Laboratories for EEST course students of IGSES 2026

Major	Laboratory	
Science and Engineering of Materials and Devices	1 MITSUHARA Masatoshi	Structural Materials Science
	2 WATANABE Ken	
	3 HASHIZUME Kenichi	Materials Science and Engineering under Extreme Conditions
Chemistry and Materials Science	4 MORI Toshifumi	Computational Molecular
	5 SAKAEBE Hikari	Materials Science for Electrochemistry
	6 ALBRECHT Ken	Materials Science for Electrochemistry
Device Science and Engineering	7 HAMAMOTO Kiichi	Opto-Electronics
	8 WANG Dong	Functional Device Engineering
Plasma and Quantum Science and Engineering	9 YAMAMOTO Naoji	Advanced Space Propulsion Engineering
	10 KATAYAMA Kazunari	Mass Transfer Reaction Engineering
	11 MOON Chanho	Non-equilibrium Plasma Dynamics
Mechanical and Systems Engineering	12 WATANABE Hiroaki	Thermal Science and Energy
	13 MIYAZAKI Takahiko・KYAW Thu	Thermal Energy Conversion Systems
	14 HAGISHIMA Aya	Sustainable Built Environment
	15 IKEGAYA Naoki	Urban Environmental Sciences
	16 ITO Kazuhide	Architectural Environmental Engineering
	17 FARZANEH Hooman	Energy and Environmental Systems
	18 HU Changhong	Marine Environment and Energy Engineering
	19 SUGIHARA Yuji	Environmental Hydrodynamics
Earth System Science and Technology	20 ELJAMAL Osama	Water and Environmental Engineering
	21 MICHIBATA Takuro	Climate Modeling

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Science and Engineering of Materials and Devices

Laboratory

Structural Materials Science

Members

Professor : MITSUHARA Masatoshi

Prof. Mitsuhara

Scientific backgrounds	Metallurgy, Mechanical property, Electron Microscopy
Overview	The mechanical properties of metallic structural materials strongly depend on the microstructure, which includes the atomic configuration of the material and its irregularities. We are conducting research to clarify the relationship between the mechanical properties and the microstructure in order to design metallic materials with superior properties needed for structural and functional applications.
Research subjects	***Deformation behavior and its microscopic mechanisms of advanced metallic materials*** - High temperature strength (Creep property) of heat-resistant steels, Ni alloys, Ti alloys, solider materials, etc. - Mechanical properties controlled by clustering and precipitation in Al-Mg-Si alloys - Helicoid-spring creep test - Uniaxial creep test with low strain rate ***Development of advanced high-temperature structural materials*** - Novel ferritic heat-resistant steel using high nitrogen. ***Microstructure and fracture toughness*** - Crack propagation behavior in WC-Co hard metals. ***Microstructural analysis method using electron microscopes*** - TEM, STEM, SEM, EBSD, EDS EELS, FIB, Tomography, etc.
Acceptable students	One student per a semester can be accepted. Students with metallurgy background who are specialized in mechanical properties and microstructural characterization are most welcome.
Other comments (if any)	https://igses.kyushu-u.ac.jp/lab_05/

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Laboratory

Members

Professor : WATANABE Ken

Scientific backgrounds	
Overview	
Research subjects	
Acceptable students	
Other comments (if any)	https://www.mm.kyushu-u.ac.jp/lab_03/

Major

Science and Engineering of Materials and Devices

Laboratory

Materials Science and Engineering under Extreme Conditions

Members

Associate Professor : HASHIZUME Kenichi
Assistant Professor : OYA Makoto

Assoc. Prof. Hashizume

Scientific backgrounds	Nuclear Materials and Materials-Hydrogen Interactions
Overview	This laboratory belongs to the department of advanced energy engineering science in Kyushu University and has been devoted to the studies on the hydrogen isotopes (including tritium) behavior in nuclear fusion, fission and other energy-related materials.
Research subjects	(1) Permeation study of tritium in nuclear fusion materials (metals and alloys) using liquid scintillation counting method. (2)Visualization of hydrogen distribution in the fusion materials (metals, alloys and ceramics) using tritium imaging plate technique and tritium autoradiography. (3)Plasma surface interactions (hydrogen recycling) (4)Study on oxidation and hydrogenation of fuel cladding materials (Zr-based alloys) for nuclear fission reactor.
Acceptable students	One student per a semester can be accepted. We can accept students who are interested in and specialize in Materials Sciences, preferably energy-related and hydrogen-related materials. We can offer experimental-based studies such as hydrogen diffusion, permeation and other hydrogen related behavior in various materials (metals, alloys and ceramics) to the students in a semester.
Other comments (if any)	

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Chemistry and Materials Science

Laboratory

Computational Molecular

Members

Associate Professor : MORI Toshifumi

Assoc. Prof. Mori

Scientific backgrounds	Physical Chemistry, Theoretical Chemistry, Biophysics, Molecular simulation
Overview	We develop and apply computational approaches based on theoretical and computational chemistry and computational science to elucidate the mechanisms of condensed phase chemical reactions and structures & functions of (bio)molecules. In particular, we work on molecular simulations which offer atomistic insights into the complex behavior of molecules in solution. By utilizing these computational approaches, we aim at understanding and modifying the functions of polymers and biomolecules.
Research subjects	・Development of molecular theories for chemical reaction dynamics in condensed phase ・Molecular simulation of biomolecules to elucidate the mechanism behind functions ・Theoretical studies on conformational dynamics of proteins ・Theoretical studies on reaction mechanisms of organic catalysts and enzymes
Acceptable Students	One student per semester can be accepted. Students with a background in physical chemistry and have some experience in computer programming are most welcome.
Other comments (if any)	https://theoc.cm.kyushu-u.ac.jp/en/

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Chemistry and Materials Science

Laboratory

Materials Science for Electrochemistry

Members

Professor : SAKAEBE Hikari

Prof. SAKAEBE

Scientific backgrounds	Electrochemistry, Inorganic Chemistry, Materials Chemistry
Overview	High performance batteries play an important roll for sustainable society. From the basis on electrochemistry and material chemistry, we are developing new battery systems and materials for them excluding the use of precious metals.
Research subjects	***Cation-shuttle system (Li^+, Na^+ and so on);*** Li-S or Li-metal sulfide battery in both in liquid and solid system Electrodes forming solid electrolyte *in-situ* New Na-ion conducting materials ***Anion-shuttle system (F^-, Cl^-, and Br^-);*** Iron fluorides application to F^- shuttle battery Novel Cl^- and Br^- conducting materials and cell system using them
Acceptable students	One student per a semester can be accepted. Students with a background in material chemistry and electrochemistry are the most welcome, however, students with the passion for fusion of different background with battery research is also welcome.
Other comments (if any)	https://sakaebe-lab.labby.jp/

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Chemistry and Materials Science

Laboratory

Materials Science for Electrochemistry

Members

Associate Professor : ALBRECHT Ken

Assoc. Prof. Albrecht

Scientific backgrounds	Electrochemistry, Organic Chemistry, Polymer Chemistry, Materials Chemistry
Overview	We are conducting research on various themes related to electrochemistry and photochemistry based on organic chemistry. Developing new molecules, measure their basic properties, and evaluate them as battery materials and OLED materials. We are also developing new chemical reactions under high electric fields using nano-gap electrodes or electronic double layers. Through these research themes, we are trying to understand the relationship between molecular structure and functions. This will lead to figuring out advanced design principle of high-performance materials.
Research subjects	***Development of Organic secondary battery materials*** - Li-ion, Na-ion, and other secondary battery materials including all solid-state batteries. - Synthesis of new organic active materials. ***Emitting materials for organic light-emitting diodes (OLEDs)*** - Design, synthesis, and evaluation of dendrimer based new thermally activated delayed fluorescence (TADF) materials for solution-processed (printed) OLEDs. ***Electrostatic catalytic reactions*** - Discovering new electrostatic catalytic reactions using nano-gap electrodes or electronic double layers.
Acceptable students	One student per semester can be accepted. Students with a background in organic chemistry or electrochemistry who are specialized in organic synthesis, semiconductors, or battery materials are most welcome.
Other comments (if any)	www.alken-lab.com/english.html

Major

Device Science and Engineering Sciences

Laboratory

Opto-Electronics

Members

Professor : HAMAMOTO Kiichi

Prof. Hamamoto

Scientific backgrounds	Electro-Magnetic Theory, Vector Analysis, Fourier Analysis
Overview	Opto-electronics has been a key technology for communication system. Recent data traffic increases dramatically, and it is going to reach to the theoretical limit of fiber transmission capacity. To overcome this issue, we have researched on several new opto-electronic devices for optical communication system. Based on the same the similar technology, we also research about breath-sensing, that enables daily health-care.
Research subjects	I) Optical mode switch We have invented world first optical mode switch that will bring us higher transmission capacity of more than 100 times enhancement per fiber in the future. II) High speed laser diode One other approach is to enhance modulation speed of laser diode (LD). Recently, we have found “photon-photon resonance” phenomenon in active-MMI LD for the first time. By utilizing this phenomenon, we aim to realize more than 100Gbps modulation speed (world record for direct modulation) in the near future. III) Breath sensing Human-breath contains various non-natured volatile gases that relate to health condition. We aim to realize compact breath-sensing device that will be integrated cell phone.
Acceptable students	Electro-magnetic theory is a mandatory requirement for the research activity.
Other comments (if any)	http://www.asem.kyushu-u.ac.jp/ep/ep02/eng/index.html

Major

Device Science and Engineering

Laboratory

Functional Device Engineering

Members

Professor : WANG Dong

Prof. Wang

Scientific backgrounds	Physics of Semiconductor Devices
Overview	***Development of processing and device for advanced ULSI contributing to sophisticated information society*** This laboratory conducts research on Si-, SiC-, SiGe-, Ge- and GeSn-based devices matching requirements from the advanced semiconductor industry, which included thin films, novel processing, and advanced-functional devices. This laboratory also plans and promotes the advanced and creative research projects related to "Semiconductor" contributing the realization of a highly progressive information society. A clean room and advanced facilities are equipped, which provide good circumstances for advanced semiconductor research.
Research subjects	***Research and development of materials and processing for Advanced Ge-CMOS and Ge-photonic devices*** ・Fabrication of high-quality gate insulator films with high permittivity ・Fabrication for metal/semiconductor contacts with low electron or hole barrier height ・Fabrication of metal-oxide-semiconductor field-effect transistor (n- and p-channel MOSFETs) ・Fabrication of photo-detector and photo-emission devices ***Optical and electrical characterizations of semiconductor thin films on insulator*** ・Crystallinity, strain, and defect evaluations using photoluminescence (PL) and deep level transient spectroscopy (DLTS) ***Research and development of processing for fabricating SiC device*** ・Formation of gate stack, contact, and pn junction
Acceptable students	One student per a semester can be accepted. Students with a background of semiconductor physics and devices are most welcome. We can also offer rudimentary experiment-based tutorial to students with and without background of "semiconductor physics and device" who are interested in research areas related to the above-listed subjects such as processing and characterization.
Other comments (if any)	https://www.gic.kyushu-u.ac.jp/functionaldevices/index_e.htm

Major

Plasma and Quantum Science and Engineering

Laboratory

Advanced Space Propulsion Engineering

Members

Professor : YAMAMOTO Naoji
Assistant Professor : MORITA Taichi

Prof. Yamamoto

Scientific backgrounds	Aerospace engineering, Plasma physics, Astronomy
Overview	We focused on advanced space propulsions, from palm sized miniature electric propulsions (Ion engines and Hall thrusters) for small satellites to laser fusion rockets for manned planetary explorer missions. We also investigate laboratory astrophysics, find a new finding missing in modeling astrophysical phenomena using ultra-intense lasers. In addition, the laser-based diagnostics for understanding the physics inside the applications.
Research subjects	**Laser fusion rocket** ● Evaluation of its performance using numerical simulation ● Experimental demonstration of laser fusion rocket **Ion and Hall thruster** ● Velocity measurement using Laser Thomson scattering technique ● Miniature ion engine lifespan evaluation test **laboratory astrophysics** ● Experimental and numerical simulation of Magnetic reconnection for understanding Solar flares ● Experimental simulation of collision-less shock for understanding Supernova remnants and astrophysical jets **Plasma diagnostics** ● Magnetic field measurement using backlight method
Acceptable students	One student per a semester can be accepted. Student who have a passion to study aerospace engineering are welcome.
Other comments (if any)	

Major

Plasma and Quantum Science and Engineering

Laboratory

Mass Transfer Reaction Engineering

Members

Professor : KATAYAMA Kazunari

Prof. Katayama

Scientific backgrounds	Nuclear Chemical Engineering, Energy Chemical Engineering
Overview	In order to develop advanced energy systems widely, fuel cycles of nuclear fusion reactors or advanced nuclear fission reactors and hydrogen energy systems are investigated in our laboratory. Highly-efficient hydrogen isotope recovery from related solid or liquid materials and clarification of hydrogen isotope transfer through porous solids or related liquids are main research targets. Studies on plasma decomposition reaction and plasma material interactions are also performed. Results obtained experimentally are analyzed based on model calculation from the standpoint of the energy chemical engineering. Collaboration study is performed with National Institutes for Quantum and Radiological Science and Technology and National Institute Fusion Sciences.
Research subjects	**1. Fusion Energy Engineering** · Experimental study on tritium recovery from solid and liquid tritium breeding materials. · Modeling and simulation study on fuel cycle of a fusion DEMO plant. · Experimental and simulation study on plasma-wall interaction with energetic particles. **2. Hydrogen Energy** · Experimental and modeling study on hydrogen production by using plasma decomposition reaction. · Fundamental study on hydrogen production at high temperature conditions. **3. Advanced Energy Engineering** · Fundamental study on handling of molten salt. · Experimental study on chemical reactions and mass transfer in Super-Critical CO_2. **4. Environment** · Experimental and modeling study on tritium migration in natural soil and tritium transfer to plants.
Acceptable students	One student per a semester can be accepted. Students with the background of fusion engineering, chemical engineering or nuclear engineering are preferable. Students who are interested in above research areas are also welcome with different backgrounds of engineering sciences. In advanced energy engineering, various engineering and science knowledge must be useful.
Other comments (if any)	

Candidate research subject for EEST course students of IGSES, Kyushu University

Major

Plasma and Quantum Science and Engineering

Laboratory

Non-equilibrium Plasma Dynamics

Members

Associate Professor : MOON Chanho

Assoc. Prof. Moon

Scientific backgrounds	Plasma dynamics, Turbulence, Anomalous transport, Fusion energy, Plasma diagnostic, Plasma engineering
Overview	Our laboratory is focusing on an experimental study of non-equilibrium plasma dynamics in magnetized plasmas. The non-equilibrium plasmas are a modern research field in plasma physics, and characterized by high electron temperatures and low ion and neutral temperatures relatively. In order to achieve fusion energy and utilize plasma processing well, it is necessary to investigate and control the non-equilibrium plasmas. Hence, the ultimate goal of our laboratory is to fully understand the complex non-equilibrium dynamics by developing and applying reliable plasma diagnostic techniques in magnetized plasmas.
Research subjects	**1. Non-equilibrium plasma dynamics (turbulence and transport)** ・Linear magnetized plasma device (PANTA) experiment ・Tokamak (PLATO) device experiment **2. Plasma diagnostic development** ・3-D tomography measurement system ・Multi-channel Ball-pen probe to measure the potential and temperature ・Laser-induced fluorescence (LIF) imaging system ・Microwave imaging reflectometry system **3. Plasma engineering** ・Radio frequency (RF) discharge plasma stability ・Electron cyclotron resonance (ECR) plasma application ・Optical spectroscopic technique for plasma processing
Acceptable students	One student per a semester can be accepted. Student who interested in the above research subjects are all very welcome.
Other comments (if any)	

Major

Mechanical and Systems Engineering

Laboratory

Thermal Science and Energy

Members

Professor : WATANABE Hiroaki

Prof. Watanabe

Scientific backgrounds	Thermal engineering, Turbulent combustion, Multiphase flow, Computational fluid dynamics, Information technology
Overview	Balancing energy supply with demand and enhancing environmental protection are still big challenges for our society. In our laboratory, combustion, and heat and mass transfer phenomena are the major topics based on thermodynamics, fluid dynamics, and thermochemistry to realize clean energy and low-carbon technologies. A complex physics in which the turbulence and the chemistry interact each other is investigated to clarify the characteristics, to build the mathematical models, and to perform the numerical simulation of such multiscale and multiphysics phenomena among gas, solid, and liquid three phases.
Research subjects	**1. Modeling and simulation of turbulent combustion** ・Fundamental research on turbulence-chemistry interaction by means of direct numerical simulation (DNS) ・Model application to power generation gas turbines and automotive engines simulations by large-eddy simulation (LES) ・Hydrogen, Ammonia, Synthetic gases, Fossil fuels **2. Modeling and simulation of spray combustion** ・Fundamental research on multiphase heat and mass transfer and ignition behavior by DNS with elementary reactions ・Model application to air-craft engine simulation by LES ・Jet fuels, Bio fuels **3. Gasification for polygeneration from solid materials** ・Solid phase pyrolysis, gas-solid two phase reactions, and gas phase reactions for hydrogen generation and the other products ・Biomass, Renewable solid materials
Acceptable Students	Up to two students per a semester can be accepted. A student joined this laboratory will be encouraged to interact actively with all members of this laboratory to foster cross-cultural understanding.
Other comments (if any)	Please refer to the following URL: http://tse.kyushu-u.ac.jp/

Major

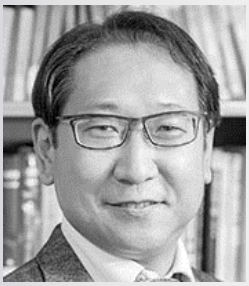
Mechanical and Systems Engineering

Laboratory

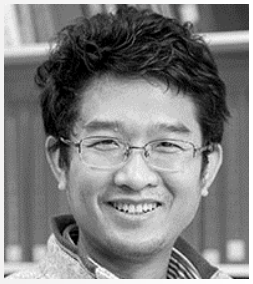
Thermal Energy Conversion Systems

Members

Professor : MIYAZAKI Takahiko
Professor : KYAW Thu



Prof. Miyazaki



Prof. Kyaw Thu

Scientific backgrounds	Thermodynamics, Heat and mass transfer, Adsorption
Overview	Our laboratory focuses research on energy efficiency, renewable energy, sustainable energy conservation and environmental problems. Key research areas include sorption (adsorption/absorption) systems (heat pumps, dehumidification and desalination), solar thermal systems, thermopyhiscal properties and heat pumps for HVAC&R. We are dedicated to improve the existing systems and introducing new horizons for green technologies (e.g. heat transfer, desiccant air conditioning, adsorption/desorption phenomena as heat pump or cooling system etc.). Our laboratory is always finding the better and eco-friendly replacement for existing systems through experiments and simulations. We are also working on the development of the next generation refrigerants and thermodynamic models for improved prediction of the thermopyhsical properties.
Research subjects	● Characteristics and analysis of functional adsorbents ● Heat and mass transfer analysis of heat exchangers ● Study on solar thermal energy utilization systems ● Experiment of heat pump cycles with new refrigerant ● Development of thermally driven air conditioning systems ● Adsorption desalination and hybrid desalination systems ● Indirect evaporative coolers (IEC) and its hybrids ● Machine learning for HVAC&R and co-generation systems ● Models for thermophysical properties of refrigerants ● Entropy and exergy analyses of thermodynamic cycles
Acceptable Students	Two students per semester can be accepted. The students with engineering (mechanical, electrical, chemical), computer science and material science background are most welcome to our laboratory. All the research topics are based on the heat and mass transfer phenomena, and students will learn the basic science of it as well as engineering applications.
Other comments (if any)	We provide research facilities (supervision and environment) to students/researchers who are interested in thermal science and heat transfer research including nano-fluids and microgeneration. Our laboratory has established strong collaborations with domestic and international research institutes/industry. More details and recent activities can be found at: http://www.cm.kyushu-u.ac.jp/dv10/TECS/

Major

Mechanical and Systems Engineering

Laboratory

Sustainable Built Environment

Members

Professor : HAGISHIMA Aya

Prof. Hagishima

Scientific backgrounds	Built Environment, Urban Environment, Urban Climatology
Overview	The primary goal of research activities of this laboratory is to contribute to the sustainability, health, and comfort of urban built environment through the energy saving, reduction of the greenhouse gas emissions, and mitigation of risks due to indoor environment and urban climatological phenomena. This laboratory is operated in cooperation with Laboratory of Urban Environmental Sciences.
Research subjects	**Sustainable building designs toward carbon neutrality** Buildings account for approximately 30% of global energy consumption and 40% of greenhouse gas emissions. Therefore, energy efficiency and decarbonization in the building sector are significant global challenges. In response, Zero Energy Buildings (ZEB), which utilize passive design, energy efficiency improvements in equipment, and the installation of rooftop solar power, have garnered attention. This research theme explores the design of ZEBs and methods to increase the self-consumption rates of renewable energy, tailored to regional climates and building designs, through Building Energy Simulation. **Affordable measures to realize sustainable healthy housing tailored to various Asian countries** In many developing countries, which account for 80% of the world's population, informal settlements and urban slums often emerge during the process of rapid urbanization and economic development. Many homes in urban slums face various health and safety risks due to poor indoor air quality and thermal environments. This study explores affordable strategies to achieve healthy, comfortable, and sustainable living environments under severe economic constraints, through on-site field surveys, measurements, and Building Energy Simulation.
Acceptable Students	Up to two students per a semester can be accepted. A student accepted to this laboratory will be encouraged to interact actively with all members of this laboratory to foster cross-cultural understanding.
Other comments (if any)	

Major

Mechanical and Systems Engineering

Laboratory

Urban Environmental Sciences

Members

Professor : IKEGAYA Naoki

Prof. Ikegaya

Scientific backgrounds	Wind engineering, Fluid mechanics, Urban and building environment, Computational fluid dynamics
Overview	This laboratory focuses on urban environmental problems caused by winds in the built environment to achieve better exterior and interior environment for human beings. In addition, we also aim to deepen the fundamental knowledge on phenomena relevant to the fluid dynamics occurring in the urban built environment. This laboratory is operated in cooperation with Laboratory of Urban and Architectural Environment.
Research subjects	**Evaluation of pedestrian wind in a built environment** Strong wind such as gust occurred in built environment due to the surrounding buildings because of high and low pressure distributions on the building faces. Such gust events are highly dangerous as well as discomfort to pedestrians. The aim of this project is understanding how the built environment causes the strong wind events and evaluating wind environment within a pedestrian level. **Turbulent structure extraction within urban boundary layer** Strong velocity shear between an urban surface and upper atmosphere is generated by the various types of buildings on the surface. This strong shear stress generates complex turbulent structures within the urban boundary layer. This project aims to clarify the similarity and dissimilarity of such structures with the turbulent structures observed in a conventional smooth-wall boundary layer. **Indoor cross-ventilation studies of a building in urban boundary layer** An appropriate usage of the indoor cross-ventilation is required for reducing the thermal energy load on a building. However, exterior airflow distributions are naturally unsteady in time and nonuniform in space because of the complex surrounding building arrangements as well as unsteady atmospheric airflow. This study focuses on how such complex exterior flows affect the indoor cross-ventilation natures.
Acceptable Students	Up to two students per a semester can be accepted. A student accepted to this laboratory will be encouraged to interact actively with all members of this laboratory to foster cross-cultural understanding.
Other comments (if any)	A student who is interested in fundamental studies on fluid dynamics and fluid mechanics is very welcomed, although this laboratory focuses on application-oriented studies as well.

Major

Mechanical and Systems Engineering

Laboratory

Architectural Environmental Engineering

Members

Professor : ITO Kazuhide

Prof. Ito

Scientific backgrounds	Architectural Environmental Engineering, Computational Fluid Dynamics, Environmental Design
Overview	Our research centers on indoor environmental engineering, emphasizing two themes: pollutant dynamics in indoor air and exposure/toxicology science. On the first, our primary interest is to better understand the physics and chemistry that control the pollutant concentrations and effects of pollutants in indoor environmental quality. On the second topic, we apply basic knowledge about the relationship between pollutants transportation and consequent human exposures/toxicology to create *in silico* human model for fluid initiated indoor environmental design. Our research group pursues research through a combination of laboratory and field experiments, modeling, and numerical simulation. In recent years, in addition to maintaining vigorous activities in the two primary areas, we have had a growing concern about and interest in the themes of sustainability, HVAC design and energy-use efficiency in buildings.
Research subjects	(a) Development of a numerical prediction method for understanding unsteady/ non-uniform contaminant concentration distribution around the human body (b) Development of numerical prediction method for microbial contamination in indoor environment (c) Development of comprehensive computer simulation person for IEQ assessment (d) Development of numerical prediction method of interior thermal/air quality distributions in car/bus cabin. (e) Development of new ventilation efficiency indices for understanding heterogeneity of contaminant mixture.
Acceptable Students	Highly motivated students are most welcome. One student per a semester can be accepted.
Other comments (if any)	It is not necessary for the students to have particular specialization.

Major

Mechanical and Systems Engineering

Laboratory

Energy and Environmental Systems

Members

Professor : FARZANEH Hooman

Prof. Farzaneh

Scientific backgrounds	Systems science, energy systems modeling, energy efficiency and management, climate change mitigation strategies
Overview	The research projects in this laboratory focus on identifying strategies and policies that could facilitate solutions for the long term energy-related problems—including global energy supply and environmental challenges facing our society. We pursue this goal through developing analytical methods and using computational models in order to understand the role of science and technology in shaping better energy and environmental policies at all levels. Researchers with diverse backgrounds conduct research on designing an appropriate decision making framework that evaluates future scenarios from both "macro and micro" perspectives, which can be used to realize a sustainable energy system for Japan, Asia and even the world.
Research subjects	1) Energy systems modeling: Integration of multi-vector energy systems across operation and investment, local district and national level infrastructures. 2) Multiple impact assessment of low-emission development strategies. 3) Hybrid renewable microgrid: Optimization, dynamic power simulation, control, and experimental validation 4) Electricity market analysis: Day-ahead electricity market, local electricity markets, demand response programs, and smart grid conceptual modeling 5） Eco-driving: Real-time dynamic predictive cruise control and personalized autonomous driving
Acceptable Students	Students with a background of: 1. statistical methods, mathematical programming, optimization techniques 2. computer programming 3. economics and engineering sciences
Other comments (if any)	Please refer to the following URL: http://farzaneh-lab.kyushu-u.ac.jp/

Major

Mechanical and Systems Engineering

Laboratory

Marine Environment and Energy Engineering

Members

Professor : HU Changhong
Assistant Professor : WATANABE Seiya

Prof. Hu

Scientific backgrounds	Ocean Engineering, Ocean Renewable Energy Development
Overview	The laboratory is engaged in education and research on ocean renewable energy development, such as floating offshore wind turbine, tidal current turbine, wave energy converter, etc. Numerical simulation and physical experiment are carried out to study the fluid dynamic performance of these ocean renewable energy converters.
Research subjects	(1) Safety assessment and optimization design of floating wind turbines (2) New concept for tidal and ocean current energy converters (3) Wave energy converter as motion suppression device for floating bodies (4) Advanced numerical method for ocean renewable energy development
Acceptable students	One student per a semester can be accepted. Students who have either fluid/aerodynamics, mechanical dynamics or CFD background are welcome.
Other comments (if any)	https://sites.google.com/view/hu-labe/top

Major

Earth System Science and Technology

Laboratory

Environmental Hydrodynamics

Members

Professor : SUGIHARA Yuji
Assistant Professor : YAMAGUCHI Soichi

Scientific backgrounds	Environmental fluid dynamics, Coastal engineering, Coastal oceanography, Ocean engineering
Overview	The laboratory is engaged in education and research in dynamical characteristics of currents, waves and material transports in coastal seas. Environmental problems such as hypoxia and red tide in coastal waters are also investigated as research subjects of the laboratory.
Research subjects	***Momentum, heat and CO_2 transfers at air-sea interface*** ●Laboratory and field experiments of air-sea fluxes of momentum, heat and CO_2 ●Characteristics of whitecaps on the ocean surface ●Numerical simulations of turbulence and air-water gas transfer ***Environmental problems in coastal and estuarine waters*** ●Material transport processes in coastal and estuarine waters ●Formation of hypoxia and red tide in coastal waters ●Modeling of ecosystems in coastal and estuarine waters ***Renewable energy in coastal seas*** ●Tidal current power generation
Acceptable students	The following knowledge and skills are required for acceptable students: 1. Fundamental knowledge of fluid dynamics 2. Fundamental knowledge of environmental engineering 3. Computer programming with FORTRAN
Other comments (if any)	

Major

Earth System Science and Technology

Laboratory

Water and Environmental Engineering

Members

Professor : ELJAMAL Osama

Prof. Eljamal

Scientific backgrounds	Environmental Engineering
Overview	***Develop Novel Methods for Environmental Remediation and Water Treatment*** ✓ A safe and sustainable environment is an important for maintaining sustainable societies, ecosystems and economies. ✓ Discharges of industrial and domestic wastewater into the environment without pre-treatment are the most common pollution source. ✓ Due to the enormous pressure on water supply demand, It is necessary to remediate unconventional water sources such as wastewater. ✓ Nanotechnology has proved to be one of the finest and advanced methods for environmental remediation.
Research subjects	**Purpose** My research interests concern the principles and techniques from science and engineering to develop: ✓ Novel methods for environmental remediation and water treatment. ✓ Novel nanotechnology-based methods for environmental remediation and water treatment. ✓ Environmental models for studying the underlying mechanisms of contaminants in water. ✓ Environmental models for predicting the long-term performance of environmental remediation systems. **Research Interests** ✓ Nanotechnology for water and wastewater treatment ✓ Energy generation from solid waste, waste-activated sludge and wastewater ✓ Modeling of reactive solute transport in porous media ✓ Modeling of groundwater flow, remediation and artificial recharge ✓ Biological treatment of water and wastewater ✓ Sustainable water resources management.
Acceptable students	Two students per a semester can be accepted.
Other comments (if any)	The students with the knowledge of environmental remediation, water treatment and environmental chemistry and the ability of statistical analysis is desirable.

Major

Earth System Science and Technology

Laboratory

Climate Modeling

Members

Associate Professor : MICHIBATA Takuro

Assoc. Prof. Michibata

Scientific backgrounds	Meteorology, Climatology, Atmospheric Science, Cloud Physics
Overview	Our laboratory focuses on the atmospheric aerosols, clouds, and precipitation in the climate system. We develop a global climate model using multiple satellite datasets to improve uncertainties in future climate prediction.
Research subjects	**1) Development of a global aerosol-climate model** Clouds play an important role in climate systems by controlling the Earth's radiation budget and hydrological cycle. However, simulating micro- and macro-structures of clouds still includes large uncertainties. Here we develop a novel modeling method for aerosol-cloud-precipitation interactions applied in global climate models to improve the performance of climate simulations. **2) Evaluation of climate models using satellite observations** Satellite observations are important references for improving climate models. We use multiple satellite datasets observing aerosol, cloud, precipitation, and radiation, to understand the process-level physics of the Earth. **3) Global warming and polar amplification** The polar region, particularly the Arctic, has warmed faster than the rest of the world, known as "polar amplification". We investigate how the simulated polar warming captures the observed temperature trend, and why models have large uncertainties against observation.
Acceptable Students	One student per semester can be accepted. The acceptable student must meet the following requirements: (1) Computer skills with Fortran and/or Python, and (2) a background in climate and/or Earth sciences. Students who join this laboratory will be encouraged to actively collaborate with all members, promoting cross-cultural understanding.
Other comments (if any)	https://www.riam.kyushu-u.ac.jp/comets