Toshio Takayama, Associate Professor**

Robot hands mechanism, Soft material based mobile devices and actuators, Mechatronics for medical devices, Microdevices for cell culture.



**Kotaro Tadano, Associate Professor (FIRST)**

Research and development of surgical robots for laparoscopic surgery, vitreous surgery and plastic surgery, human-machine interfaces and pneumatic systems.



**Takasi Nisisako, Associate Professor (FIRST)**

Innovative nano- and microfluidics for Lab-on-a-Chip applications and functional materials production, and their industrialization.



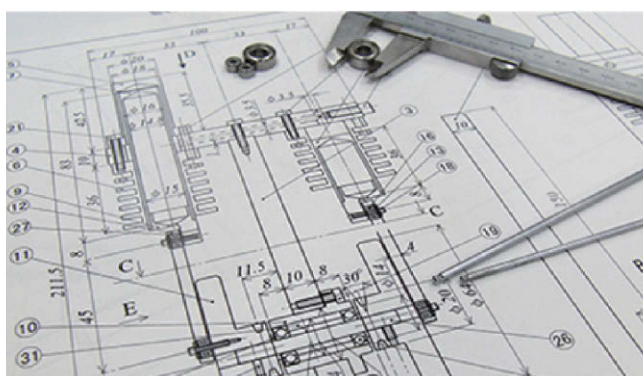
**Tohru Yagi, Associate Professor**

Our goal is to understand the neural mechanisms, and to exploit its findings in biomedical engineering applications, e.g. neural interfaces.



**Tetsuya Yamada, Assistant Professor (FIRST)**

MEMS biosensor/Artificial cell membrane/Electromicrobiology/Photocatalyst/Nanoparticles.



## Mechno-frontier Group

### Human Centric Design Field



**Masafumi Okada, Professor**

Robot design and control from mathematical or physical point of view, and its application to human motion instruction.



**Shigeki Saito, Professor**

Robotics based on Micro-mechanics, adhesional device by bio-inspired structure, creativity in engineering design.



**Yoshifumi Nishida, Professor**

Methodology on observing daily behavior of persons who faces the physical and cognitive changes, and designing a daily life system that enables to maintain quality of life based on data-driven ergonomics and statistical mathematics.



**Yusuke Sugahara, Associate Professor**

Mechanism, design and control of robots and mechanical systems. Biped walking vehicle, stair-climbing wheelchair, Aero-Train, human-powered robotics, cable-driven parallel robots, mechanism of mobile robots.



**Wataru Hijikata, Associate Professor**

Study on medical device and mechanical system based on mechatronics and biomedical engineering, development of implantable power generator, artificial heart, wireless power transfer, control of muscle contraction.



**Emiko Uchiyama, Assistant Professor**

Constructing methodology to understand how humans process information and how to execute motions from their perception. Modeling and statistically analyzing human information processing mechanism based on designed physical measurements.



**Ken Masuya, Assistant Professor**

Study on the robots that coexist and cooperate with human beings in human environments.

## Mechno-frontier Group

### Muliscience Field



**Tomohiro Nozaki, Professor**

Research on electron-driven catalysis using nonthermal plasma technology: pursuing new catalyst materials, elucidation of chemical reaction and energy & mass transport phenomena via in situ & operando spectroscopy.



**Yoichi Murakami, Associate Professor**

Molecular energy engineering, thermal engineering, physical chemistry, molecular photophysics, engineering of triplet spins, development of energy conversion materials.



**Kazuyoshi Fushinobu, Associate Professor**

Thermal/energy phenomena, from fundamental to applications. Laser processing, Electronic packaging, Digital Printing, Energy Equipment. Strong ties with industries.



**Hiroki Akasaka, Associate Professor**

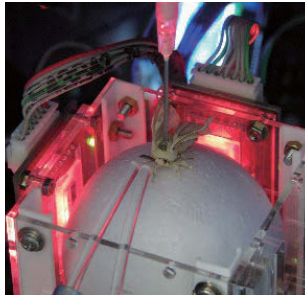
Main research field is carbon and related materials. Related keywords are thin film engineering, material science and engineering, materials analysis, inorganic carbon materials.



**Takatoki Yamamoto, Associate Professor**

Micro/nano technologies for biomedical applications, biomedicine, BioMEMS.

# Department of Systems and Control Engineering



Integrate the real world (physical) and information (cyber) as one system to create new values for future society.

Our modern life is supported by a huge number of complex artificial systems. To design valuable systems, we need to understand their dynamical properties so that they will safely work and surely satisfy our requirements. The Department of Systems and Control Engineering provides courses that offer insights into a variety of systems, which enable us to predict and control their dynamics. Our interest includes not only artificial systems, e.g., robots, cars, planes, medical systems, and intelligent systems, but even life, society, and nature. The Department of Systems and Control Engineering prepares students to become creative and innovative individuals who can make beneficial contributions to our society.



**Hiroyuki Hachiya**  
Department Chair

## Research

System control, used to measure, analyze, and control various phenomena, is essential in many fields in modern society including those in industry. A wide variety of technologies and techniques are required to design. Mathematical models take important roles in clarifying system structures so that we know dynamical properties of them. Control theory provides systematic design of control and measurement functions. We also need to find appropriate measurement methods, communication protocols, information processing, actuators, sensors, micro-controllers, and ways of integration. We have formed research groups and are conducting high level researches so that we achieve the ability to innovate novel systems to bring values into our society.

The department's primary fields of research are as follows: systems control theory, network control, precision mechanical instrumentation, sensing theory, computer vision, image processing, wave application instrumentation, chaotic vibrations, stochastic dynamics, nonlinear dynamics, inverse analysis, smart power grids, biomechanics, biorobotics, combustion engines, combustion control, exhaust treatment, autonomous systems, signal processing, artificial intelligence, intelligent robots, rescue robots, and radiation biology.

## Education

In the Department of Systems and Control Engineering, we foster the basic ability necessary to objectively analyze everything — concrete and abstract — in nature and society as a system and to create new systems of value based on this knowledge. Students gain scholastic abilities in measurement, control, design, and system science as well as in areas such as machines, electricity, and information. We cultivate in our students flexible, creative thinking they need to construct systems that offer new value through many unique educational initiatives that focus on the importance of projects and practical learning. Students can take classes in which they participate in robot contests, and classes through which they form teams to examine societal needs and to build systems that tackle those issues. Students proceed to research works in specific issues conducted at affiliated laboratories, and through their master's thesis research they will acquire the technological and organizational skills needed to develop new systems. They learn not only research protocols and methods but also ethical attitudes to be responsible engineers contributing to make a better future.

### Undergraduate programs

\* School of Engineering

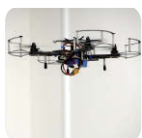
\* Department of Systems and Control Engineering

### Graduate programs

\* Systems and Control Engineering

\* Engineering Sciences and Design

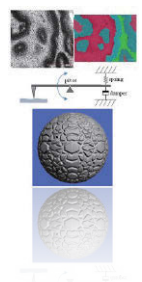
## Research Groups and Fields of Research



### Control Theory Group

Researching cutting-edge systems theory targeting various systems, from next-generation robots to smart cities

Intelligent Robot Field  
Cyber Physical Systems Field  
Complex Network Systems Field



### Advanced Measurement Group

Researching cutting-edge measurement technologies that allow observation of objects both visible and invisible, to gain an understanding of various phenomena found in our world

Mechanical Design and Functional Evaluation Field  
Computer Vision and Image Processing Field  
Applied Measurement Using Acoustic and Radio Waves Field



### System Analysis Group

Using mathematical approaches to analyze systems both natural and artificial, and research methods that allow for deeper quantitative and qualitative understanding of their behavior

Nonlinear and Stochastic Dynamics Field  
Computational Mechanics Field  
Power Systems for Transportation Field



### System Integration Group

Realizing future robot systems based on various approaches, such as sports engineering, speech recognition, machine learning and biomimetics, in order to bring happiness to the people

Bio-robot Field  
AI-robotics Field



# Faculty

## Control Theory Group Intelligent Robot Field



**Mitsuji Sampei**, Professor

Nonlinear Control Theory and its Application, Control of Under-Actuated Mechanical Systems, Design and Control of Multi-Rotor Systems.



**Masaki Yamakita**, Associate Professor

Theoretical studies on adaptive and learning control and state estimation and model predictive control for nonlinear systems, and their applications to robotic and industrial systems

## Control Theory Group Cyber Physical Systems Field



**Masayuki Fujita**, Visiting Professor

Distributed cooperative control of robotic networks/visual feedback estimation and control/energy management systems



**Yoshihiro Miyake**, Professor (Dept. Computer Science)

From Communication Science to Interface Creation



**Takeshi Hatanaka**, Associate Professor

Cyber-Physical & Human Systems, Cyber-Physical Campus Energy Management, Networked Mobility, Distributed Optimization/Learning/Games

## Control Theory Group Complex Network Systems Field



**Jun-ichi Imura**, Professor

Development of control theory of large-scale complex network systems, and applications to smart grids, intelligent transportation systems, and biological systems



**Hiroshi Deguchi**, Professor (Dept. Computer Science)

Agent Based Modeling & Simulation, IoT System as an Autonomous Distributed Cooperative System, Complex Systems with Decision Makers, Management Information System, Gaming Simulation, Social System, Data Analysis for Economic & Accounting System



**Tomohisa Hayakawa**, Associate Professor

Control Theory, Nonlinear Dynamical Systems Theory, Digital Society Mechanism Design, Smart Cities, and Game Theory



**Hideaki Ishii**, Associate Professor (Dept. Computer Science)

Large-scale networked control, Coordinated control of multi-agent systems, Distributed algorithms for PageRank computation, Cyber security for power systems



**Takayuki Ishizaki**, Associate Professor

Decentralized design of large-scale distributed control systems, Electricity market design under high penetration of storage and renewable energy resources

## Advanced Measurement Group Mechanical Design and Functional Evaluation Field



**Atsushi Hirata**, Professor (Dept. Mechanical Engineering)

Ultraprecision polishing, coating, laser processing, tribology and material characterization with micro/nano materials for surface function design



**Seichihiro Hara**, Associate Professor

Sensing method of surface texture and machining information, Processing and evaluation of measurement information, Design applying quality and sensitivity engineering, Modeling of surface texture

## Advanced Measurement Group Computer Vision and Image Processing Field



**Masatoshi Okutomi**, Professor

Computer vision and image processing, covering both their theory and applications. Recent topics include 3D scene reconstruction, stereo vision, structure from motion, inverse rendering, multispectral imaging, computational imaging, and super resolution.



**Masayuki Tanaka**, Associate Professor

Image Analysis, Multispectral Imaging, Multi-Modal Image Fusion, Image Processing Based on Generative Model, Optimization and Machine Learning.

## Advanced Measurement Group Applied Measurement Using Acoustic and Radio Waves Field



**Hiroyuki Hachiya**, Professor

Development of quantitative diagnosis method by ultrasound based on tissue structures and elastic property, and measurement methods in the ocean, air and ground.



**Shinji Ohyama**, Associate Professor

Measurement technology such as new localization system for sensor networks, CT system for visualization of temperature and wind speed distribution



**Shinnosuke Hirata**, Assistant Professor

An estimation method of physical properties of tissues or object's position and motion by scattering or propagation properties of ultrasound

## System Analysis Group Nonlinear and Stochastic Dynamics Field



**Hiroya Nakao**, Professor

Nonlinear dynamics, Stochastic processes, Rhythmic phenomena, Self-organization phenomena



**Misako Takayasu**, Professor  
(Dept. Mathematical and Computing Science)

Analysis and modeling of socio-economic phenomena, big-data analysis, nonlinear transport, group motion, complex network, phase transition



**Toru Aonishi**, Associate Professor (Dept. Computer Science)

Computational neuroscience, Mathematical theory of neural networks, Data-driven science



**Takahiro Tsuchida**, Assistant Professor

Investigation of random phenomena in various fields, Response analysis of non-Gaussian randomly excited systems, Dynamics of fractional-order systems

Interdisciplinary  
Research Groups

Mechanical Engineering

Systems and Control  
Engineering

Electrical and Electronic  
Engineering

Information and  
Communications Engineering

Industrial Engineering and  
Economics

## System Analysis Group

### Computational Mechanics Field



**Kenji Amaya, Professor**

Implementation of inverse analysis for industry, Electrical chemistry simulation such as Localized corrosion analysis, Electroplating analysis, Corrosion monitoring using data assimilation, Aberration analysis



**Yusuke Miyazaki, Associate Professor**

Development of Detailed Digital Human Models, Injury Mechanism and Prevention, Quantitative Injury Risk Assessment of Products and Living Environment, Measurement of Human Motions and Forces in Real World Environment, Sports Engineering



**Isao Ono, Associate Professor (Dept. Computer Science)**

Development of evolutionary computation algorithms for various optimization problems and reinforcement learning algorithms for various tasks



**Yuki Onishi, Assistant Professor**

Large deformation analysis using state-of-the-art FEM, Peeling analysis of plastic film, Electrodeposition of automobile body, Localized corrosion in saltwater

## System Analysis Group

### Power Systems for Transportation Field



**Hidenori Kosaka, Professor**

High Efficiency Mobility Systems, High Efficiency Clean Internal Combustion Engines, Investigation of Combustion via Laser Diagnostics, Combustion Control



**Susumu Sato, Associate Professor**

Improvement of Environment Load in Transportation System, High Efficiency After-treatment System, Alternative Fuel Engines



**Tsuyoshi Nagasawa, Assistant Professor**

Thermal and fluid engineering / Energy conversion / Internal combustion engine / Exhaust after-treatment / Solid oxide fuel cell

## System Integration Group

### Bio-robot Field



**Daisuke Kurabayashi, Professor**

Analysis of Adaptive Behavior by using Bio-machine Hybrid Systems, Integration of Distributed Autonomous Robotic Systems, Motion and Path Planning for Robotic Systems



**Motomu Nakashima, Professor**

Modeling of human motion in sports, Optimization of human motion as well as design and development of optimal tools and equipment using simulation and humanoid robot



**Hideyuki Tsukagoshi, Associate Professor**

Study on fluid powered actuator referring to the muscular structure and the working principle of creatures, and their application to medical robot and rescue.



**Masahiro Takinoue, Associate Professor (Dept. Computer Science)**

Construction and understanding of self-assembled artificial cell-like systems and molecular robots based on DNA nanotechnology and microfluidic technology



**Yuya Hattori, Assistant Professor**

Analysis of radiation responses of cell population, Analysis of odor-source search behavior of *C. elegans*, Development of control method based on responses of micro-organisms population.



**Akisue Kuramoto, Assistant Professor**

Biomechanical analysis of worker posture/Anomaly detection in work movement/Optimal work environment design/Biological measurement/Surrounding environment recognition technology for transportation systems

## System Integration Group

### AI-robotics Field



**Kazuhiro Nakadai, Specially Appointed Professor**

Key research topics are robot audition and computational scene analysis, and wide areas are covered such as robotics, signal and speech processing, AI, and machine learning.



**Minoru Nakayama, Professor (Dept. Information and Communications Engineering)**

Human visual perception is analyzed using behavioral metrics such as EEG, eye movement, pupil responses and other responses



**Masayuki Yamamura, Professor (Dept. Computer Science)**

Artificial Intelligence with personality and emotion, Evolvable Digital Artificial Life, Wet Artificial Life enhanced by Synthetic Biology, Molecular Robots



**Kenji Nishida, Specially Appointed Associate Professor**

Statistical pattern recognition, Image processing, Computer vision, Machine learning, Facial expression detection for nursing and rehabilitation



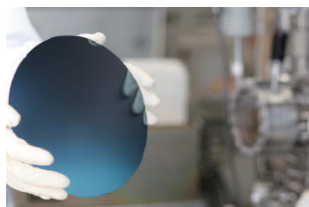
**Katsutoshi Itoyama, Specially Appointed Associate Professor (Lecturer)**

My research interests are focused on statistical audio signal processing and machine learning techniques for music information processing, audio-based scene analysis, and robotics.





# Department of Electrical and Electronic Engineering



The Department of Electrical and Electronic Engineering provides an education and conducts research into the core fields of energy technology, electronics, ICT, and more – the foundations upon which modern society and its continuous diversification and advancement are built.

Electrical and electronic engineering no longer concerns itself only with the study of electronic devices; it now serves as the foundation for all industries, including automobiles, robotics, and artificial intelligence. Students who learn electrical and electronic engineering as it is today are sought after not only by electronics manufacturers, but also by the automobile industry, societal infrastructure, and a wide variety of other fields. The Tokyo Institute of Technology has a long, proud tradition of successful research in the field, and the Department of Electrical and Electronic Engineering continues in that tradition, providing students with a solid academic foundation, a broad perspective, and creative thinking abilities they can harness to contribute to our society. We produce engineers and researchers of the highest level – individuals who can change the world.



**Yasuyuki Miyamoto**  
Department Chair

## Research

The field of electrical and electronic engineering includes the study of hardware and software technologies that sustain electrical power, information processing and communications technology systems, and the physical properties, devices, and other elemental technologies that keep such systems working properly. The Department of Electrical and Electronic Engineering provides an education that serves as the core of the field of study, and conducts cutting-edge academic and practical research, the results of which are presented at top-level conferences and in leading journals around the world. This allows us to contribute to both academia, and through collaborations with industry and government bodies, to the resolution of issues faced by our society.

Our primary fields of research are as follows: power electronics, electric power systems, power mechatronics, plasma engineering, light wave communications, photonic devices, wireless communication engineering, electronic devices, magnetic devices, spintronics, semiconductor processes, semiconductor devices, sensor devices, solar cells, organic electronic materials/properties, organic electronics, nonlinear optics, analog-digital hybrid integrated circuits, electronic circuits, nanoelectronics, nanophotonics, applied properties, and more.

## Education

At the Department of Electrical and Electronic Engineering, students acquire the fundamental knowledge and abilities required in this diverse field that studies large-scale electric energy production and control, information transmission systems that harness optical and radio wave phenomena, information processing and communication, the circuits and signal processing that serve as the foundation of computers, integrated circuits, and electronic devices. Classes teach students the fundamental theories the field is based upon, and provide a more practical understanding through a curriculum that offers simulation exercises, the opportunity to construct integrated circuits, and micro-processing experience. Our goal is to cultivate individuals who will become pioneering researchers, leading engineers and educators with open minds, creativity, and originality – individuals capable of succeeding in the related industries and fields of research and education.

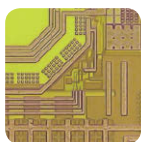
### Undergraduate programs

- \* School of Engineering
- \* Department of Electrical and Electronic Engineering

### Graduate programs

- \* Electrical and Electronic Engineering
- \* Energy Science and Engineering
- \* Human Centered Science and Biomedical Engineering
- \* Nuclear Engineering

## Research Groups and Fields of Research



### Circuit Group

Studying the most sophisticated analog and digital circuit design technologies necessary for advanced electronic devices

Integrated Circuit Field



### Electric Power and Energy Group

Gaining a thorough understanding of advanced power systems, power conversion, electrical equipment, high voltage and environmental technologies

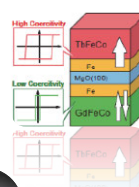
Electric power system Field  
Power electronics Field  
Plasma and environment Field  
Electric machinery Field



### Photonics, Ultrasonics, and Communications Group

Researching the hardware and software needed to build the next generation of communications networks

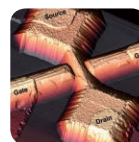
Photonics Field      Wireless communications Field  
Ultrasonics Field



### Electronic Materials Group

Developing cutting-edge devices and methods to control the physical properties of new functional materials

Energy Electronics Field  
Spintronics Field  
Nano- and Bio-photonics Field  
Organic electronics Field  
Integrated electronics Field  
Bioelectronics Field



### Device Group

Researching the innovative devices needed to create advanced low power and ultra-fast electronics

Green Device Field  
Compound Semiconductor Device Field  
Terahertz device Field  
Quantum Functional Device Field  
Intelligent Device Field



## Faculty

LANE: Laboratory for Advanced Nuclear Energy  
FIRST: Laboratory for Future Interdisciplinary Research of Science and Technology

### Circuit Group

#### Integrated Circuit Field



**Kenichi Okada, Professor**

Millimeter-wave Wireless Transceiver/5G/Battery-less IoT Wireless Sensor Node/CMOS Integrated Circuits/PLL/Atomic Clock/Terahertz Communication&Sensing&Imaging



**Atsushi Shirane, Assistant Professor**

5G, IoT, Satellite Communication, Wireless Communication, Wireless Power Transfer, Machine Learning



**Hiroyuki Ito, Associate Professor (Nano Sensing Unit)**

Integrated Circuit Technology/Sensing System with Ultra High Sensitivity/Intelligence of Things/Edge AI/IT for Agriculture



**Takashi Tokuda, Professor (FIRST)**

Integrated Circuits, Sensors, Optoelectronics, Biomedical Devices, IoT Devices, Wireless Circuits

### Photonics, Ultrasonics, and Communications Group

#### Wireless communications Field



**Jiro Hirokawa, Professor**

Millimeter-wave high-efficiency planar antenna, 2D beam-switching circuit, fast analysis for antenna design, 2D orthogonal multiplexing



**Takashi Tomura, Tenure-track Assistant Professor**

Research based on electromagnetic engineering: large-scale EM analysis, near-field communication system, satellite on-board & phased array antennas.



**Kei Sakaguchi, Professor**

Wireless communication engineering  
5G/IoT/Millimeter-wave/Wireless energy transmission  
Connected car/Automated driving



**Tran Gia Khanh, Associate Professor**

Gbps-class wireless backbone network, Radio resource management using AI, IoT networks employing drones



**Takahiro Aoyagi, Associate Professor**

Electro Magnetic Comatibility (EMC), Measurement of Electrical Properties, Wave Propagation, Wireless Communication System, Body Area Networks



**Atsuhiko NISHIKATA, Associate Professor**

EMC/RF material evaluation/EM shielding and absorption  
MMW's biological thermal effect/Radio retroreflector  
EM source estimation/Spatial acoustics



**Teruya Fujii, Specially Appointed Professor**

Wireless transmission technologies for the 5th and 6th mobile communication system/The 3D cell layout and network cooperation control/HAPS Cellular system/ Cellular drone repeater system for disaster.



**Hideki Omote, Specially Appointed Associate Professor**

5th and 6th mobile communication system/Radio propagation for the 5th,6th mobile communication system and HAPS Cellular system/International standardization of mobile radio propag

### Photonics, Ultrasonics, and Communications Group

#### Photonics Field



**Nobuhiko Nishiyama, Professor**

Photonic-electronic convergence integrated circuits based on heterogeneous integration/High-speed semiconductor lasers/Lidar system for car



**Tomohiro Amemiya, Assistant Professor (FIRST)**

Integrated optics, Metamaterials, Plasmonics, Semiconductor optical devices



**Yuya Shoji, Associate Professor (FIRST)**

Waveguide optical isolator/Magneto-optical signal processing device/Silicon photonics/Photonic integrated circuit/On-chip photonic network device



**Kensuke Ogawa, Specially Appointed Professor**

Photonic integrated circuits/Optical devices on photonic-electronic integration platforms/Ultrafast photonics/Time-resolved spectroscopy/Lightwave sensing/Optical interferometry



**Fumio Koyama, Professor (FIRST)**

VCSEL photonics, photonic integrated devices, high-speed semiconductor lasers, optical communications and Interconnects, optical sensing for automotive applications, high power semiconductor lasers



**Takahiro Sakaguchi, Assistant Professor (FIRST)**

Opto-electronics/Distributed Bragg Reflector Vertical Cavity Surface Emitting Laser/Opto-photonic module/Semiconductor Devices



**Masanori Nakahama, Assistant Professor (FIRST)**

Opto-electronics/Semiconductor Wavelength Tunable Laser/High Power Laser/Tunable VCSEL employing Micro-Electro-Mechanical-System/High Power Semiconductor Laser with High Beam Quality for Laser Imaging.



**Hiroyuki Uenohara, Professor (FIRST)**

We have been pursuing the optical routing/node systems and related photonic functional devices using optical signal processing with high-speed, low power consumption.



**Tomoyuki Miyamoto, Associate Professor (FIRST)**

Configuration of optical wireless power transmission (OWPT) systems/Development of modules and devices for OWPT/Creation of new applications of OWPT

### Photonics, Ultrasonics, and Communications Group

#### Ultrasonics Field



**Kentaro Nakamura, Professor (FIRST)**

Ultrasonic transducers and industrial applications of ultrasonics; Medical applications of optical/ultrasonic methods; Optical fiber sensors and their applications



**Marie Tabaru, Associate Professor (FIRST)**

Biomedical Engineering Measurement/Agricultural Engineering Measurement/Medical Engineering/Wave Engineering/Advanced Diagnostic Imaging



**Minoru Kuribayashi Kurosawa, Associate Professor**

Acoustics/Ultrasonics/Mechatronics/Transducers Surface acoustic wave motor/Piezoelectric device Energy harvesting/Hi-Fi audio/Passive intermodulation

### Device Group

#### Compound Semiconductor Device Field



**Yasuyuki Miyamoto, Professor**

Compound Semiconductor electron devices/Steep Slope FET/Power electronics IC/InP/GaN/2-D semiconductor/Crystal growth/Ultrafine process





**Masahiro Watanabe, Associate Professor**

Nanostructure devices, Function design of electronic and photonic devices: Nanostructure-silicon photonics, Nonvolatile quantum effect memory, Advanced nano-heterostructure process technology



**Hitoshi Wakabayashi, Professor**

Electron Devices: Advanced 3D MISFET (Silicon) and 2D FET



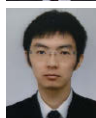
**Iriya Muneta, Assistant Professor**

Spintronics/Transition-metal chalcogenides/2D layered materials/Magnetism/Valleytronics/Electron correlation/Magnetoresistance/Spin injection



**Kazuo Tsutsui, Professor (FIRST)**

Semiconductor devices/process technology/GaN and Si power devices/atomic level analyses of doped impurities



**Takuya Hoshii, Assistant Professor**

Semiconductor devices/process technology/MISFET and MIS-HEMT/power devices/atomic level analyses of doped impurities/crystal growth

## Device Group

### Quantum Functional Device Field



**Yukio Kawano, Associate Professor (FIRST)**

Terahertz image sensors and their application to industrial and medical inspection, Terahertz and infrared plasmonic probes, Near-field terahertz and infrared spectroscopic imaging and material analysis



**Takamasa Kawanago, Assistant Professor (FIRST)**

Self-assembled molecule monolayer for gate dielectrics  
Transfer printing for building functional devices  
Organic/inorganic interfacial phenomena

## Device Group

### Intelligent Device Field



**Shun-ichiro Ohmi, Professor**

Semiconductor devices, Integrated electron device. Research on new functional device utilizing high-k and ferroelectric thin films

## Device Group

### Terahertz Device Field



**Masahiro Asada, Professor (FIRST)**

Semiconductor nano-devices/terahertz electronics, devices, and circuits/semiconductor terahertz sources/terahertz response of nanostructure/resonant tunneling devices



**Safumi Suzuki, Associate Professor**

Terahertz electronic devices, High electron mobility transistor, Terahertz applications (Wireless communication, Spectroscopy, etc.)

## Device Group

### Green Device Field



**Mutsuko Hatano, Professor**

Quantum sensors and power devices using widegap semiconductors. Developing wide-field technologies from materials to systems for energy and medical applications.



**Tetsuo Kodera, Associate Professor**

Fundamental technologies toward quantum communication and quantum computers, Group IV semiconductor physics, Quantum spin physics, New functional devices using quantum technologies.



**Takayuki Iwasaki, Associate Professor**

Quantum sensing and quantum emitter using atomic-scale structures in diamond toward next-generation low-loss power devices and biological/medical applications.



**Kuniyuki Kakushima, Associate Professor**

Interface control based on process and material development for semiconductor devices including memory, energy, power (Si, wide bandgap), medical imaging.



**Keigo Arai, Assistant Professor**

Precision sensing and imaging via quantum manipulation of spins in diamond/From development of new measurement protocols to applications in life science and electronics for the IoT era

## Electronic Materials Group

### Energy Electronics Field



**Akira Yamada, Professor**

Development of high-efficiency thin-film solar cells, Cu(In,Ga)Se<sub>2</sub> and Cu<sub>2</sub>ZnSn(SSe)<sub>4</sub> absorber materials, Developing tandem solar cells using a perovskite top cell



**Shinsuke Miyajima, Associate Professor**

Semiconductor/Photoelectric conversion materials and devices/Group IV amorphous and nanocrystalline, Oxide, and Organic-inorganic perovskite materials



**Kazuyoshi Nakada, Assistant Professor**

Solar cell, Semiconductor physics, Crystalline silicon solar cells, Cu(In,Ga)Se<sub>2</sub> solar cells, Cu(In,Ga)Se<sub>2</sub>/perovskite tandem solar cells

## Electronic Materials Group

### Spintronics Field



**Shigeki Nakagawa, Professor**

Spintronics (Perpendicular MRAM, Half-metallic ferromagnets), Magnetic films for energy conversion, Magnetic film devices with high magnetic anisotropy, High density magnetic recording technology



**Yota Takamura, Assistant Professor**

Spintronics (Half-metallic ferromagnets, Si-based devices, Perpendicular magnetic anisotropy, Superconductors) Soft magnetic thin films for power electronics applications



**Pham Nam Hai, Associate Professor**

Spintronics/Ferromagnetic semiconductor/Topological Insulator/Magnetoresistive Random Access Memory/Magnetic sensor/Semiconductor spin device

## Electronic Materials Group

### Nano- and Bio-photonics Field



**Kotaro Kajikawa, Professor**

Our group aims at developing the fields of nanophotonics, surface plasmon and metamaterials and the related for novel optical devices.



**Mana Toma, Assistant Professor**

Plasmonics/Nano-Micro Structure Science/Biosensor



**Haruhiko Ito, Associate Professor**

We study Nanophotonics with near-field light and Atomphotonics for controlling laser-cooled atoms, and develop quantum-functional devices with atoms and spins.



**Takayuki Okamoto, Specially Appointed Professor**

Nanophotonics/Plasmonics/Optical devices/Organic light emitting diode/Organic thin-film solar cell/Broadband light absorber/Radiative cooling

## Electronic Materials Group

### Organic Electronics Field



**Takaaki Manaka, Professor**

Organic electronics/Organic devices/Evaluation techniques for organic semiconductor/Organic dielectric materials/Non-linear Optics/Liquid Crystals



**Dai Taguchi, Assistant Professor**

Analysis of electrical and electronic materials, and novel electrical and optical techniques for probing these materials based on dielectric physics.



**Hiroaki Iino, Associate Professor (FIRST)**

Organic electronics/Imaging devices/Liquid crystalline organic semiconductors/Organic thin film transistors/Printed electronics/Molecular alignment

## Electronic Materials Group

### Integrated Electronics Field



**Satoshi Sugahara, Associate Professor (FIRST)**

Integrated Devices and Circuits/High-Speed and Low-Power Devices/Energy-Efficient Circuits/Wearable Electronics

## Electronic Materials Group

### Bioelectronics Field



**Takamichi Nakamoto, Professor**  
(Dept. Information and Communications Engineering)

Biologically-inspired Sensors/Electronic Measurement/Embedded Systems/Human Olfactory Interface/Odor Sensor/Olfactory Display

## Electric Power and Energy Group

### Electric Power System Field



**Kenichi Kawabe, Tenure-track Assistant Professor**

Power system engineering/Power engineering/Wind power/Photovoltaic power/Energy storage/Power electronics-based devices/Mathematical Programming

## Electric Power and Energy Group

### Power Electronics Field



**Hideaki Fujita, Professor**

Power electronics circuits and systems for solar, wind, micro-hydro power generation. High-efficiency and multifunctional power converters for industrial motor drive and induction heating.



**Makoto Hagiwara, Associate Professor**

Application of power electronics to next-generation electric power systems, battery energy storage systems, electric vehicles and renewable energies.



**Kenichiro Sano, Tenure-track Assistant Professor**

Power electronics in electric power systems: High voltage DC transmission for offshore wind farms, transient analysis of power systems, power qualities in distribution systems



**Takahiro Urakabe, Specially Appointed Professor**

Power electronics, Modeling of power semiconductor devices



**Shigeki Harada, Specially Appointed Associate Professor**

Power electronics, Modeling of power semiconductor devices

## Electric Power and Energy Group

### Electric Machinery Field



**Akira Chiba, Professor**

Power Mechatronics and Intelligent Drive: Bearingless motor drive with integrated motor and magnetic bearing functions. Switched reluctance motors for high efficiency and compactness for EV, hybrid vehicles, and next generation automobiles.



**Kyohei Kiyota, Associate Professor**

Efficiency and output improvements and acoustic noise reduction of reluctance and bearingless motors



**Yusuke Fujii, Assistant Professor**

Electric machinery/ power electronics / control theory/ magnetic suspension/ motor drive



**Hiroshi Nakamura, Specially Appointed Professor**

Robotics actuator for human cooperative motion

## Electric Power and Energy Group

### Plasma and Environment Field



**Koichi Yasuoka, Professor**

High-voltage and Plasma Engineering. Arcless hybrid switch for AC/DC power distribution, Mineralization of persistent organic substances for water reclamation



**Nozomi Takeuchi, Associate Professor**

Plasma Engineering/High Voltage Engineering/Electrostatic Engineering/Plasma in contact with liquid for advanced water treatment process and treatments of carbon materials/Electrohydrodynamics and its applications



**Shungo Zen, Assistant Professor**

Atmospheric pressure plasma application/Plasma Engineering/High Voltage Engineering/Power Engineering/Energy Storage Material/Solar Cell/Hybrid DCCB



**Yoshiyuki Oguri, Professor, (LANE)**

Interaction between ion beams and hot plasmas related to inertial fusion/Accelerator-based trace-element analysis/Medical application of MeV ion beams



**Hiroshi Akatsuka, Associate Professor (LANE)**

Modeling of atomic-molecular processes in plasmas, spectroscopic measurement/Interaction with electromagnetic field/Astronautic or nuclear applications

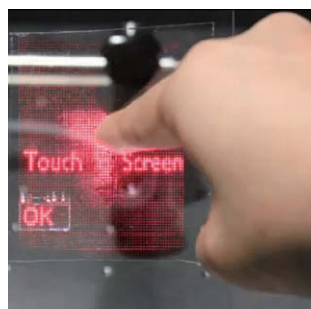


**Akitoshi Okino, Associate Professor (FIRST)**

Development of brand-new atmospheric plasma sources and its applications for medical/analytical/material field



# Department of Information and Communications Engineering



Contributing to a richer, more sustainable society through research and education aimed at advanced information and communication technologies

One of the defining characteristics of our department is the interdisciplinary academic environment designed to aid in the development of information and communications technologies (ICT) designed for human use. The research and education cover a broad range of topics, from the hardware that is the foundation of information processing, to signal processing technologies, machine learning technologies, advanced intelligent information processing, the mechanisms behind human recognition, human interface systems, and medical technology. We are also actively engaged in collaborative research with corporations and research institutions in Japan and around the world, and provide students with numerous opportunities to experience that work first-hand. Information and communications technologies will continue to evolve, and the roles they play in society will likely increase as well. We educate students with hopes and dreams and untamable vitality, who will lead the drive towards a rich and exciting future with ICT.



**Wakaha Ogata**  
Department Chair

## Research

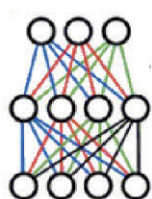
The aim of the Department of Information and Communications Engineering is to contribute to the academic fields that study both fundamental and applicable hardware and software technologies that will allow us to build a sustainable and user-friendly ICT-based society. In order to construct human-centric ICT systems, we need a better understanding of human emotion and the cerebral mechanisms upon which those emotions are based. In addition, we must build structures that allow for effective communication between people and the machines they use, and mechanisms for advanced information processing beyond human capabilities. In order to realize these objectives, we require technologies that can process and transmit vast amounts of information quickly. It is for this reason that the Department of Information and Communications Engineering conducts research in a broad range of technical fields, and puts a strong focus on the intercommunication and exchange between those fields. In concrete terms, our research efforts are directed towards ICT study, in areas that include communications and networks, signal processing, very-large-scale integration (VLSI), computers, security, media information processing, biometric information processing, sense information processing, and intelligent information processing. ICT systems have the potential to change our lives greatly, and our goal is to continuously work towards expanding that potential from the very frontier of the fields.

## Education

Students in the master's program gain a fundamental understanding and practical skills as we foster within them a broad overview of the ICT industry as a whole. They simultaneously engage in a variety of activities that provide them with a strong ethical stance needed when viewing the world from the global perspective and engaging in research and development. The aim of these efforts is to graduate future researchers and engineers with a level of competence that is world-class, resulting in leading individuals capable of working in industries around the globe. In the doctoral program, the aim is the help students develop these abilities and perspectives even further, and to cultivate further leaders who will carve a path to new frontiers of science and technology that will make our global society even richer.

Many students who graduate from this department and the specialty program that was its predecessor move on to work in jobs connected to electronic and electrical engineering and in corporations active in the field of ICT. Our graduates are active in a broad range of other fields as well, with some moving on to positions in the mechanical and automobile industries or in chemical/material related work, and some working in the fields of finance and consulting. Graduates of our doctoral degree program can also be found at universities and private research institutes both here in Japan and abroad.

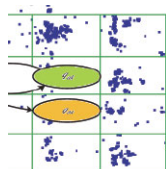
## Research Groups and Fields of Research



### Human Information Systems Group

Clarifying the underlying mechanisms of human senses, perception, cognition and motor control, engineering mechanisms that mimic those functions, and researching their application systems

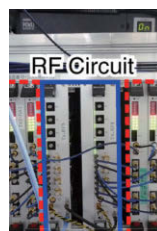
Sensory Information Processing Field  
Intelligent Information Processing Field  
Media Information Processing Field  
Biological Information Processing Field



### Signal Processing Group

Researching fundamental mathematical technologies and effective algorithms for processing various types of signals

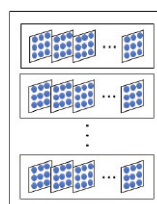
Media Signal Processing Field  
Inverse Problems Field



### Communication, Networks, and Security Group

Researching algorithms and hardware systems that ensure safe, accurate and speedy transmission of information

Communication Systems Field  
Information Theory and Security Field  
Communication Networks Field



### Integrated Circuit and Computer Group

Researching the algorithms, design technologies, and mechanical systems required to produce high-performance computational systems

Digital Integrated Circuits Field  
Analog Integrated Circuits Field  
Distributed Information and Advanced Communication Systems Field

## Faculty

### Human Information Systems Group

#### Sensory Information Processing Field



**Makio Kashino, Visiting Professor**

Brain mechanisms of auditory perception, sensory characteristics in autism, decoding of mental states from biological signals, sports brain science



**Hirohiko Kaneko, Professor**

Visual information processing, Psychophysics, Space perception, Stereopsis, Binocular disparity processing, Multisensory integration, Eye movements, Perceptual adaptation



**Rumi Hisakata, Assistant Professor**

Psychophysics/Human visual processing/Binocular vision and 3D perception/Motion perception/Visual illusions/small eye movements/visual stability



**Yasuharu Koike, Professor (Biointerfaces Unit)**

Computational Neuroscience, Human Motor Control Theory, Human interface: Brain Machine Interface, Analysis of subjective feeling based on computational model



**Natsue Yoshimura, Associate Professor (Biointerfaces Unit)**

Brain activity information decoding (motor control, emotion, language, etc)/Brain-machine interfaces/Machine learning/EEG/fMRI



**Hiroyuki Kambara, Assistant Professor (Biointerfaces Unit)**

Computational Neuroscience: We proposed computational model for neural motor learning of reaching movements.



**Imari Sato, Visiting Professor**

Computer vision, Computer graphics, Spectral imaging, Computational photography, and Modeling reality.



**Petter Holme, Specially Appointed Professor (Biointerfaces Unit)**

Network theory, computational social science



**Takehiro Nagai, Associate Professor**

Psychophysics/affective engineering/color engineering/color perception/material perception/image processing based on properties of human visual perception

### Human Information Systems Group

#### Intelligent Information Processing Field



**Itsuo Kumazawa, Professor (FIRST)**

Image Processing, Image Recognition, User Interface, Tactile Display, Optical Sensor, Virtual Reality, Artificial Neural Network



**Minoru Kuribayashi Kurosawa, Associate Professor (Department of Electrical and Electronic Engineering)**

Acoustics/Ultrasonics/Mechatronics/Transducers Surface acoustic wave motor/Piezoelectric device Energy harvesting/Hi-Fi audio/Passive intermodulation



**Nobuhiko SUGINO, Professor (GSIC)**

Code Optimization Methods for GPGPU, Automatic Parallelizing Compilers, Implementation Techniques of Digital Signal Processing



**Yoshihiro Watanabe, Associate Professor**

Computer vision, Augmented reality, Visual display, Digital archiving, Human computer interaction



**Masato Motomura, Professor (AI Computing Research Unit)**

Reconfigurable Hardware, Intelligent Computing, Deep Learning Processor, Annealing Machine

FIRST: Laboratory for Future Interdisciplinary Research of Science and Technology  
GSIC: Global Scientific Information and Computing Center  
ASIST: Advanced Research Center for Social Information Science and Technology  
WRHI: Tokyo Tech World Research Hub Initiative



**Jaehoon Yu, Associate Professor (AI Computing Research Unit)**

System Architecture, Intelligent Computing, Deep Learning Processor, Computer Vision



**Thiem Van Chu, Assistant Professor (AI Computing Research Unit)**

Computer Architecture, Reconfigurable Hardware, FPGA, AI Computing

### Human Information Systems Group

#### Media Information Processing Field



**Manabu Okumura, Professor (FIRST)**

natural language processing, text summarization, computer assisted language learning, sentiment analysis, text data mining



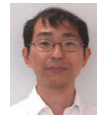
**Hiroya Takamura, Professor (FIRST)**

Computational Linguistics/Natural Language Processing/Machine Learning



**Hidetaka Kamigaito, Assistant Professor (FIRST)**

Natural Language Processing/Machine Translation/Syntactic Parsing/Automatic Summarization



**Takahiro Shinozaki, Associate Professor**

Speech information processing putting the focus on automatic speech recognition and understanding, statistical pattern recognition, machine learning.



**Takamichi Nakamoto, Professor (FIRST)**

Human Olfactory Interface/Olfactory Display/Odor Sensing System/Sensory Information Processing/Embedded System/Biologically-inspired Sensing System



**Katsuhito Akahane, Assistant Professor (FIRST)**

Virtual reality/Human interface/Haptic display



**Shoichi Hasegawa, Associate Professor (FIRST)**

Virtual reality technologies, especially haptics and physics simulation and application to interactive embodied agents and entertainment



**Hironori Mitake, Assistant Professor (FIRST)**

Character Technology to Enrich Life : Conversational Agent with Social/Physical Presence, Touchable Virtual Creature, Motion Generation with Sensor/Motor Simulation etc.



**Masahiro Yamaguchi, Professor**

Optical imaging and display/Spectral imaging and display/Color reproduction/Image analysis for pathology/Holography/Light-field display/3D user interface



**Tomoya Nakamura, Assistant Professor**

Computational optics, Optical design, Image processing, Coded imaging, Holography



**Kotaro Funakoshi, Associate Professor**

Natural language processing, Multimodal dialogue system, Human-machine interaction



## Human Information Systems Group

### Biological Information Processing Field



**Takashi Obi**, Associate Professor (FIRST)

Medical information system, Medical information network, National e-ID, Medical image processing. Medical information analysis



**Marie Tabaru**, Associate Professor (FIRST)

Biomedical Engineering Measurement/Agricultural Engineering Measurement/Medical Engineering/Wave Engineering/Advanced Diagnostic Imaging



**Kentaro Nakamura**, Professor (FIRST)

Ultrasonics, High power ultrasonics, Optical instrumentation, Optical fiber sensors, Medical measurement and imaging with ultrasonic and optical methods



**Kenji Suzuki**, Specially Appointed Professor (WRHI)

We develop computational intelligence that learns, from image examples, physicians' knowledge in interpreting images to help make smart decisions in biomedicine.

## Signal Processing Group

### Media Signal Processing Field



**Minoru Nakayama**, Professor

Human visual perception and their characteristics in various aspects are analyzed using some behavioral metrics such as EEG, eye movement, pupil responses and other responses.



**Izumi Ito**, Assistant Professor

Signal processing/Image processing/Transforms and spectral techniques

## Signal Processing Group

### Inverse Problems Field



**Isao Yamada**, Professor

Algorithms for Variety of Mathematical Problems in Signal Processing, Optimization, Inverse Problems and Data Science



**Masao Yamagishi**, Assistant Professor

Signal Processing/Optimization/Inverse Problems/Adaptive Filtering

## Communication, Networks, and Security Group

### Communication Systems FieldF



**Kazuhiko Fukawa**, Professor

Transmission and network techniques for wireless communications by developing digital signal processing, adaptive filters, and statistical based algorithms.



**Yuyuan CHANG**, Assistant Professor

Mobile communication, millimeter wave communication, multiple input multiple output (MIMO) systems, multi-user MIMO (MU-MIMO) systems, user scheduling, wireless sensor network



**Yukihiro Okumura**, Visiting Professor

Next generation mobile communication system/Radio access technologies/Radio Access Networks/Mobile Radio Applications

## Communication, Networks, and Security Group

### Information Theory and Security Field



**Tomohiko Uyematsu**, Professor

Information theory for non-parametric data, network information theory, and random number generation



**Tetsunao Matsuta**, Assistant Professor

Multi-user information theory/Non-asymptotic analysis in information theory/Cache-aided communication/Non-asynchronous communication/Rumor source identification in networks



**Wakaha Ogata**, Professor

Cryptography, Encryption, Digital signature, User authentication, Secret sharing, Cryptographic protocol, Multi-party protocol



**Kenta Kasai**, Associate Professor

Coding Theory/LDPC Codes/Spatially-Coupled Codes/Graphical Models/Fountain Codes/Quantum Error Correcting Codes/Memory Channels



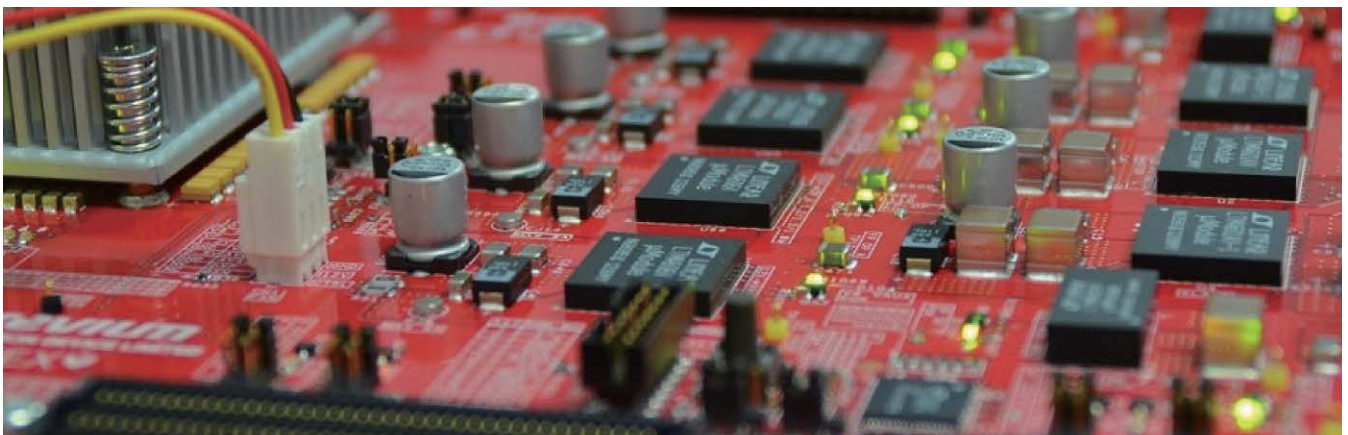
**Daniel Berrar**, Specially Appointed Associate Professor

Data science, machine learning, statistics, bioinformatics, systems biology



**Ryutaroh Matsumoto**, Associate Professor

Quantum Information Processing, Information Theoretic Security, Algebraic Error-Correcting Code, Adversarial Machine Learning



## Communication, Networks, and Security Group

### Communication Networks Field



**Yoshiaki Kitaguchi**, Associate Professor (GSIC)  
Information and communication engineering/Next generation network operation and management/Network security/System dependability evaluation/Inter-cloud system

## Integrated Circuit and Computer Group

### Digital Integrated Circuits Field



**Tsuyoshi Isshiki**, Professor  
System-on-Chip design verification automation, high-performance processor design automation, secure VLSI architecture



**Dongju Li**, Assistant Professor  
Fingerprint Authentication/SOC Architecture/Information Security



**Satoshi Tayu**, Assistant Professor  
Graph algorithm/Combinatorial optimization



**Atsushi Takahashi**, Professor  
High-performance VLSI Design System/Electronic Design Automation (EDA)/Physical Design/Design for Manufacturability (DFM)/Next-Generation Lithography/Graph Theory/Combinatorial Optimization/Synchronous Circuits/Adaptive Computation



**Yuko Hara**, Associate Professor  
Embedded Systems, Internet-of-Things (IoT), High-Level Synthesis, Logic Synthesis, Hardware/Software Co-design, Computer Aided Design (CAD), Architecture/Microprocessor, FPGA

## Integrated Circuit and Computer Group

### Analog Integrated Circuits Field



**Shigetaka Takagi**, Professor  
Our main research topics are analog integrated circuit designs for high linearity, high-speed operation, low supply voltage operation, reduction in power consumption, etc.



**Hiroki Sato**, Assistant Professor  
CMOS Analog Integrated Circuit, Low-Voltage Circuit Technique, Signal Processing, IP Networking, Computer Security

## Integrated Information and Communications Group

### Distributed Information and Advanced Communication Systems Field



**Katsunori Yamaoka**, Professor  
Information and Communication Network/Internet Technology/Telecommunication Networking/Next and Future Network/Network Engineering for Multimedia and Application



**Hiroki Nakahara**, Associate Professor  
Reconfigurable System, FPGA, Deep Learning, Multi-Valued Logic



**Shimpei Sato**, Assistant Professor  
Digital circuit design/Variable latency circuit/Computer architecture/Many-core processor/Network on Chip/Approximate computing



**Hiroshi Sasaki**, Associate, Professor  
Computer Architecture, Computer Security, Computer Systems, Internet of Things (IoT), Workload Characterization





# Department of Industrial Engineering and Economics



How do we more effectively produce and offer better products at lower prices? In order to help people live richer, happier lives, we must thoroughly and logically consider scientific and technological perspectives on what sort of society we should build for the future.

It is necessary to utilize scientific tools such as modelling, quantitative analysis and statistical processing to better respond to constantly changing financial and operational conditions. The knowledge and understanding gleaned using these tools can be used to build even better systems when we utilize the strengths of engineering approaches that have been honed through on-site experience.

This is the strength of the Department of Industrial Engineering and Economics – the ability to combine the theoretical base provided by science and engineering with practical skills and experience.



**Hiroyuki Umemuro**  
Department Chair

## Research

Our aim is to analyze various issues in corporate management and economics from the perspectives of mathematics, science, engineering, business administration, economics and various other fields of study, and attempt to find solutions. It is for this reason that the areas and topics of research undertaken in this department are so diverse.

Areas of study include: business strategy; capital procurement and investment; organization management; strategic and financial analysis of management activities through marketing and other means; production management; quality management; supply chain management; finding solutions to various corporate operational issues using management information systems; industrial engineering; ergonomics; cognitive engineering; psychological understanding of human behavior; operations research; optimization; development of mathematical problem solving methods such as analysis of big data; game theory; micro/macroeconomics; econometrics; experimental economics; economic behavioral analysis using mathematical and engineering approaches.

## Education

Our curriculum is centered on four pillars of mathematics, economics, business administration, and management technology, and it is designed to provide a focus on specific subjects while helping students reach their educational goals. Our students are able to become engineers, researchers, and specialists with rich imaginations, with the ability to come up with theoretical structures that carve out new areas of research, and with open minds that enable them to put their ideas into practical use.

Approximately 70% of our undergraduates advance to graduate study, while the others start working after their undergraduate degree in various industries that include manufacturing and consulting, and financial industries such as banking, insurance, and securities. Graduates with master's degree also go on to work in a broad range of industries, while the relatively high rate of students work in manufacturing and consulting-related fields. Graduates of the Department of Industrial Engineering and Economics have excellent mathematical abilities and are well-versed in both management and economics theory. They can be found in a broad array of fields, and they are highly thought of in all industries in which they work.

## Research Groups and Fields of Research



### Advanced Management and Paradigm Creation Group

Developing optimization methods through engineering analysis focused on industrial processes including development, production, and sales, and on human behavior in those processes.

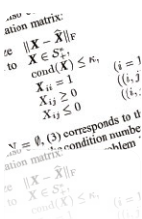
Industrial System Field  
Human Centered System Field  
Operations Management Field



### Corporate System Creation Group

Conducting scientific analysis of corporations that act as drivers of innovation, and presentation of strategies for optimal corporate governance, management/organization, marketing, and capital.

Corporate Governance System Field  
Management Strategy / Marketing Field



### Analysis Method Creation Group

Developing analytical methods for diverse types of information and optimization methods of management and economic activities, based on mathematical and statistical analysis and active utilization of AI.

Mathematical Sciences and Informatics Field  
Operations Research Field  
Econometrics Field  
Cyber Physical System Field



### Economic Science Group

Analyzing economic and social systems based on economics, and designing and presenting policies and institutions that could achieve desirable economic and social situations.

Macroeconomics/Cliometrics Field  
Microeconomics/Game Theory Field  
Humanomics Field  
Global Environmental Research Field

## Faculty

### Advanced Management and Paradigm Creation Group Industrial System Field



**Kenji Itoh, Professor**

Ergonomics/cognitive engineering/safety engineering/patient safety/Holistic Management System



**Xiuzhu Gu, Associate Professor**

Risk management / patient safety/healthcare operations management/applied ergonomics/occupational health and safety

### Advanced Management and Paradigm Creation Group Human Centered System Field



**Hiroyuki Umemuro, Professor**

Products or services that provide affective experiences/technology and aging/human-robot(agent)-interaction/management considering affective experiences of stakeholders



**Hirotaka Aoki, Associate Professor**

Cognitive ergonomics/cognitive task analysis applying eye tracking technique/usability and user experience evaluation/development of cognitive task analysis methods/industrial engineering



**Jacqueline Urakami, Assistant Professor**

Human Factors/culture and technology/cognitive ergonomics for interface design/technology for an aging society

### Advanced Management and Paradigm Creation Group Operations Management Field



**Masami Miyakawa, Professor**

Applied statistics/Multivariate analysis/Statistical causal inference/Design of Experiment/Taguchi method



**Sadami Suzuki, Associate Professor**

Production management/operations management/logistics/supply chain management/customer satisfaction/customer value/service management

### Analysis Method Creation Group Operations Research Field



**Shinji Mizuno, Professor**

Modeling of problems in management science and engineering/approach by operations research/development and analysis of optimization algorithms/solution methods and evaluation



**Kazuhide Nakata, Associate Professor**

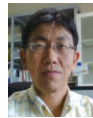
We focus on operations research, machine learning, and optimization. In particular, we develop algorithms for precisely analyzing large scale models.

### Analysis Method Creation Group Mathematical Sciences and Informatics Field



**Tomomi Matsui, Professor**

Optimization Algorithms based on Mathematics and Informatics./Discrete Optimization/Combinatorics/Operations Research/Algorithm



**Akiyoshi Shioura, Professor**

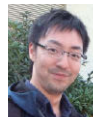
Theory of discrete convex analysis/efficient algorithms for discrete optimization problems/application to operations research, mathematical economics, etc.



**Yasushi Kawase, Assistant Professor**

Discrete optimization/Competitive analysis for online optimization/Algorithmic Game Theory/Robust optimization/Community detection in networks

### Analysis Method Creation Group Econometrics Field



**Kota Ogasawara, Associate Professor**

Cliometrics/Natural Experiments/Health Economics/Human Capital Formation/Empirical Economics/Applied Econometrics

### Corporate System Creation Group Corporate Governance System Field



**Kotaro Inoue, Professor**

Corporate finance/corporate investment policy/financial policy/corporate governance/behavioral finance



**Kyoko Nagata, Associate Professor**

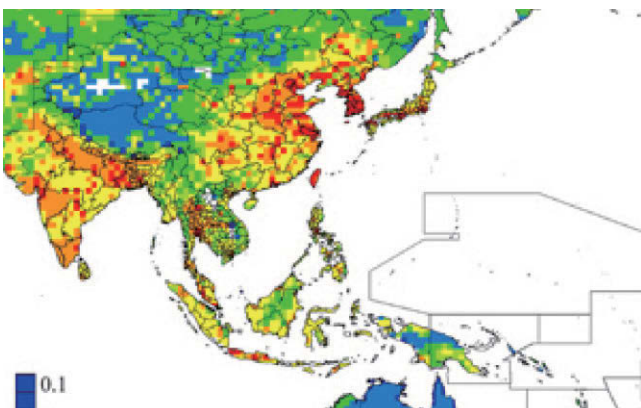
Corporate evaluation/corporate governance/profit adjustment/empirical research on capital market

### Corporate System Creation Group Management Strategy / Marketing Field



**Chung Sulin, Associate Professor**

Marketing/Distribution strategies/Retail internationalization (especially internationalization process and strategies of convenience store)/modernization of the distribution industry





## Economic Science Group

### Macroeconomics/Cliometrics Field



**Kyoko Yamamuro, Professor**

Economic History/Cliometrics/Quantitative History/Historical Data Analysis/Edo era



**Ryoji Ohdoi, Associate Professor**

Development of economic growth models based on agents' heterogeneity/analysis of international propagation of shocks/dynamic extension of trade models



**Takeo Hori, Associate Professor**

Macroeconomics/Economic Growth/Technical Progress/Structural Transformation/Heterogeneous Agents/Sustainability of Public Debts/Monetary Policy



**Daisuke Kurisu, Assistant Professor**

Mathematical statistics/Econometrics/Time series analysis/Nonparametric statistics

## Economic Science Group

### Microeconomics / Game Theory Field



**Takehiko Yamato, Professor**

Economic mechanism design/Market and public goods provision mechanisms: theory and experiments/Behavioral game theory and implementation theory



**Ryo Kawasaki, Associate Professor**

Game theory/Mathematical economics/Application of stable sets in economics/Potential games and their applications/Analysis of markets with indivisibilities



**Tomoya Kazumura, Assistant Professor**

Mechanism design/Game theory/Efficient auction design

## Economic Science Group

### Humanomics Field



**Dai Senoo, Professor**

Theory of Organization, Strategy, Knowledge Management and Information Systems. Main projects are Creative Office, Open Innovation and Business Ecosystem.



**Emiko Fukuda, Associate Professor**

Industrial economics/experimental economics/numerical analysis of game theory model/congestion management/security and disaster-relief service



**Bach Quang Ho, Assistant Professor**

My research analyzes service as a component of the society, and focuses on service systems that achieve well-being, especially those that transform people's behavior and attitudes and promote their growth.

## Economic Science Group

### Global Environmental Research Field



**Toshihiko Masui, Professor**

Development of integrated assessment model toward low-carbon and sustainable society, and quantification of future scenarios by using the developed model.



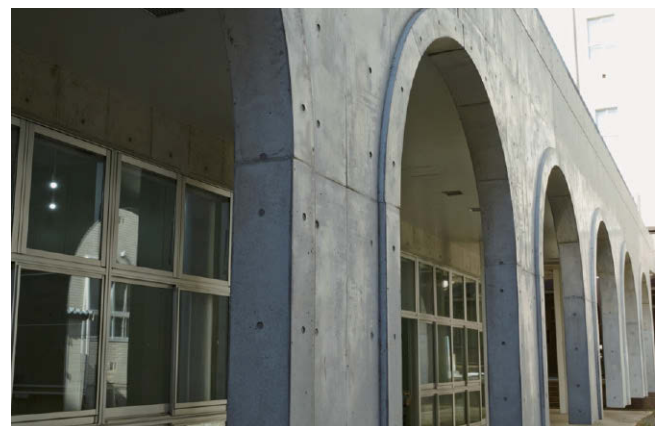
**Yuko Kanamori, Associate Professor**

Development and analysis of environmental model of household sector/lifestyle/population and household structure analysis



**Yosuke Munesue, Assistant Professor**

Impacts of food losses and waste on global food insecurity, natural resources, and greenhouse gas emissions/food loss reduction in the Sustainable Development Goals

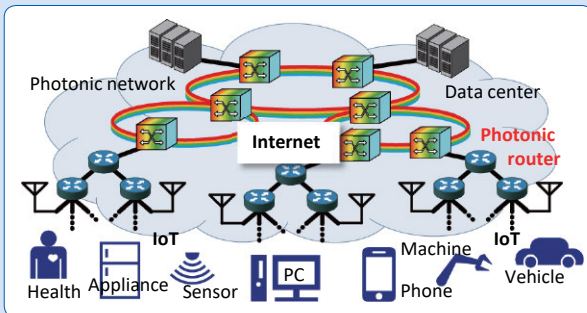


# Typical Research Projects

## JST-CREST

Advanced core technology for creation and practical utilization of innovative properties and functions based upon optics and photonics

### Development of zero standby power consumption photonic router by integrating heterogeneous materials of magnetic materials, metals and semiconductors



#### Research Overview

The research project aims to develop a novel photonic router characterized by no standby power consumption. The router is realized by integrating heterogeneous materials such as magnetic materials, metals and semiconductors on a single silicon photonic circuit chip. It has the great advantage of accommodating an increase in traffic transmitting large-capacity contents together with small-sized contents generated by IoT (Internet of Things) while preventing an increase in power consumption. The router brings about a breakthrough in infrastructural technologies for communication networks.

#### Members

**Tetsuya Mizumoto**, Executive Vice President  
**Nobuhiko Nishiyama**, Prof. (Electrical & Electronic Eng., p16)  
**Yuya Shoji**, Assoc. Prof. (Electrical & Electronic Eng. (FIRST, IIR), p16)  
**Tomohiro Amemiya**, Assis. Prof. (Electrical & Electronic Eng. (FIRST, IIR), p16)  
**Kazuhiro Ikeda**, Dr. (National Institute of Advanced Industrial Science and Technology) [Collaborator]

## Ministry of Internal Affairs and Communications, Research and Development for Expansion of Radio Wave Resources

#### Research Overview

Due to the recent advancement of AI and IoT technologies, wireless traffic is increasing year by year. 1000 times increase in 20 years is estimated for the world - wide wireless traffic. Further advanced technology is required for supporting the wireless traffic.

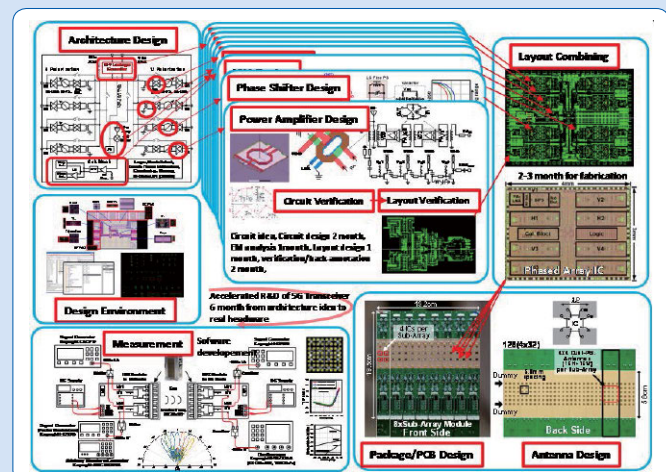
This research project is for further improvement of 5G technology and new innovative technologies for 6G and 7G. Millimeter - wave wireless communication has been introduced for 5G in addition to the conventional microwave. However, still research and development of millimeter - wave wireless communication is required to make it more effective and convenient.

In this research project, Tokyo Tech collaborates with related companies for developing wireless and IC technologies for the future 6G and 7G wireless service.

#### Members

**Kenichi Okada**, Prof. (Electrical & Electronic Eng., p.5)  
**Atsushi Shirane**, Assis. Prof. (Electrical & Electronic Eng., p.5)

#### Research and Development for 6G and Beyond



## Grant-in-Aid for Scientific Research on Innovative Area

## Science of Soft Robots



Soft robots with flexible bodies, motions, and intelligences



Research examples; from left, flight with soft wings, functional robot skin, soft artificial muscle

#### Research Overview

Conventional robotics has been aiming for power, precision, and certainty. As a result, it achieved the excellent results in the industry, but it is not yet easy to realize some flexible and adaptable motions that living creatures can easily accomplish.

In this project, researchers conducting novel researches concerning "softness" gather from mechanical/electrical engineering, material science, computer science, medicine and biology. Through this interdisciplinary study, we are aiming to create a new discipline, "Science of Soft robots." Tokyo Tech conducts on researches, "flight and swimming with soft wings", "functional soft skin", and "soft artificial muscles" and promoting the project as a key member.

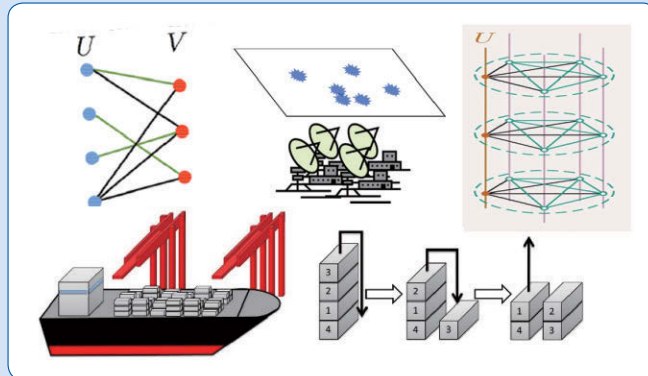
#### Members

**Koichi Suzumori**, Prof. (Mech.Eng., p10)  
**Gen Endo**, Assoc. Prof. (Mech.Eng., p10)  
**Hiroyuki Nabae**, Assis. Prof. (Mech.Eng., p10)  
**Hiroyuki Nabae**, Assis. Prof. (Mech.Eng., p10)  
**Takako Yoshida**, Assoc. Prof. (Mech.Eng., p10)  
**Toshinori Fujie**, Assoc. Prof. (School of Life Science and Technology)  
**Hiroyuki Nabae**, Assis. Prof. (Mech.Eng., p10)



## Research Project Promoted by Department of Industrial Engineering and Economics

### Optimization Technology in Industrial Engineering and Economics



#### Research Overview

Various problems in practice are often written by a similar optimization model. For example, a problem to assign tasks in a factory to machines is called a matching problem, and a solution technique is used for assigning graduating medical students to their first hospital appointments and fusing databases with multiple sensors. It is known that facility location problems of fire departments have structures similar to those of electronic components location problems on electric circuit boards, container location problems at piers and distortion sensor location problems of buildings. Techniques for solving scheduling problems in the manufacturing industry are used for determining the delivery order of parcels and for determining the hole drilling order of electric circuit boards. The Analysis Method Creation Group aims to expand the scope of application as well as deepening the optimization theory.

#### Members

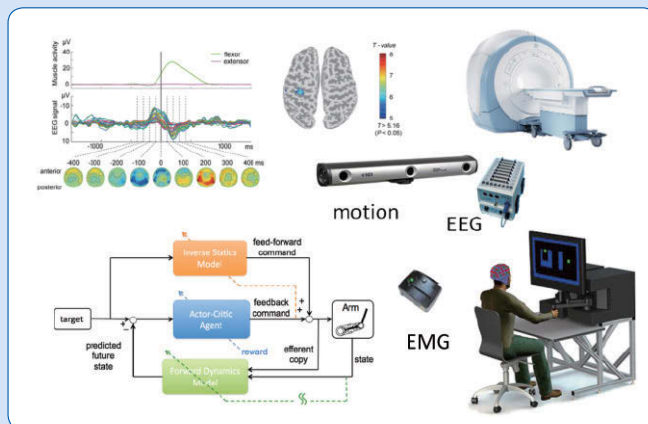
**Tomomi Matsui**, Prof. (Industrial Eng. & Econo., p24)  
**Akiyoshi Shioura**, Prof. (Industrial Eng. & Econo., p24)  
**Yasushi Kawase**, Assis. Prof. (Industrial Eng. & Econo., p24)

**Shinji Mizuno**, Prof. (Industrial Eng. & Econo., p24)  
**Kazuhide Nakata**, Assoc. Prof. (Industrial Eng. & Econo., p24)

## Program for Advancing Strategic International Networks to Accelerate the Circulation of Talented Researchers (JSPS)

### Human Interface

### Computational Neuroscience connecting behavior and brain activities



#### Research Overview

In this research, we aimed to elucidate "How does the brain represent the body motion and solve the control problem. The objective this research is to open up a new field of "Computational brain/body imaging method " which elucidate the brain's theory of computation from EEG and body motion during motion task.

We are conducting research toward realization a society that ensures the quality of life and realizes a safe and secure life by using new rehabilitation techniques and developing prosthesis integrated with the body, even if the possibility of having some disability increases as the aging.

#### Members

**Yasuharu Koike**, Prof. (Info. & Communi. Eng., p20)  
**Natsue Yoshimura**, Assoc. Prof. (Info. & Communi. Eng., p20)  
**Hiroyuki Kambara**, Assis. Prof. (Info. & Communi. Eng., p20)

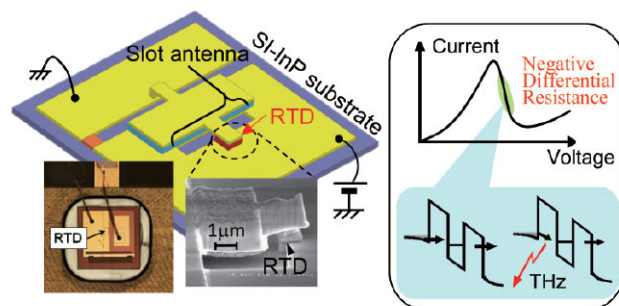
## Grant-in-Aid for Specially Promoted Research from Japan Society for the Promotion of Science

### Exploration of breakthrough in terahertz-device performance by understanding the radiation mechanism from view point of electron travelling and transition

#### Research Overview

The terahertz (THz) frequency range of approximately 0.1-10 THz remains unexplored, but various applications are expected, such as ultrahigh-speed wireless communications, imaging, and spectroscopy, etc. Compact semi-conductor sources with high power and room-temperature operation are essential for these applications. Up to now, we have succeeded a room-temperature oscillation of resonant tunneling diodes above 1 THz as the first-time achievement in electronic single devices. Because the THz range is located between light wave and millimeter wave, we have to establish comprehensive base of THz-device physics including the transport and transition of electrons in order to realize high-performance THz devices.

This project aims at establishment of THz-device physics and realization of high performance terahertz sources for various applications.



#### Members

**Masahiro Asada**, Prof. (Laboratory for Future Interdisciplinary Research of Sci. and Tech., Electrical & Electronic Eng., p17)  
**Yasuyuki Miyamoto**, Prof. (Electrical & Electronic Eng., p17)  
**Nobuhiko Nishiyama**, Prof. (Electrical & Electronic Eng., p16)  
**Safumi Suzuki**, Assoc. Prof. (Electrical & Electronic Eng., p17)

# Statistics

## Number of Staff

(As of May 1 2019)

Course	Professor	Associate Professor	Associate Professor (Lecturer)	Assistant Professor	Total
Department of Mechanical Engineering	23	26	0	21	70
Department of Systems and Control Engineering	10	7	0	10	27
Department of Electrical and Electronic Engineering	14	16	0	12	42
Department of Information and Communications Engineering	12	6	0	10	28
Department of Industrial Engineering and Economics	12	11	0	7	30
Total	71	66	0	60	197

## Number of Students

(As of May 1 2019)

### Undergraduate Course

Department	1st year				2nd year				2nd year				3rd year				Total	
	Men	Women	International Student	International Student	Men	Women	International Student	International Student	Men	Women	International Student	International Student	Men	Women	International Student	International Student	International Student	Total
Department of Mechanical Engineering	356	14	21	2	141	7	8	0	143	7	12	1	140	10	9	0	453	25
Department of Systems and Control Engineering					47	2	2	0	43	4	7	0	47	2	2	0	148	8
Department of Electrical and Electronic Engineering					64	1	4	1	75	1	6	1	84	4	2	0	235	8
Department of Information and Communications Engineering					41	0	10	1	49	2	6	0	49	4	4	0	159	7
Department of Industrial Engineering and Economics					53	0	6	0	48	2	14	1	53	0	6	0	180	3
Total	356	14	21	2	346	10	30	2	358	16	45	3	373	20	23	0	1175	51 1552

(As of May 1 2019)

### Master's Course

Department	1st year				2nd year				Total	
	Men	Women	International Student	International Student	Men	Women	International Student	International Student	International Student	Total
Department of Mechanical Engineering										
Graduate Major in Mechanical Engineering	151	27	10	5	150	21	17	7	328	60
Graduate Major in Energy Science and Engineering	9	5	1	0	16	3	1	1	27	9
Graduate Major in Engineering Sciences and Design	12	2	1	0	23	0	0	0	36	2
Graduate Major in Human Centered Science and Biomedical Engineering	19	3	1	0	20	8	1	0	41	11
Graduate Major in Nuclear Engineering	4	0	0	0	4	2	1	1	9	3
Subtotal	195	37	13	5	213	34	20	9	441	85
Department of Systems and Control Engineering										
Graduate Major in Mechanical Engineering	57	7	4	2	59	6	3	1	123	16
Graduate Major in Engineering Sciences and Design	0	0	0	0	1	1	0	0	1	1
Subtotal	57	7	4	2	60	7	3	1	124	17
Department of Electrical and Electronic Engineering										
Graduate Major in Electrical and Electronic Engineering	122	21	8	8	120	17	16	9	266	55
Graduate Major in Energy Science and Engineering	11	1	1	1	10	5	0	0	22	7
Graduate Major in Engineering Sciences and Design	8	0	1	0	12	1	2	0	23	1
Graduate Major in Nuclear Engineering	7	0	0	0	7	2	0	0	14	2
Subtotal	148	22	10	9	149	25	18	9	325	65
Department of Information and Communications Engineering										
Graduate Major in Information and Communications Engineering	80	17	15	13	82	24	9	4	186	58
Graduate Major in Human Centered Science and Biomedical Engineering	8	7	0	0	3	0	0	0	11	7
Subtotal	88	24	15	13	85	24	9		197	61
Department of Industrial Engineering										
Graduate Major in Industrial Engineering and Economics	52	5	11	5	59	5	13	7	135	22
Graduate Major in Engineering Sciences and Design	0	0	0	0	5	0	0	0	5	0
Subtotal	52	5	11	5	64	5	13	4	140	19
Total	540	95	53	34	571	95	63	23	1227	247

Interdisciplinary Graduate Majors	1st year				2nd year				Total	
	Men	Women	International Student	International Student	Men	Women	International Student	International Student	International Student	Total
Graduate Major in Energy Science and Engineering	71	19	7	2	73	15	9	1	160	37
Graduate Major in Engineering Sciences and Design	21	4	4	1	38	4	1	0	64	9
Graduate Major in Human Centered Science and Biomedical Engineering	72	18	26	8	69	15	16	5	183	46
Graduate Major in Nuclear Engineering	39	5	5	3	41	11	8	1	93	20
Graduate Major in Artificial Intelligence	60	11	8	3	69	17	13	8	150	39
Graduate Major in Urban Design and Built Environment	45	4	21	6	52	5	24	8	142	23



## Doctoral Course

(As of May 1 2019)

(As of May 1, 2019)

Doctoral Course	1st year				2nd year				3rd year						
Department	Men		Women		Men		Women		Men		Women		Total		
	International Student		International Student		International Student		International Student		International Student		International Student		International Student		
Department of Mechanical Engineering															
Graduate Major in Mechanical Engineering	20	10	3	1	25	13	0	0	19	8	3	1	70	33	
Graduate Major in Energy Science and Engineering	1	0	0	0	2	1	0	0	3	2	2	1	8	4	
Graduate Major in Engineering Sciences and Design	2	0	2	2	2	0	0	0	2	2	1	0	9	4	
Graduate Major in Human Centered Science and Biomedical Engineering	2	2	0	0	1	0	1	1	2	1	1	0	7	4	
Graduate Major in Nuclear Engineering	2	1	0	0	2	2	1	1	2	1	0	0	7	5	
Subtotal	27	13	5	3	32	16	2	2	28	14	7	2	101	50	
Department of Systems and Control Engineering															
Graduate Major in Mechanical Engineering	8	5	0	0	10	5	1	1	15	7	1	1	35	19	
Graduate Major in Engineering Sciences and Design	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Subtotal	8	5	0	0	10	5	1	1	15	7	1	1	35	19	
Department of Electrical and Electronic Engineering															
Graduate Major in Electrical and Electronic Engineering	37	20	3	3	24	12	0	0	17	11	3	3	84	49	
Graduate Major in Energy Science and Engineering	2	1	0	0	2	1	0	0	0	0	0	0	4	2	
Graduate Major in Engineering Sciences and Design	2	1	0	0	0	0	0	0	0	0	1	1	3	2	
Graduate Major in Nuclear Engineering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Subtotal	41	22	3	3	26	13	0	0	17	11	4	4	91	53	
Department of Information and Communications Engineering															
Graduate Major in Information and Communications Engineering	18	9	1	1	18	8	4	3	17	4	6	5	64	30	
Graduate Major in Human Centered Science and Biomedical Engineering	2	2	1	1	6	5	0	0	2	1	1	0	12	9	
Subtotal	20	11	2	2	24	13	4	3	19	5	7	5	76	39	
Department of Industrial Engineering															
Graduate Major in Industrial Engineering and Economics	4	3	3	3	7	1	1	1	8	4	4	3	27	15	
Graduate Major in Engineering Sciences and Design	0	0	0	0	0	0	0	0	1	0	0	0	1	0	
Subtotal	4	3	3	3	7	1	1	1	9	4	4	3	28	15	
Total	100	54	13	11	99	48	8	7	88	41	23	15	331	176	

Interdisciplinary Graduate Majors	1st year				2nd year				3rd year				Total	
	Men	Women	International Student	International Student	Men	Women	International Student	International Student	Men	Women	International Student	International Student		
Graduate Major in Energy Science and Engineering	12	2	2	1	14	5	2	1	16	8	3	2	49	19
Graduate Major in Engineering Sciences and Design	3	1	3	2	2	0	0	0	3	2	1	0	12	5
Graduate Major in Human Centered Science and Biomedical Engineering	15	8	6	5	14	8	3	2	13	3	5	2	56	28
Graduate Major in Nuclear Engineering	6	3	1	1	15	5	6	5	12	5	5	1	45	20
Graduate Major in Artificial Intelligence	21	9	4	1	10	5	3	2	21	6	5	1	64	24
Graduate Major in Urban Design and Built Environment	15	8	5	3	6	2	6	3	13	3	5	4	50	23

## Research Funds

Year	Number of Projects	Research Fund (in thousand yen)
2015	31	1,510,299
2016	48	1,273,790
2017	51	910,291
2018	72	1,712,631
2019	61	1,841,489
Total	263	7,248,500

(As of December 2019)

## Grant-in-Aid for Scientific Research 2019

Subject for Research	Number of Adoption	Amount (in thousand of yen)
Grant-in-Aid for Scientific Research (A)	16	155,350
Grant-in-Aid for Scientific Research (B)	39	172,120
Grant-in-Aid for Scientific Research (C)	34	46,102
Grant-in-Aid for Young Scientists (A)	3	13,228
Grant-in-Aid for Young Scientists (B)/ Grant-in-Aid for Early-Career Scientists	20	28,340
Grant-in-Aid for Scientific Research on Innovative Areas	7	86,190
Grant-in-Aid for Challenging Research (Pioneering) or (Exploratory)	13	28,470
Grant-in-Aid for Research Activity start-up	4	5,720
"Fund for the Promotion of Joint International Research (Fostering Joint International Research (A))"	1	14,950
Total	137	550,470

(As of January 2020)

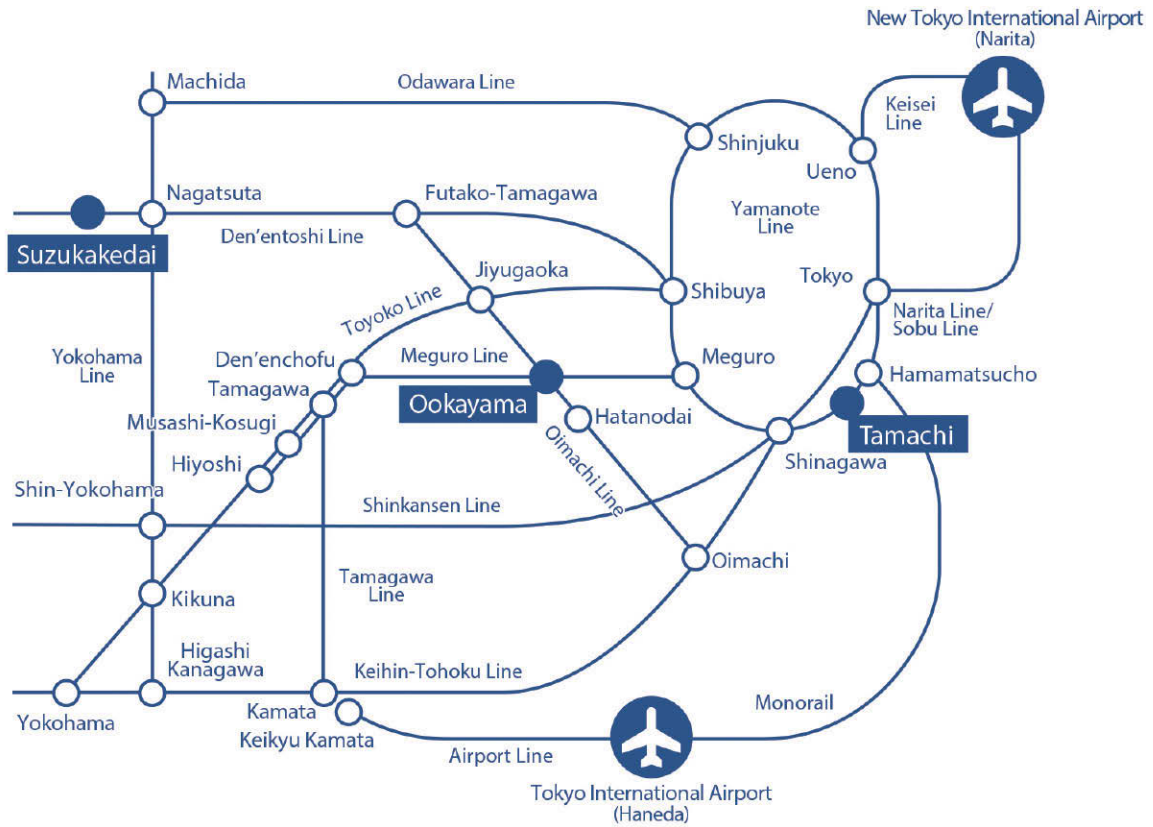
For any inquiry regarding industry-university cooperation, contact us at:

**Industry-University Cooperation Office in School of Engineering**

E-mail: [icu-seng@e.titech.ac.jp](mailto:icu-seng@e.titech.ac.jp)

**Industrial Cooperation Contract Group 1, Industrial Cooperation Contract Group 2,  
Industrial Cooperation Division, Research Promotion Department**

URL: <http://www.sangaku.titech.ac.jp> E-mail: [san.kyo@jim.titech.ac.jp](mailto:san.kyo@jim.titech.ac.jp)



**Ookayama Campuls**  
**Suzukakedai Campuls**  
**Tamachi Campuls**

a 1-minute walk from Ookayama Station  
a 5-minute walk from Suzukakedai Station  
a 2-minute walk from Tamachi Station

## Location

### Ookayama Campus

2-12-1 Ookayama, Meguro-ku, Tokyo 152-8550 Japan

### Suzukakedai Campus

4259 Nagatsuta-cho, Midori-ku, Yokohama, Kanagawa 226-8503 Japan