



Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

CAMPUS Asia—EEST ASIA--- Laboratories Information---

Department of		Laboratory of	Research Field
ASEM Applied Science for Electronics and Materials 	1	Professor. HAMAMOTO Kiichi http://www.asem.kyushu-u.ac.jp/ep/ep02/jp/	Opto-Electronics
	2	Professor. NISHIDA Minoru http://www.asem.kyushu-u.ac.jp/of/of01/root/welcome.html	Crystal Physics and Engineering
	3	Professor. OHTAKI Michitaka http://www.asem.kyushu-u.ac.jp/~ohtaki/	Inorganic Chemistry for Energy-Related Materials
	4	Associate Professor. YOSHITAKE Tsuyoshi http://www.asem.kyushu-u.ac.jp/qq/qq01/index-e.htm	Applied Electromagnetics
	5	Professor. KIKUCHI Hirotsugu http://kikuchi-lab.cm.kyushu-u.ac.jp/index.html	Functional Molecule Engineering
	6	Professor. OKADA Shigeto http://www.cm.kyushu-u.ac.jp/dv07/dv07j.html	Material Electrochemistry
	7	Professor. HAYASHI Jun-ichiro http://carbonres.cm.kyushu-u.ac.jp/index-en/	Chemical Reaction Engineering
	8	Professor. NAKASHIMA Hiroshi http://gic.kyushu-u.ac.jp/nakasima/index_e.htm	Advanced Functional Devices
	9	Professor. HATTORI Reiji http://www.gic.kyushu-u.ac.jp/hattori/index_Eng.html	Electronic Display Technologies

	10	Professor HATA Satoshi http://www.asem.kyushu-u.ac.jp/qg/qg01/top-e.html	Quantum Materials Physics
	11	Professor YOON Seong-Ho http://carbon.cm.kyushu-u.ac.jp/index-en.htm	Materials Engineering and Carbonic Materials
MMS Molecular and Material Sciences 	1	Professor. MIZUNO Seigi http://www.mm.kyushu-u.ac.jp/lab_01/	Surface Science
	2	Professor. AOKI Yuriko http://aoki.cube.kyushu-u.ac.jp/index_top.html	Theoretical Material Science
	3	Professor. SHIMANOE Kengo http://www.mm.kyushu-u.ac.jp/lab_03/index.html	Theory of Functional Materials
	4	Professor. EINAGA Hisahiro http://www.mm.kyushu-u.ac.jp/lab_04/	Functional Inorganic Materials Chemistry
	5	Professor. NAKASHIMA Hideharu http://www.mm.kyushu-u.ac.jp/lab_05/en_index.php	Structural Materials Science
	6	Professor .HARATA Akira http://www.mm.kyushu-u.ac.jp/lab_07/	Analytical Chemistry and Physical Chemistry
	7	Professor. ARAKAWA Kazuo http://www.riam.kyushu-u.ac.jp/ece/ARAKAWA_group/indexE.html	Mechanics and Materials
	8	Associate Professor. TODO Mitsugu http://www.riam.kyushu-u.ac.jp/ece/TODO_group/index-e.htm	Mechanics and Materials-Biomaterial & Biomechanics
	9	Professor. TOMOOKA Katsuhiko http://www.cm.kyushu-u.ac.jp/tomooka/tomooka/Top_Page.html	Novel Structures in Organic Chemistry

	10	Professor. NAGASHIMA Hideo http://www.cm.kyushu-u.ac.jp/dv04/dv04j.html	Organometallic and Heteroatom Chemistry
	11	Professor. SHINDO Mitsuru http://www.cm.kyushu-u.ac.jp/dv01/dmstj.html	Synthetic Methodology
	12	Associate Professor. TAKAHASHI Yoshiaki HP: not available	Physical Polymer Science
	13	Professor. YANAGIDA Takeshi http://yanagida-lab.weebly.com/	Nanoscience and Nanotechnology of Nanostructured Materials
	14	Professor. KUNINOBU Yoichiro http://kununobu-lab-english.cm.kyushu-u.ac.jp/	Design of Advanced Organic Compounds
AEEs Advanced Energy Engineering Sciences 	1	Associate Professor. HASHIZUME Kenichi http://www.qpn.kyushu-u.ac.jp/lab8/index-j.html	Materials Sciences in Extremely Severe Conditions
	2	Professor. FUKADA Satoshi http://www.qpn.kyushu-u.ac.jp/lab5/English/Engtop.html	Energy Chemical Engineering
	3	Professor. WATANABE Yukinobu http://enep.ence.kyushu-u.ac.jp/	Energy Engineering Physics
	4	Professor. YAMAMOTO Naoji http://art.aees.kyushu-u.ac.jp/index.html	Advanced Space Propulsion Laboratory
EEE Energy and Environmental Engineering	1	Professor. TANIMOTO Jun and Professor. HAGISHIMA Aya http://ktlabo.cm.kyushu-u.ac.jp/	Urban and architectural environment Green-Asia Environmental Studies
	2	Professor. MIYAZAKI Takahiko http://www.cm.kyushu-u.ac.jp/dv10/Koyama_lab/index.html	Thermal Energy Conversion System



3	Associate Professor. TASHIMA Hiroshi HP: not available	Engine and Combustion
4	Associate Professor KYAW Thu HP: not available	Thermal Energy Conversion System
5	Associate Professor ANYOJI Masayuki http://mac507.ence.kyushu-u.ac.jp/	High-speed Gas Dynamics
6	Professor ITO Kazuhide http://www.phe-kyudai.jp/	Environmental System / Ergonomics
7	Associate Professor Hooman Farzaneh http://farzaneh-lab.kyushu-u.ac.jp/	Energy and Environmental Systems

ESST

Earth
System
Science and
Technology



1	Professor. HADA Tohru http://www.esst.kyushu-u.ac.jp/~space/index_e.html	Space Environmental Fluid Dynamics
2	Associate Professor. Osama Eljamal http://www.esst.kyushu-u.ac.jp/~gsd/index_eng.html	Environmental Fluid Dynamics
3	Professor SUGIHARA Yuji HP: Not available	Coastal Environment Research
4	Professor. YOSHIDA Shigeo http://hyoka.ofc.kyushu-u.ac.jp/search/details/K004957/english.html	Nonlinear Fluid Engineering
5	Professor. OKAMOTO Hajime http://www.riam.kyushu-u.ac.jp/gfd/	Atmospheric Physics
6	Professor HU Changhong http://www.riam.kyushu-u.ac.jp/ship/indexe.html	Ocean Systems Dynamics

	7	Professor. TAKEMURA Toshihiko http://www.riam.kyushu-u.ac.jp/climate/indexe.html	Climate Change Science
	8	Professor. UNO Itsushi http://www.riam.kyushu-u.ac.jp/taikai/	Atmospheric Environment Modeling
	9	Associate Professor. ICHIKAWA Kaoru http://www.esst.kyushu-u.ac.jp/~dmp/index-e.html	Descriptive Marine Physics
	10	Professor. ISOBE Atsuhiko http://mepl1.riam.kyushu-u.ac.jp	Ocean Dynamics
	11	Professor. HIROSE Naoki http://www.riam.kyushu-u.ac.jp/omg/	Atmosphere-Ocean Modeling

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Opto-electronics / Hamamoto lab
Staffs	Professor : Kiichi HAMAMOTO Associate Professor : Assistant Professor : Haisong JIANG
Scientific backgrounds	Electro-Magnetic Theory, Vector Analysis, Fourier Analysis
Overview	<p>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.</p> <p>Based on the same the similar technology, we also research about breath-sensing, that enables daily health-care.</p>
Research subjects	<p>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.</p> <p>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.</p> <p>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.</p>
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 (*) Recent TV news show: https://www.youtube.com/watch?v=HqEg6U76I2A

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Crystal Physics and Engineering
Staffs	Professor : Minoru NISHIDA Associate Professor : Masaru ITAKURA Assistant Professor : Hiroshi AKAMINE
Scientific backgrounds	Nanostructure Characterization and Control, Crystallography, Electron Microscopy
Overview	<p><i>Nanostructure characterizations and control in advanced crystalline materials</i></p> <p>The functional properties of advanced materials greatly depend on the nanostructure. In order to control the nanostructure, the structural characterizations are required on atomic scale. That is, the structure control and characterization are often compared to two wheels of a car. In this laboratory, the nanostructure characterizations in advanced materials such as shape memory alloys, hydrogen permeation alloys, rare earth magnets, thin film semiconductors are performed by various electron microscopes. The obtained results are fed back to the structure control in those materials. The basic researches on the phase transformation in metals and alloys, and the crystal growth mechanism in semiconductors are also performed.</p>
Research subjects	<p><i>Nanostructure characterizations in advanced crystalline materials with various electron microscopes</i></p> <ul style="list-style-type: none"> • Thermal and magnetic induced shape memory alloys • Ti, Zr and Hf-based alloys • Semiconductor thin films • Magnetic materials (NdFeB) • High density magnetic memory alloys • Multiferroic materials <p><i>Nanostructure control via phase transformations</i></p> <ul style="list-style-type: none"> • Martensitic transformation • Order-disorder transformation • Crystallization and crystal growth mechanism • Phase-field simulation
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students with metallurgical background who are specialized and/or interested in crystallography and phase transformation are most welcome.</p> <p>We can also offer rudimentary experimental-based tutorial to students with and without metallurgical background who are interested in crystalline materials and research areas related to the above mentioned.</p>
Other comments (if any)	http://www.asem.kyushu-u.ac.jp/of/of01/root/welcome.html http://hyoka.ofc.kyushu-u.ac.jp/searchSP/details/K003198/english.html http://hyoka.ofc.kyushu-u.ac.jp/searchSP/details/K001481/english.html http://hyoka.ofc.kyushu-u.ac.jp/searchSP/details/K006627/english.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Applied Science for Electronics and Materials
Laboratory	Inorganic Chemistry for Energy-Related Materials
Staffs	<p>Professor : Michitaka OHTAKI, Ph.D.</p> <p>Associate Professor : Koichiro SUEKUNI, Ph.D.</p> <p>Assistant Professor : Kosuke WATANABE, Ph.D.</p>
Scientific backgrounds	Materials Science, Inorganic and/or Solid-State Chemistry, Applied Physics
Overview	<p><i>Molecular and Materials Physical Chemistry for Energy-oriented Functional Materials</i></p> <p>This laboratory was newly established in 2013, focusing on development of energy-oriented novel functional materials based on inorganic materials science, chemistry, and physics. It also aims at more comprehensive targets in materials science by combining a wide variety of the properties of inorganic materials with intelligence of organic molecules. The most distinguished achievement of this lab is a pioneering work on oxide thermoelectric materials resulting in its continuing accomplishments of the world-best performances in both n- and p-type bulk thermoelectric oxides so far. Its perspective, however, is not limited to the thermoelectric materials, but extends to unconventional approaches in materials science for next-generation materials including low-dimensional quantum-structured inorganic nanomaterials spontaneously formed by self-assembly molecular templating.</p>
Research subjects	<p><i>Oxide- and Sulfide-based Thermoelectric Materials for Heat-to-Electricity Direct Energy Conversion</i></p> <ul style="list-style-type: none"> • Development of eco-friendly oxide materials for thermoelectric power generation to recuperate waste heat energy • Experimental materials researches for unconventional transport properties aiming at decoupling of electrical and thermal conductions (electrons and phonons) in solids <p><i>Self-assembly Synthesis of Low-dimensional Quantum-structured Inorganic Nanomaterials and their Electronic/Optical Properties</i></p> <ul style="list-style-type: none"> • Synthesis and applications (photocatalysis, thermoelectrics, photovoltaics, etc.) of inorganic quantum-confined nanomaterials by using organic molecular assembly as a template • Curiosity for evolution of unconventional properties by controlling spacial ordering and regularity of low-dimensional nanomaterials
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students who have an interest in general materials science and chemistry are highly welcome. Although Prof. Ohtaki has an organic chemistry background, he is now working on (mostly) inorganic chemistry and applied physics, showcasing a broad acceptability of this lab. Those who are active and self-initiative, with both intuitive and logical ways of thinking, are most welcome. Whereas this lab expertizes (mostly) inorganic experimental materials science, the academic background of its previous students ranges from theoretical modeling in physics to biological science.</p>
Other comments (if any)	This lab is in strong conjunction with Research Center for Synchrotron Light Applications, and Research and Education Center for Advanced Energy Materials, Devices, and Systems, KU.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Applied Electromagnetics
Staff	Professor : Associate Professor : Tsuyoshi YOSHITAKE
Scientific backgrounds	Applied Physics, Solid State Physics, Electronic Materials
Overview	<p><i>Development of new ecologically friendly materials in thin film applicable to photovoltaics and advanced electrical devices</i></p> <p>The laboratory devotes itself to education and research on materials for optoelectronics, in particular, photovoltaics comprising ecologically friendly materials. The research is mainly experimentally conducted and the experiment covers the growth of new materials in thin film by physical vapor depositions, the structural and optoelectrical evaluations of films, and the fabrication of optoelectrical devices on the basis of the film preparation.</p>
Research subjects	<p><i>Fabrication of nanocrystalline diamond films by physical vapor depositions and their application to photovoltaics</i></p> <ul style="list-style-type: none"> • Deposition of nanocrystalline diamond thin films by pulsed laser deposition and coaxial arc plasma deposition • Structural characterization of the films by spectroscopic methods with synchrotron radiation and electron microscopy • Fabrication of photovoltaic devices and their evaluation as solar cells and ultraviolet detectors <p><i>Fabrication of semiconducting iron disilicides thin films by sputtering and their application to photovoltaics</i></p> <ul style="list-style-type: none"> • Heteroepitaxial growth of β-FeSi₂ thin films on single crystalline Si substrates by sputtering and their structural and electrical evaluations • Fabrication of photovoltaic devices and their optoelectrical evaluation as solar cells and near-infrared detectors <p><i>Hetero-structural spintronics devices comprising ferromagnetic metals and semiconductors on the basis of Fe-Si system</i></p> <ul style="list-style-type: none"> • Fabrication of hetero-structural artificial lattices by sputtering • Magnetic and optoelectrical evaluation of spintronics devices based on the Fe-Si artificial lattices •
Acceptable students	Students whose educational backgrounds are applied physics, electronics, and materials are preferable from the viewpoint of educational compatibility. However, we are willing to receive students that have an interest in our research in spite of their majors.
Other comments (if any)	Please freely contact with us if you are interested in our lab as a candidate.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Functional Molecule Engineering
Staffs	Professor : Hirotugu KIKUCHI Associate Professor : Yasushi OKUMURA Assistant Professor :
Scientific backgrounds	Soft Matter Chemistry and Applied Physics
Overview	Molecular self-assembly, which is an interdisciplinary subject extending over chemistry, physics and biology, derives the spontaneous nano-ordering being able to contribute much to key technologies of the bottom-up type electric and photonic devices. The focus of our studies is creating novel soft-matter with unique photonic structures and functionality through chemical and physical programming of topological frustration for the molecular assembling geometry of liquid crystals and polymers. We have developed novel functional materials showing fast electro-optics and photo-controllable photonic band.
Research subjects	The object is to create new material science with high functionality of a low environmental load through molecular self-organization in nature and advancement of basic chemistry related to spontaneous ordering. 1. Clarification of order formation mechanism of the nanostructural soft matter and creation of a new structural type 2. Creation of new liquid crystal phase by substance fusion and application to the electro-optic device 3. Development of 3D photonic liquid crystal and photoregulation 4. New device materials that mimics a biological hierarchical structure and emergent self-organizing mechanism phenomenologically. 5. Development of a high-speed/high-functional liquid crystal device material 6. Unidirectional translational motion of magnetic particles induced by alternating magnetic fields 7. Development of AC-driven electro-osmotic pump using porous polymer membranes
Acceptable students	One student per a semester can be accepted.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Material Electrochemistry
Staffs	Professor : Shigeto OKADA Associate Professor : Assistant Professor :
Scientific backgrounds	Solid-state chemistry, Electrochemistry
Overview	<p>The goal of this study is to develop low-cost, high-efficiency large-size rechargeable batteries.</p> <p>Through the new rechargeable battery, we hope to simultaneously provide solutions to two urgent national issues: earthquake reconstruction through providing solutions to electricity shortages caused by Fukushima Nuclear Power Plant accident and the industry restructuring from electronics to energy industry by Japan's world-class battery technology.</p> <p>For a long time, semiconductors were key device for Japan. Nowadays, instead of semiconductors, new batteries are expected as key devices of many industries in Japan, such as telecommunications, automobiles, robotics and the power-generation industries. In order to realize large-scale rechargeable batteries for the next generation, battery material research in this lab is primarily being conducted through the following approaches, now.</p>
Research subjects	<p>1) Research on new minor-metal free cathode material for large-scale rechargeable lithium-ion batteries [NEDO Research and development initiative for scientific innovation of new generation batteries project (2009-2015)]</p> <p>2) Research on rechargeable sodium-ion batteries [Elements science & technology projects of MEXT (2009-2013)]</p> <p>3) Research on aqueous rechargeable sodium-ion batteries [Elements strategy initiative for catalysts and batteries of MEXT (2012-2021)]</p>
Acceptable students	<p>One student per a semester can be accepted.</p> <p>You will experience design of the suitable host structure as electrode, synthesis of the inorganic materials using electric furnace, identification by XRD, fabrication of electrodes, setup of coin-type cell in Ar glove box, evaluation of the electrochemical performances, and analysis of the reaction mechanism. Students with chemistry background who are specialized in synthesis, identification, and characterization of inorganic materials will be most welcome.</p>
Other comments (if any)	It will be very busy and hard work, but may be exciting.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Chemical Reaction Engineering
Staffs	Professor : Jun-ichiro HAYASHI Associate Professor : Shinji KUDO Assistant Professor :
Scientific backgrounds	Chemical Reaction Engineering
Overview	<p>This laboratory has been carrying research works mainly on carbon resource utilization with bases/principles of chemical reaction engineering, aiming at 1) proposal and development of novel thermochemical and catalytic processes/systems of carbon resource conversion/upgrading, 2) experimental proof-of-concept of the proposals, 3) development of numerical models that considers detailed chemical reaction kinetics, transport phenomena and fluid dynamics simultaneously, 4) numerical simulation and design of thermochemical and catalytic reactors and processes. The main targets of carbon resources are biomass, coal and heavy oil.</p>
Research subjects	<p>Current research subjects are as follows:</p> <ul style="list-style-type: none"> • Thermochemical conversion of solid fuels such as coal and biomass to gas, liquid and carbon material/materials (i.e., pyrolysis, carbonization and gasification) • Catalytic conversion of biomass to produce syngas, liquid fuels and/or specific chemicals. • Hydrothermal upgrading of biomass and coal • Computational fluid dynamics study for reforming of multi-component gas mixtures derived from solid carbon resources • Computer aided reactor design for C/C and SiC/SiC composite materials production by chemical vapor infiltration • Detailed chemical kinetic modeling for reactions included in thermochemical conversions of carbon resources
Acceptable students	One student per a semester can be accepted.
	Students who have learned fundamentals of chemical engineering, physical chemistry, and/or mechanical engineering are acceptable.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Advanced Functional Devices
Staffs	Professor : Hiroshi NAKASHIMA Associate Professor : Dong WANG Assistant Professor : Keisuke YAMAMOTO
Scientific backgrounds	Physics of Semiconductor Devices
Overview	<p><i>Development of processing and device for advanced ULSI contributing to sophisticated information society</i></p> <p>This laboratory conducts researches on Si-, SiC-, SiGe-, and Ge-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 arranged, which provide good circumstances for advanced semiconductor research.</p>
Research subjects	<p><i>Research and development of materials and processing for Advanced Ge-CMOS and Ge-photonic devices</i></p> <ul style="list-style-type: none"> • 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 <p><i>Optical and electrical characterizations of semiconductor thin films on insulator</i></p> <ul style="list-style-type: none"> • Crystallinity, strain, and defect evaluations using photoluminescence (PL) and deep level transient spectroscopy (DLTS) <p><i>Research and development of processing for fabricating SiC device</i></p> <ul style="list-style-type: none"> • Formation of gate stack, contact, and pn junction
Acceptable students	One student per a semester can be accepted.
	<p>Students with a background of semiconductor physics and devices are most welcome.</p> <p>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.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Electronic Display Technologies
Staffs	Professor : Reiji HATTORI Associate Professor : Assistant Professor :
Scientific backgrounds	Electronic circuit theory, Applied Physics, Organic Electronics
Overview	<p><i>Display electronics and related technology</i></p> <p>The laboratory aims to develop “University-made display,” which means the easily-made but low-cost and reliable display. We are trying to send a new display to the world. The recent researching technologies are organic/oxide thin-film transistors, a flexible display, an electronic paper display, and so on. The related technologies such as touch screen panel and wireless-power-transfer system are also researched.</p>
Research subjects	<p><i>Thin-Film Transistor (TFT) Technologies</i></p> <ul style="list-style-type: none"> • Process and fabrication study of organic TFT devices • Design of TFT layout and circuit with CAD • Fabrication of oxide TFT backplane on 200mm x 200mm glass substrate • Device simulation analysis of Organic/Oxide TFT <p><i>Active-Matrix Organic Light-Emitting Display (AM-OLED)</i></p> <ul style="list-style-type: none"> • Driving circuit for AM-OLED • Device simulation analysis of OLED • Device fabrication using Liquid-OLED and MEMS technologies <p><i>Electronic Paper Display</i></p> <ul style="list-style-type: none"> • Quick-Response Liquid-Powder Display • Full-color electro-chromic display <p><i>Display-Related Technologies</i></p> <ul style="list-style-type: none"> • Capacitive-coupling wireless-power transfer. • Touch screen panel • Wearable and flexible sensors
Acceptable students	One student per a semester can be accepted.
	Students whose educational background is electronic engineering, computer science, applied physics, solid-state physics or organic electronics are acceptable from the viewpoint of educational compatibility. All of them is not necessary but one of them is enough.
Other comments (if any)	http://www.astec.kyushu-u.ac.jp/e/project/photonic.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Quantum Materials Physics
Staff	Professor : Satoshi HATA Associate Professor : Assistant Professor : Hikaru SAITO
Scientific backgrounds	Transmission Electron Microscopy (TEM) Scanning Transmission Electron Microscopy (STEM) Electron Tomography (ET) Electron Energy-Loss Spectroscopy (EELS) Nanostructure in Metals and Alloys Plasmonics
Overview	Hata Laboratory develops and uses new methods of transmission electron microscopy (TEM) and scanning transmission electron microscopy (STEM) for clarifying nanostructures and their relationships with physical properties of advanced materials. Members of Hata Laboratory learn fundamentals and various skills of TEM/STEM imaging and analysis in order to be electron microscopists who can contribute to materials research.
Research subjects	1. Development of advanced electron tomography methods and their applications 2. Development of automated crystal orientation mapping by scanning precession electron diffraction and its applications 3. Development of advanced EELS methods for plasmonics research 4. Study of nanostructural evolutions in alloys by advanced TEM/STEM
Acceptable students	Students who have Fundamental knowledge of electron microscopy (mandatory), solid state physics (mandatory) and metallurgy (optional); Skills for safely treating chemicals and electrical tools; Skills for programing (optional)
Other comments (if any)	http://www.asem.kyushu-u.ac.jp/qq/qq01/top-e.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Applied Science for Electronics and Materials
Laboratory	Materials Engineering and Carbonic Materials
Staff	Professor : Seong-Ho YOON Associate Professor : Jin MIYAWAKI Assistant Professor : Koji NAKABAYASHI
Scientific backgrounds	<ul style="list-style-type: none"> • Synthesis and Application of Functional Carbon Materials • Energy and Environmental Engineering
Overview	Our research group designs and fabricates high-functional and high-performance carbon materials to solve various problems relating to energy and environment. Furthermore, we are pursuing to achieve our goals to the practical applications of developed carbon materials based on elucidated scientific principles and structure recognition through unremitting experiments.
Research subjects	Regarding our research, we are studying four main themes as follows; <ul style="list-style-type: none"> • Fundamental research of various carbon materials with high-functionality and high-performance: Invention of advanced materials by controlling their nano-structural units as the new methods • Materialization of nano-hybrid carbon materials by using the new nano-technology: Development into various application fields by newly improving properties of general carbon materials • Effective utilization of fossil resources as carbon materials for energies and environments: Research of De-SO_x, De-NO_x, desalinization, battery, capacitor and fuel cell by using activated carbons and carbon nano-materials supported catalysts • Constant creation of new carbon materials with novel properties
Acceptable students	One student per a semester can be accepted.
	Students with a background of material science and energy and environmental engineering are most welcome.
Other comments (if any)	http://carbon.cm.kyushu-u.ac.jp/index-en.htm

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Surface Science
Staffs	Professor : Seigi MIZUNO Associate Professor : Takeshi NAKAGAWA
Scientific backgrounds	Solid State Physics, Inorganic Chemistry, Physical Chemistry
Overview	Surfaces are getting more important when the size of things gets smaller, and closely related to the fundamental mechanism of chemical reactions and electronic devices. Our group fabricates novel surface materials on semiconductor and metal substrates, and determines their atomic structures using low energy electron diffraction and scanning tunneling microscope. Furthermore we explore their two dimensional electronic states and magnetism. Development of new instruments to investigate surface and electronic structures is also our research interest.
Research subjects	<p><i>Atomic structure determination of novel surfaces and interfaces</i> Creation of novel surface structures on metal and semiconductor (Si, SiC) substrates and determination of their atomic structure using low energy electron diffraction (LEED). Current projects cover two dimensional structures such as graphene, silicene, and silicon oxide/nitrogen oxide layers.</p> <p><i>Development of nano LEED</i> Construction of nano LEED which can determine atomic structures with a spatial resolution of nano-meters. This subject includes the fabrication of electron emitters made of chemically etched tungsten tips, and the evaluation and manipulation of their atomic structures using field ion microscope and field electron microscope.</p> <p><i>Magnetic low dimensional structures</i> Formation of low dimensional magnetic structures (atomic wires, 2 dimensional ultrathin films). We aim to produce materials with excellent magnetic properties such as high anisotropy, stable magnetization against ambient conditions. Experimental techniques are scanning tunneling spectroscopy/microscopy, synchrotron radiation, and LEED.</p>
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students with a background of material sciences are welcome. Especially, the knowledge of solid state physics, inorganic chemistry, or physical chemistry is desirable. We offer tutorials about ultra high vacuum, preparation of surfaces, molecular beam epitaxy, electron diffraction, and so on. Complementary lectures related to surface science are also given.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Theoretical Material Science
Staffs	Professor : Yuriko AOKI Associate Professor : Assistant Professor : Wataru MIZUKAMI
Scientific backgrounds	Computational chemistry, Theoretical chemistry and physics, Quantum chemistry, Data science for material design
Overview	<p>The laboratory is engaged in construction of the integrated simulation system for the prediction of biomolecular complexes as well as nano-scaled materials, and also for the analysis of their functional mechanisms at ab initio level of theory in quantum chemistry and first principle method. We are developing methodologies to elucidate the structures, properties, and catalytic reaction mechanisms of molecules and materials. We are in progress to establish original methods to calculate large systems like DNA, proteins, and other nano-scale materials efficiently using supercomputers. On the other hand, we are also doing computational chemistry to make various phenomena known in experiments clear in their mechanism using computational software.</p>
Research subjects	<p>This group is conducting only computational research</p> <ul style="list-style-type: none"> ● Development of linear scaling computational methods for DNA and proteins and its applications. ● Theoretical design of ferromagnetic organic compounds. ● Molecular design of nonlinear optical materials by quantum chemistry ● Molecular design of conducting polymers by structure control ● Functional design of the materials for organic thin film solar cell ● Catalytic reaction analysis using first-principle calculations ● Transition state searching for designing catalysis ● Data science for designing functional materials
Acceptable students	<p>One student per a semester can be accepted.</p> <p>The students who are interested in Quantum Chemistry are welcome. Using ready-made soft wear is one way to conduct the research for analyzing experimental data. However, developing codes and methodology are possible only for the students who will learn UNIX commands and FORTRAN languages and also have challenging spirits to study theoretical chemistry or quantum mechanics. The latter case must be more interesting in constructing original method and finding novel treatment. Even for the former case, analysis of functional properties of molecules, clusters, polymers, and materials are available within a short period</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Theory of Functional Materials
Staffs	Professor : Kengo SHIMANOE Associate Professor : Maiko NISHIBORI
Scientific backgrounds	materials chemistry, electrochemistry, ceramic science
Overview	Our research interests are material sciences focusing on the development of functional materials, analysis of functional properties, and design and application of functional devices. Our research activities are classified into the following categories.
Research subjects	<p>(1) Development and basic understanding of chemical gas sensors. Major effort is directed to gas sensors using semiconducting or ion-conducting oxides.</p> <p>*Semiconductor type gas sensor using nanomaterials such as SnO₂ and WO₃ synthesized by a wet chemical method.</p> <p>Control of micro porous structure for thin film semiconductor gas sensors using nanomaterials.</p> <p>Analysis of diffusion-reaction for semiconductor gas sensors.</p> <p>Elucidation of basic characteristics of semiconductor gas sensors.</p> <p>*Solid electrolyte type gas sensor using sodium or oxygen ion super conducting materials.</p> <p>Elaboration of compact type sensor operative at low temperature.</p> <p>(2) Development and application of novel functional inorganic materials (mostly mixed oxides or their composites)</p> <p>*Oxygen reduction electrodes for metal-air batteries</p> <p>New type oxygen-separating membranes using mixed conductors</p> <p>(3) "Nano-meso-macro" hierarchically controlled synthesis and fabrication of materials and devices</p> <p>*Synthesis of nano-sized metal oxides and metals for catalytic application by sophisticated methods</p> <p>*"Nano-meso-macro" hierarchically controlled fabrication of catalytic and electrochemical elements/devices</p> <p>*Characterization of materials by advanced techniques including synchrotron radiation techniques (XAFS, SAXS)</p>
Acceptable students	One or two students per a semester can be accepted.
	Students with chemistry background inorganic materials are most welcome. We can also offer rudimentary experiment-based tutorial to students with and without chemistry background who are interested in research areas related to the above-listed subjects such as environmental chemistry, synthesis and characterization of materials.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Functional Inorganic Materials Chemistry
Staffs	Professor : Hisahiro EINAGA Associate Professor :
Scientific backgrounds	Physical and Inorganic Chemistry, Material Science
Overview	<p><i>Energy- and environment-related technologies based on functional inorganic materials</i></p> <p>The laboratory is engaged in education and research on the development of new materials, devices and systems for energy and environmental applications, which are key technological challenges to realize the sustainable and prosperous society. We also focus on the basic aspects behind the technology developments such as synthesis and characterization of materials.</p>
Research Subjects	<p><i>Catalytic and sorption technologies for environmental protection and energy saving</i></p> <ul style="list-style-type: none"> • Development of catalysts for the treatment of gasoline/diesel vehicle exhausts • Novel-type gas separation using mixed-conductive materials <p><i>Development of catalytic oxidation processes under mild conditions</i></p> <ul style="list-style-type: none"> • Catalytic abatement of harmful substances such as CO, volatile organic compounds (VOCs) by ozonation, photocatalysis and microwave irradiation
Acceptable students	One student per a semester can be accepted.
	<p>Students with chemistry background who are specialized in heterogeneous catalysis and inorganic materials are most welcome.</p> <p>We can also offer rudimentary experiment-based tutorial to students with and without chemistry background who are interested in research areas related to the above-listed subjects such as catalysis, environmental chemistry, synthesis and characterization of materials.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Structural Materials Science
Staff	Professor : Hideharu NAKASHIMA Associate Professor : Masatoshi MITSUHARA Assistant Professor : Shigeto YAMASAKI
Scientific backgrounds	Metallurgy, Mechanical property, Electron Microscopy
Overview	<p>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.</p>
Research subjects	<p><i>Deformation behavior and its microscopic mechanisms of advanced metallic materials</i></p> <ul style="list-style-type: none"> - High temperature strength (Creep property) of heat-resistant steels, Ni alloys, Ti alloys, solder 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 <p><i>Development of advanced high-temperature structural materials</i></p> <ul style="list-style-type: none"> - Novel ferritic heat-resistant steel using high nitrogen. <p><i>Microstructure and fracture toughness</i></p> <ul style="list-style-type: none"> - Crack propagation behavior in WC-Co hard metals. <p><i>Microstructural analysis method using electron microscopes</i></p> <ul style="list-style-type: none"> - TEM, STEM, SEM, EBSD, EDS EELS, FIB, Tomography, etc.
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students with metallurgy background who are specialized in mechanical properties and microstructural characterization are most welcome.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Analytical Chemistry and Physical Chemistry
Staffs	Professor : Akira HARATA Associate Professor : Akihiro YABUSHITA Assistant Professor : Toshio ISHIOKA
Scientific backgrounds	Analytical chemistry and/or physical chemistry
Overview	The purpose of our research is two-fold. The first is to invent new spectroscopic methods for measuring the structures, reactions, and functions of molecules. The second is to apply these new methods to solve problems in molecular and material sciences. We aim to develop new fields on analytical and physical chemistry mainly using laser and synchrotron radiation. Matter irradiated with pulse laser light or synchrotron radiation, which ranges from 10^{-8} to 10^{-15} seconds, exhibits various phenomena such as photothermal conversion, fluorescence, photoionization, optical harmonic generation, etc. These phenomena can be used to understand the environment of molecules in a liquid, on a liquid surface, at a solid-liquid interface, or on an aerosol surface. Because these phenomena are highly sensitive to the target molecule, they can be used to develop species-selective methods for ultrasensitive analysis. We strive to apply these methods to developing new materials, solving atmospheric and environmental issues and analyzing life-related phenomena.
Research subjects	Laser chemistry, synchrotron radiation chemistry, and their application to ultrasensitive analysis (physical and analytical chemistry): Instrumentation, sensing-system development, and measurements on (1) laser photothermal spectroscopy especially for ultratrace separation analysis combined with HPLC (2) laser-induced fluorescence spectroscopy especially for interface analysis (3) laser-induced multiphoton ionization spectroscopy especially for ultratrace analysis (4) laser second harmonics especially for interface analysis (5) anion-recognition system by chemically induced-fitting with surface modified nanoparticles and electrodes (6) resonance-enhanced multiphoton ionization/time-of-flight mass spectrometry for revealing reaction mechanisms in space. (7) cavity ring-down spectroscopy for revealing reaction mechanisms in atmospheric environment.
Acceptable students	One student per a semester can be accepted.
	A student with any academic backgrounds is welcome if they she/he has interests in analytical chemistry, physical chemistry, laser chemistry, optical spectroscopy, nonlinear optics, phsicochemical data processing, reagent synthesis, numerical analysis, and/or instrumentation.
Other comments (if any)	Check Web site for details. http://www.mm.kyushu-u.ac.jp/lab_07/

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Mechanics and Materials, Arakawa group
Staffs	Professor : Kazuo ARAKAWA Associate Professor : Assistant Professor :
Scientific backgrounds	Mechanical Properties of Materials,
Overview	<p><i>Research and development of new composite materials for renewable energy investigation</i></p> <p>Arakawa group provides education relating to research and development of new composite materials for renewable energy investigation on offshore floating energy farm. As a lightweight and high-strength material for wind-lens turbines on the energy farm, we focus on the manufacturing process of carbon-fiber reinforced plastic (CFRP) using new techniques including vacuum-assisted resin transfer molding (VARTM). We also investigate the mechanical properties of CFRP using various experimental and analytical methods.</p>
Research subjects	<p><i>Development of new composite materials for offshore floating energy farm</i></p> <ul style="list-style-type: none"> ● Development of carbon-fiber reinforced plastic (CFRP) as a lightweight and high-strength material ● Improvement of manufacturing process of CFRP using vacuum-assisted resin transfer molding (VARTM) technique ● Development of energy harvesting composite materials with piezoelectric films <p><i>Evaluation of mechanical properties of new composite materials</i></p> <ul style="list-style-type: none"> ● Material testing using various experimental methods ● Deformation and fracture measurement of composite materials ● Full-field deformation measurement using three-dimensional digital image correlation (3D-DIC) technique ● Monitoring of resin transfer process in CFRP molding using 3D-DIC technique
Acceptable students	<p>One student per a semester can be accepted.</p> <p>This group accepts student from a variety of disciplines, including the mechanical, material, chemical and physical fields. Students with background who have studied mechanics and materials are most welcome.</p> <p>We would like to instruct students so that they are motivated to manufacture new composite materials by themselves and to evaluate the mechanical properties including the strength of materials.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Mechanics and Materials – Biomaterial & Biomechanics Group -
Staffs	Associate Professor : Mitsugu TODO
Scientific backgrounds	Biomaterial, Biomechanics, Composite material, Finite element method
Overview	Prof. Todo's group in Mechanics and Materials Lab. is actively working on the research topics related to biomaterials and biomechanics. Especially, tissue engineering researches for bone, cartilage and ligament regenerations in orthopedic field are the main topics of study. Also, computational analyses using the finite element method of artificial knee and hip joints are conducting as joint works with medical researchers in the orthopedic field.
Research subjects	<p><i>Regenerative Medicine and Tissue Engineering</i></p> <ul style="list-style-type: none"> • Development of organic/inorganic composite scaffolds for bone and cartilage tissue engineering • Development of artificial bone and cartilage tissues using 3D scaffolds with mesenchymal stem cells • Development of porous materials with drug release function <p><i>Biomechanics of Artificial Joints</i></p> <ul style="list-style-type: none"> • Computational analysis of artificial knee and hip joints • Computational analysis of mechanical interactions between artificial joints and bones.
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students who have academic backgrounds in mechanical engineering, materials engineering (metal, ceramics, polymer and composites) and chemical engineering are welcome to join our group. Tissue engineering is one of the typical interdisciplinary research fields, therefore, any scientific and engineering backgrounds are basically acceptable.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Novel Structures in Organic Chemistry
Staffs	Professor : Katsuhiko TOMOOKA Associate Professor : Masato ITO Assistant Professor : Kazunobu IGAWA
Scientific backgrounds	Synthetic Organic Chemistry, Structural Organic Chemistry
Overview	<p><i>Creation of novel functional molecules based on control of stereochemistry</i></p> <p>Three-dimensional molecular design is important for creation of molecular functionality. We are focusing on the design and synthesis of unique chiral molecules for development of novel bioactive molecules, functional materials, asymmetric reagents, chiral architectures, and so on.</p>
Research subjects	<p>1. Synthetic Methodology</p> <p>Efficient synthesis of highly functionalized valuable molecules requires innovative synthetic reactions including precise stereochemical control. To this end, we focus on the development of asymmetric reactions affording heterofunctionalized chiral molecules based on carbanion reactions and novel oxidation reactions.</p> <p>2. Chiral Silicon Compounds</p> <p>Chiral non-racemic organosilicon compounds with a stereogenic center at silicon have long been elusive but potentially useful unnatural chiral molecules. We have developed a number of efficient asymmetric methods to provide an access to novel silicon compounds of this class, which should significantly contribute to the elucidation of unexplored stereochemistry of organosilicon compounds and to the future development of new chiral functional and biologically active organosilicon compounds.</p> <p>3. Planar Chiral Heterocycles</p> <p>Planar chiral heterocycles have a unique three-dimensional structure and show dynamic interconversion of the enantiomers. We focus on the stereochemical behavior of the planar chiral heterocycles and their applications as chiral building blocks, asymmetric reagents, and chiral architectures for functional materials.</p>
Acceptable students	One student per a semester can be accepted.
	<p>We can accept students who have knowledge of organic chemistry to understand reaction mechanisms based on the electronic theory. The students with experimental skill of organic synthesis are most welcome.</p> <p>In our group, basic organic synthesis, structural analysis, asymmetric synthesis, and computational study on organic reactions will be instructed.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Organometallic and Heteroatom Chemistry
Staffs	Professor : Hideo NAGASHIMA Assistant Professor : Yusuke SUNADA Assistant Professor : Atsushi TAHARA
Scientific backgrounds	Organic Chemistry, Inorganic chemistry, Polymer chemistry, Catalysis
Overview	<p><i>Development of new catalysts for production of functional organic molecules and polymer materials.</i></p> <p>Transition metal complexes useful in organic and polymer synthesis as homogeneous catalysts are designed, and subjected to studies on synthesis, characterization, reactions, and catalysis. Environmentally benign chemical processes are a target to be developed, and research based on element strategy, replacement of noble metals to common metals, high catalytic activity by minimum amounts of metals, and catalyst recovery and reuse, is ongoing.</p>
Research subjects	<ol style="list-style-type: none"> <i>Element strategy: Replacement of noble metals to common metals</i> <ul style="list-style-type: none"> Development of new iron complexes as homogeneous catalysts in organic and polymer synthesis. <i>Element strategy: High catalytic activity by minimum amounts of metals</i> <ul style="list-style-type: none"> Development of highly active ruthenium, rhodium, iridium, palladium, and platinum catalysts in organic and polymer synthesis. <i>Element strategy: Catalyst recovery and reuse</i> <ul style="list-style-type: none"> Catalyst encapsulation of late transition metals into polysiloxane gels. Catalyst encapsulation of late transition metals into hyperbranched polystyrenes. <i>Fundamentals in organometallic chemistry</i> <ul style="list-style-type: none"> Preparation, physical properties, and reactions of small metal clusters and nano-sized organometallic compounds.
Acceptable students	<p>One student per a semester can be accepted.</p> <p>We offer advanced experimental experiences on organometallic chemistry and catalysis for students who have basic knowledge and training of experimental organic chemistry. Broader area of science is included in our research, physical chemistry (kinetics), inorganic chemistry (coordination chemistry and chemistry of elements), polymer chemistry, and chemical engineering. For students whose expertise are in these scientific area, new experience in our laboratory possibly be provided by discussion with our staff.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Synthetic Methodology
Staffs	Professor : Mitsuru SHINDO Associate Professor : Arihiro KANO Assistant Professor : Kenji MATSUMOTO
Scientific backgrounds	Synthetic Organic Chemistry, Molecular Biology
Overview	Our research goal is to develop new synthetic reactions, to synthesize target bioactive organic compounds, to elucidate the functions of life science phenomena on a molecular level, and to create new bioactive organic molecules.
Research subjects	<p><i>Synthetic Organic Chemistry and Chemical Biology</i></p> <ul style="list-style-type: none"> *Development of new useful synthetic organic reactions using functional reactive species called "ynolates". *Total synthesis of bioactive natural products. *Design and synthesis of bioactive organic molecules and their molecular probes, including apoptosis and allelopathy, which contribute to the development of medical drugs, agrochemicals, and biotools. *Elucidation of the mechanism and identification of the factor of which the tumor evade immunological surveillance. *Drug Delivery System, especially targeted to cancers
Acceptable students	One student per a semester can be accepted.
	Students with organic chemistry or molecular biology background who are specialized in synthetic organic chemistry or chemical biology are most welcome.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Molecular and Material Sciences
Laboratory	Physical Polymer Science (Takahashi group)
Staffs	Professor : Associate Professor : Yoshiaki TAKAHASHI Assistant Professor : Akihiko TAKADA
Scientific backgrounds	Physical Chemistry, Polymer Science
Overview	<p>Our group pursues basic studies on physical properties of polymers. The main part is experimental studies on the relation of rheological and other basic physical properties to hierarchical structures of biopolymers and synthetic polymers. We also focus on usage of ionic liquids as solvent for polymers.</p>
Research subjects	<p>Physical properties of ionic liquid based solvents.</p> <ul style="list-style-type: none"> ● Temperature dependence of density and viscosity. <p>Viscoelastic properties of natural polymers in ionic liquids.</p> <ul style="list-style-type: none"> ● New characterization methods of natural polymers. ● Solvent effects on the viscoelastic properties over a wide range of concentration. ● Viscoelastic properties of polymer blends via ionic liquid solutions.
Acceptable students	One student per a semester can be accepted.
	<p>Students having polymer science background and interested in rheology are most welcome. We can also offer basic experiment-based tutorial to students who are interested in characterization of polymers and related soft materials.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Molecular and Material Sciences
Laboratory	Nanoscience and Nanotechnology of Nanostructured Materials
Staff	Professor : Takeshi YANAGIDA Associate Professor : Kazuki NAGASHIMA Assistant Professor :
Scientific backgrounds	Nanoscience and Nanotechnology
Overview	Our research interests include: 1) Creation and Understanding of Novel Nanostructures based on Fundamental Nanoscience at Atomic and Molecule Level 2) Creation and Understanding of Nanoscale Physical Properties of Nanomaterials using “Single” Nanomaterial Measurement 3) Creation of Novel Nanoscale Devices based on Above Fundamental Nanoscience and Nanotechnology 4) Real Applications of Nanoscale Devices via Collaboration with Companies
Research subjects	Nanoscience and Nanotechnology for Forthcoming IoT Society and Human Health
Acceptable students	Acceptable Backgrounds include: Physics, Chemistry, Electrical Engineering, Chemical Engineering, Nanoscience and Nanotechnology
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Molecular and Material Sciences
Laboratory	Design of Advanced Organic Compounds
Staffs	Professor : Yoichiro KUNINOBU Associate Professor : Assistant Professor : Takeru TORIGOE
Scientific backgrounds	Synthetic Organic Chemistry, Organometallic Chemistry, Structural Organic Chemistry, Organic Materials Chemistry
Overview	We are trying to resolve energy and environmental problems through creation of high-functioning catalysts, development of practical synthetic organic reactions, and creation of high-performance organic functional materials.
Research subjects	<p><i>Creation of High-Performance Catalysts</i></p> <p>Control of regioselectivity is very important for synthetic organic reactions including C-H bond transformations. We are creating new methods to control regioselectivity using noncovalent interactions, such as hydrogen bonding and Lewis acid-base interaction. For example, we succeeded in <i>meta</i>-selective C-H transformation using a catalyst with a substrate recognition site, which can recognize a functional group of substrates by hydrogen bonding.</p> <p><i>Development of Novel and Practical Synthetic Organic Reactions</i></p> <p>We develop novel synthetic organic reactions with a focus on C-H bond transformations. We focus on the development of both scholastically important and synthetically useful reactions, such as C-H transformations without using directing groups. For example, C-H/C-H coupling reactions and regioselective introduction reactions of a trifluoromethyl group, which is important in drugs, agrochemicals, and organic functional materials, are developed.</p> <p><i>Creation of Novel Organic Functional Materials</i></p> <p>We synthesize novel π-conjugated molecules with a non-covalent bonding, such as Lewis acid-base interaction. We believe that such π-conjugated molecules must have special properties, which are not expressed in π-conjugated molecules consist of only covalent bonds.</p>
Acceptable students	One student per a semester can be accepted. Students with chemistry background who are specialized in organic synthesis, organometallic chemistry, and organic functional materials are most welcome.
Other comments (if any)	http://kuninobu-lab-english.cm.kyushu-u.ac.jp/

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Advanced Energy Engineering Science
Laboratory	Materials Sciences in Extremely Severe Conditions
Staffs	Professor : Associate Professor : Kenichi HASHIZUME Assistant Professor :
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)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Advanced Energy Engineering Science
Laboratory	Energy Chemical Engineering
Staffs	Professor : Satoshi FUKADA Associate Professor : Kazunari KATAYAMA Assistant Professor :
Scientific backgrounds	Nuclear Chemical Engineering, Energy Chemical Engineering
Overview	<p>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 Institute Fusion Sciences and Japan Atomic Energy Agency.</p>
Research subjects	(1) Studies related with fusion fuel cycle <ul style="list-style-type: none"> ● Materials purification, clarification of solid-hydrogen interactions, ● Hydrogen isotope separation, migration of hydrogen isotopes ● Tritium migration through porous materials and liquid blankets ● Tritium recovery from solid or liquid blanket materials ● Tritium retention and permeation in fusion blankets. (2) Hydrogen production using nuclear heat or with low carbon emission <ul style="list-style-type: none"> ● Hydrogen production with methane conversion ● Clarification of effects of water vapor in fuel cell system
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students with the background of energy chemical engineering or nuclear chemical engineering are preferable. Experiment is performed in our laboratory as well as in NIFS or JAEA laboratory. Based on experiment and calculations, design-based studies are intended. Students who are interested in above research areas are also welcome with different backgrounds of engineering sciences.</p>
Other comments (if any)	http://www.qpn.kyushu-u.ac.jp/lab5/English/Engtop.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Advanced Energy Engineering Science
Laboratory	Energy Engineering Physics
Staffs	Professor : Yukinobu WATANABE Associate Professor : Tadahiro KIN Assistant Professor
Scientific backgrounds	Radiation Physics & Engineering, Nuclear Physics & Engineering,
Overview	Our research group aims at applying atomic and nuclear physics to advanced science and technology. In particular, we are studying physical mechanisms on the transport of high-density energy generated by elementary particle and nuclear reactions in matter and biological body, in connection with development of next-generation fission and fusion energy system, space equipment, and particle accelerators for medical purpose. The scope of our research covers neutron and light-ion induced reactions, nuclear data, radiation physics, radiation transport calculations, radiation detection, multi-scale simulation of single-event effects in microelectronic devices, and so on.
Research subjects	<ol style="list-style-type: none"> Nuclear physics and its application <ul style="list-style-type: none"> Experimental and theoretical study of deuteron-induced reactions Experimental and simulation study of production of radioisotopes for medical use with deuteron accelerator neutron source Modeling of nuclear reactions related to fusion reactor engineering Radiation effects in microelectronic devices <ul style="list-style-type: none"> Multi-scale and multi-physics simulation of soft error phenomena in semiconductor devices under space and terrestrial cosmic-ray environments Advanced radiation detectors <ul style="list-style-type: none"> Development of a compact detector system for measuring cosmic-ray muons and its application to muon radiography for geophysical-scale materials Development of a new radioactivity analyzer using NaI(Tl) scintillator and its application to radioactivity analyses in food Intense-laser-driven ion acceleration <ul style="list-style-type: none"> Study of ion acceleration using ultraintense and ultrashort laser pulses in collaboration with Japan Atomic Energy Agency Development of detector systems of generated ions and electrons
Acceptable students	One student per a semester can be accepted.
	Students with physics background who are majoring at nuclear and radiation physics & engineering are welcome. Regardless of major fields, we will provide an introductory tutorial to students who are interested in the above-mentioned research subjects.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Advanced Energy Engineering Science
Laboratory	Advanced Space Propulsion Laboratory
Staffs	Professor : Naoji YAMAMOTO Associate Professor :
Scientific backgrounds	Aerospace engineering, plasma physics,
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 the laser based diagnostics for understanding the physics inside these propulsions.
Research subjects	<p>Laser fusion rocket</p> <ul style="list-style-type: none"> ● Improvement of its performance by numerical simulation ● Validation of numerical simulation by experiment <p>Hall thruster</p> <ul style="list-style-type: none"> ● Lifetime sensor using CRDS spectroscopy ● Control discharge oscillation by intelligent power supply <p>Ion engine</p> <ul style="list-style-type: none"> ● Extend lifetime by means of numerical simulation and experiment ● Development of miniature ion engine system <p>Plasma diagnostics</p> <ul style="list-style-type: none"> ● Velocity measurement by high sensitive absorption spectroscopy. ● Plasma property measurement by Laser Thomson scattering
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)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Energy and Environmental Engineering
Laboratory	Urban and architectural environment
Staff	Professor : Jun TANIMOTO Associate Professor : Naoki IKEGAYA
Scientific backgrounds	Wind engineering, Urban climatology, Urban and building environment, Complex science and game theory
Overview	<p>The Urban and Architectural Environment Laboratory focuses on solving complex, multidisciplinary problems related to urban and architectural environment, leading to a better future. Our research activities are summarized into following four aspects.</p> <ul style="list-style-type: none"> - Observation and modeling of urban climate - Modeling of building physics from the viewpoints of thermal and fluid dynamics system - Modeling of human-environment-social system based on complex science and game theory <p>This laboratory is operated in cooperation with Laboratory of Green Asia Environmental Studies.</p>
Research subjects	<p>Wind tunnel experiment of airflow around urban building arrays The airflow around building arrays is one of important factors of pedestrian environment, urban ventilation of pollutant matters, and ventilation of urban buildings. Under these circumstances, this subject focuses on flow visualization and measurement around block arrays based on PIV (particle image velocimetry) and hot-wire anemometry.</p> <p>Building energy simulation of residence located in various climate region Thermal requirement and energy consumption in buildings are theoretically estimated based on the knowledge of heat transfer engineering. This subject aims to investigate the countermeasure for energy saving and reduction of CO₂ emission of houses under various climate conditions.</p> <p>Statistical physics of evolutionary games and its application One of the hottest issues in the current statistical physics is the Evolutionary Game Theory (EGT) that primarily models human decision-making process. We applied the framework supported by the EGT to understand a substantial mechanism working behind complex things that we can observe; such as traffic flow, epidemic spreading on social networks etc. The aim of this project is to find a brand-new horizon in which pure science merges concrete engineering problems to obtain actual provisions for our society</p>
Acceptable students	<p>Up to two students per a semester can be accepted.</p> <p>A student accepted to this laboratory will be encouraged to interact actively with all members of this laboratory to foster cross-cultural understanding.</p>
Other comments (if any)	A student who are interested in various things; not only science & engineering, but also social science, literature, human and arts is very welcome.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Energy and Environmental Engineering
Laboratory	Green-Asia Environmental Studies
Staff	Professor : Aya HAGISHIMA
Scientific backgrounds	Building Environmental Engineering, Urban climatology, Wind engineering
Overview	<p>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 urban climatological phenomena. Our research activities are summarized into following four aspects.</p> <p>This laboratory is operated in cooperation with Laboratory of Urban and Architectural Environment.</p>
Research subjects	<p>Stochastic building energy simulation of residence for demand forecast Thermal requirement and energy consumption in buildings are strongly affected by not only heat transfer processes of building envelopes but also stochastic occupants' behavior. This theme focuses on the latter factor targeting the framework of demand forecast for optimization and design of smart houses coupled with renewable energy sources.</p> <p>Low carbon building design methods tailored to various Asian countries Countries located in Asia are diverse in terms of climate, economic level, lifestyle, as well as social systems, however, the research on building designs for energy saving and low carbon has been mainly conducted in mid-latitude developed countries. Thus, it is generally difficult to apply the existing technologies in Asian countries. This theme aims to fill this research gap and provide comprehensive design methodologies tailored to each country based on numerical simulations as well as field surveys.</p> <p>Wind tunnel experiment of airflow around urban building arrays The airflow around building arrays is one of important factors of pedestrian environment, urban ventilation of pollutant matters, and ventilation of urban buildings. Under these circumstances, this subject focuses on flow visualization and measurement around block arrays based on PIV (particle image velocimetry) and hot- wire anemometry.</p>
Acceptable students	<p>Up to two students per a semester can be accepted.</p> <p>A student accepted to this laboratory will be encouraged to interact actively with all members of this laboratory to foster cross-cultural understanding.</p>
Other comments (if any)	A student who are interested in various things; not only science & engineering, but also social science, literature, human and arts is very welcome.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Energy and Environmental Engineering
Laboratory	Thermal Energy Conversion System Laboratory
Staff	Professor : Takahiko MIYAZAKI Associate Professor : Assistant Professor :
Scientific backgrounds	Thermodynamics, Heat and mass transfer, Adsorption
Overview	<p>Research in our laboratory focuses on efficiency, performance, energy conservation and environmental problems related with heat exchanger, heat pump and cooling systems (i.e. refrigeration and air conditioning).</p> <p>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.</p>
Research subjects	<ul style="list-style-type: none"> ● Analysis on thermal and adsorption characteristics 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
Acceptable students	The students with mechanical engineering background are most welcome to our laboratory. In addition, those who are studying chemical engineering or material science will fit to the scope of our laboratory in the field of adsorption studies. 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)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Energy and Environmental Engineering
Laboratory	Engine and Combustion Laboratory
Staff	<p>Professor</p> <p>Associate Professor : Hiroshi TASHIMA</p> <p>Assistant Professor : Daisuke TSURU</p>
Scientific backgrounds	Internal combustion engine, Diesel engines, Kinetics of combustion reactions, Spray development, Emission control
Overview	<p>The Engine and Combustion Laboratory focuses on improvements in thermal efficiency and emission control of internal combustion engines, especially large diesels which occupy marine propulsion and private power stations. Since a diesel engine is a complex system including fuel injection, spray development, droplet evaporation, mixture formation, combustion in various modes and etc., our research area widely ranges from proposing novel combustion concepts to establishing spray-relating CFD model, or from laser visualization techniques of in-cylinder phenomena to PIV measurements for spray air-entrainment process.</p>
Research subjects	<ul style="list-style-type: none"> • Investigation of mechanism of LOPI (Lub Oil Pre-Ignition) in PCC (Pre-Combustion Chamber) type gas engines and development of its countermeasures • Application of RSCI (Reactivity Stratified Compression Ignition) to large marine DF (Dual Fuel) engines • Study on air-entrainment process of a diesel spray and a high-pressure gas jet on dynamic PIV measurement technique • Combustion modelling of water emulsified fuel spray for 3D CFD based on experimental results in a CVCC (Constant Volume Combustion Chamber) • Investigation of sources of power estimation error in “Attained EEDI” certification using a 1D engine performance simulator
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Student having backgrounds in thermal engineering, thermal engines, fluid dynamics, and combustion chemistry are welcome.</p>
Other comments (if any)	<p>Many joint researches with industries are going on in our lab domestically and internationally. The research theme for students may be restricted because of the present research schedule and the secrecy obligations.</p>

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	EEE, Green Asia Education Center
Laboratory	Koyama-Miyazaki Lab (IGSES), Saha Lab (I2CNER)
Staff	Professor : Associate Professor : Kyaw Thu
Scientific backgrounds	Sorption science and advanced thermodynamic analyses for heat pump and desalination systems
Overview	We have been working on adsorption science from theoretical development to simulation (molecular and cycle). The immediate applications are adsorption heat pumps and energy storage. We particularly apply the second law of thermodynamics (entropy and exergy techniques) to assess systems such as power cycles (gas turbine), mechanical vapour compression chillers, sorption heat pump and solar thermal systems.
Research subjects	<ul style="list-style-type: none">• Adsorption simulation (molecular)• Adsorption science (adsorbed phase thermodynamics)• System simulation (heat pump, desalination cycle, co-generation systems and hybrid cycles)• Entropy and exergy analyses of various thermodynamic cycles
Acceptable students	Any highly motivated students are welcome for fruitful outcomes.
Other comments (if any)	It is not necessary for the students to have particular specialization. We train all students from basics.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Energy and Environmental Engineering
Laboratory	High-speed Gas Dynamics
Staff	Professor Associate Professor : ANYOJI Masayuki
Scientific backgrounds	Aerospace Engineering, Experimental Gas Dynamics, Flow Visualization
Overview	We are addressing the challenging issues related to aerospace fluid dynamics such as the development of a new type of an aircraft for planetary exploration, the acoustic noise arising from rockets and jet engines, and the development of advanced fluid-measurement techniques. Our main research method is experimental measurement using some wind tunnels, but fluid analysis using CFD (computational fluid dynamics) is also conducted.
Research subjects	<p><i>Development of Mars Airplane</i></p> <ul style="list-style-type: none"> -Aircraft design -Aerodynamic characteristics of low-Reynolds number airfoils -High-altitude flight test using a real Mars airplane <p><i>Flow visualization</i></p> <ul style="list-style-type: none"> -Development of a global luminescent oil-film skin-friction meter and its application to various engineering model (vehicle model, ahmed body, and delta wing) <p><i>Transonic or Supersonic Flow</i></p> <ul style="list-style-type: none"> -Impinging jet -Internal flow and acoustic noise (transonic tone) -Flow around delta wing
Acceptable students	One student per a semester can be accepted. Students with backgrounds of aerospace engineering, fluid dynamics are welcome. Fundamental skills of CFD and CAD are also desirable. But, the above knowledge and skills is not necessarily required for the students.
Other comments (if any)	Enthusiastic students are very welcome.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Department of Energy and Environmental Engineering
Laboratory	Environmental System / Ergonomics
Staff	Professor : Kazuhide Ito Assistant Professor : Sung-jun Yoo
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 <i>in silico</i> 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	<ul style="list-style-type: none"> (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.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Energy and Environmental Engineering
Laboratory	Energy and Environmental Systems
Staff	Professor Associate Professor : Hooman 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 modelling - 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 in urban areas 3)Energy planning under uncertainties – design of sustainable energy systems under multi-dimensional uncertainties. 4)Integration of renewable energy sources – role and value of emerging technologies and systems in supporting the integration of variable renewable generation and distributed energy resources, system integration costs.
Acceptable students	Students with a background of: 1. statistical methods, mathematical programing, 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/

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Space Environmental Fluid Dynamics
Staffs	Professor : Tohru HADA Associate Professor : Shuichi MATSUKIYO Assistant Professor :
Scientific backgrounds	Space plasma physics, Astrophysics, Plasma Physics
Overview	<p><i>Space plasma physics</i></p> <p>Space is not a vacuum, but is filled with a medium called plasma, an extremely high temperature gas that conducts electricity. Based on physical understanding of the plasma, we study nonlinear and non-equilibrium high-energy phenomena in space and astrophysical environments. Our primary methods for conducting research are theoretical analysis (plasma physics, nonlinear science) and computer simulations, but we are also involved in research collaborations on laboratory plasma and high-power laser experiments.</p>
Research subjects	<p><i>Nonlinear waves and turbulence in space plasma environment</i></p> <ul style="list-style-type: none"> • Nonlinear evolution of large amplitude magnetohydrodynamic (MHD) waves in the solar wind and in planetary foreshocks. • Acceleration and heating of charged particles by space plasma waves. • Analysis of MHD turbulence in the solar wind using spacecraft data. • Nonlinear processes of relativistic plasma waves in astro-plasma environment. <p><i>Acceleration and transport of cosmic rays</i></p> <ul style="list-style-type: none"> • Diffusive shock acceleration of cosmic rays (i.e., energetic particles). • Transport of cosmic rays in heliospheric boundaries. • Non-Gaussian model (Levy process, fractional differential equation model) of the cosmic ray transport. <p><i>Physics of collisionless shocks</i></p> <ul style="list-style-type: none"> • Structure and time evolution of collisionless shocks. In particular, elucidation of the dissipation mechanisms at the shocks. • Acceleration of non-thermal particles due to the shocks. • Laboratory experiment of the collisionless shocks using high-power laser facilities (collaboration with experimental group at Osaka university).
Acceptable students	One student per semester can be accepted.
Other comments (if any)	It may be advantageous to have background on plasma physics, space science, numerical analysis, computer programming, etc, but it is also true that these can be learned after entering the lab. What is more important is that the student is able to make logical discussions on the issues of their interest based on physical understanding of fundamental concepts.

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Environmental Fluid Dynamics
Staffs	Professor : Associate Professor : Osama ELJAMAL Assistant Professor :
Scientific backgrounds	Environmental Engineering
Overview	<p><i>Develop Novel Methods for Environmental Remediation and Water Treatment</i></p> <ul style="list-style-type: none"> ✓ 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	<p>Purpose</p> <p>My research interests concern the principles and techniques from science and engineering to develop:</p> <ul style="list-style-type: none"> ✓ 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. <p>Research Interests</p> <ul style="list-style-type: none"> ✓ 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.
	The students with the knowledge of environmental remediation, water treatment and environmental chemistry and the ability of statistical analysis is desirable.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Earth System Science and Technology
Laboratory	Coastal Environment Research
Staff	Professor : Yuji SUGIHARA Associate Professor : Assistant Professor : Soichi YAMAGUCHI
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	<p><i>Momentum, heat and CO₂ transfers at air-sea interface</i></p> <ul style="list-style-type: none"> ●Laboratory and field experiments of air-sea fluxes of momentum, heat and CO₂ ●Modeling of CO₂ transfer in coastal seas ●Numerical simulations of turbulence and air-water gas transfer <p><i>Environmental problems in coastal and estuarine waters</i></p> <ul style="list-style-type: none"> ●Material transport processes in coastal and estuarine waters ●Formation of hypoxia and red tide in coastal waters ●Water quality purification using nano-bubble devices <p><i>Renewable energy in coastal seas</i></p> <ul style="list-style-type: none"> ●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)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Nonlinear Fluid Engineering
Staffs	Professor : Shigeo YOSHIDA Associate Professor : Makoto OKAMURA Assistant Professor : Hidekazu TSUJI : Yingyi LIU
Scientific backgrounds	Fluid Dynamics, Mechanical Dynamics, Control
Overview	The laboratory is engaged in education and research in highly nonlinear phenomena of fluid, and fluid/mechanical dynamics and control of renewable energy converters, in particular wind.
Research subjects	<p><i>Turbine fluid dynamics</i></p> <p>Some aspects of fluid dynamic models for wind/tidal turbines are under development. Modeling of 3D effects, rotor-tower interaction of downwind turbines, and rotor-diffuser for diffuser augmented turbines are typical topics here.</p> <p><i>Wind turbine dynamics and control</i></p> <p>General research concept is to develop technologies for large scale economic renewable energy converters, considering fluid-dynamics, elasticity and control. An aero-elastic model is under development aiming for a fast and reliable design. Multi-discipline optimization, multi-megawatt, load mitigations are major topics here.</p> <p><i>Tethering/catenary dynamics</i></p> <p>Tethering/catenary systems are essential for future renewable energy technologies as floating wind/tidal, and airborne turbines. Modeling and applications, and control are focused on.</p> <p><i>Wind farm optimization</i></p> <p>Fast and reliable wind farm layout optimization method and models are under development aiming for better economics. Optimization algorithm and modeling of the wake and wake effects are major topics here.</p>
Acceptable students	One student per a semester can be accepted.
	Students who have either fluid/aerodynamics, mechanical dynamics or control background are welcome. Experiences in coding numerical programs are also welcome.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Atmospheric Physics
Staffs	Professor : Hajime OKAMOTO Associate Professor : Masaru YAMAMOTO Assistant Professor : Kaori SATO
Scientific backgrounds	Atmospheric Physics
Overview	<p><i>Analyses of cloud and aerosols physical properties by satellite remote sensing and atmospheric dynamics by meteorological simulations.</i></p> <p>The laboratory is engaged in education and research on the development of new satellite remote sensing techniques and we focus on physical properties of clouds and aerosols, atmospheric radiation and water cycle in the climate system. We develop algorithms for global analyses of clouds and aerosol. Observational tools include cloud radar and lidar onboard Earth Observing Satellites. We also investigate atmospheric dynamics of Earth and terrestrial planets, based on global- and regional-scale meteorological simulations.</p>
Research subjects	<p><i>Global analysis of cloud radar and lidar data from space</i></p> <ul style="list-style-type: none"> • Development of algorithms to retrieve macroscale and microphysical properties of clouds • Analysis of aerosol properties by lidar (Light detection and Ranging) • Evaluation of General Circulation Models <p><i>Development of new observational technology for the better understanding of global energy and water</i></p> <ul style="list-style-type: none"> • Multiple field of view/multiple scattering lidar • Planning new satellite missions with international collaboration. <p><i>Atmospheric dynamics</i></p> <ul style="list-style-type: none"> • Meteorological simulation in and around Japan (cyclogenesis and regional atmosphere-ocean interaction) • Modeling of planetary atmospheric circulation (superrotation and cloud formation)
Acceptable students	One student per a semester can be accepted.
	Students with geophysics background who are specialized in atmospheric physics are most welcome. We can also offer rudimentary theoretical and experimental based tutorials to students with and without atmospheric physics background who are interested in research areas related to above listed-subjects.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Earth System Science and Technology
Laboratory	Ocean Systems Dynamics
Staff	Professor : Changhong HU Associate Professor : Assistant Professor : Makoto SUEYOSHI
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)	http://www.riam.kyushu-u.ac.jp/ship/indexe.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Earth System Science and Technology
Laboratory	Climate Change Science
Staff	<p>Professor : Toshihiko TAKEMURA</p> <p>Associate Professor :</p> <p>Assistant Professor : Nawo EGUCHI</p> <p style="text-align: right;">: Takuro MICHIBATA</p>
Scientific backgrounds	Climate Change
Overview	The laboratory is engaged in education and research on elucidation of climate change due to atmospheric substances. We especially focus on climate change due to aerosols and clouds.
Research subjects	<p><i>Development of the numerical model, SPRINTARS, which can simulate and predict global distributions of main atmospheric aerosols</i></p> <p>Suspended particle matters (aerosols) are soil dust particles from deserts and sea salt particles from sea surface which are natural sources, and sulfate, black carbon, and organic matter from fossil fuel and biomass burning which are anthropogenic sources. We have developed SPRINTARS which can simulate and predict their global distributions with computers.</p> <p><i>Evaluation of climate change due to aerosols with SPRINTARS</i></p> <p>Aerosols cause climate change through the aerosol-radiation interaction (direct effect) in which they scatter and absorb the solar and thermal radiation, the aerosol-cloud interaction (indirect effect) in which they alter microphysical and optical properties of cloud droplets and ice crystals acting as cloud condensation and ice nuclei, and etc. We analyze climate change due to aerosols through improvements of the climate model and earth system model incorporating SPRINTARS.</p> <p><i>Development of the weekly forecasting system with SPRINTARS</i></p> <p>Air pollution due to PM2.5 and soil dust is a social problem. We are operating a weekly forecasting system with SPRINTARS every day. We also study for more accurate aerosol forecasting.</p>
Acceptable students	One student per a semester can be accepted.
	Students with background of atmospheric physics are most welcome. Additionally, students who have some experience with linux, shell script, fortran, and computer simulation are desirable.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Atmospheric Environment Modeling
Staffs	Professor : Itsushi UNO Associate Professor : Keiya YUMIMOTO Assistant Professor : Yukari HARA : Zhe WANG
Scientific backgrounds	Atmospheric Physics and Chemistry, Meteorology
Overview	<p>The laboratory is engaged in education and research on the development of chemical transport modeling of atmospheric environment both over east Asia scale and global scale phenomena, which are key environmental challenges to understanding and analysis of the regional air quality problems and global climate changes. We also focus on the integration of satellite/ground-base remote sensing data and numerical modeling based on the data assimilation technique.</p>
Research subjects	(1) Chemical transport modeling studies of atmospheric environment over east Asia. (2) Elucidation of climate change by atmospheric aerosols with numerical models.
Acceptable students	One student per a semester can be accepted.
	<p>Students with atmospheric physical and chemistry background and computer modeling skill are most welcome.</p> <p>We can also offer the Asian scale atmospheric environment modeling tutorial to students with meteorological background who are interested in research areas related to the above-listed subjects.</p>
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science and Technology
Laboratory	Descriptive Marine Physics
Staffs	Professor : Associate Professor : Kaoru ICHIKAWA Assistant Professor :
Scientific backgrounds	Satellite oceanography, Turbulence, Geophysical fluid dynamics
Overview	This section is aiming to explain the physical processes related to the East-Asia ocean environment through numerical simulation and ocean monitoring.
Research subjects	<p><i>Interactions between Kuroshio and mesoscale eddies, and evaluation of their influence on the large-scale circulation</i></p> <p><i>Numerical modeling of the East China Sea</i></p> <ul style="list-style-type: none"> • The Kuroshio, one of the strongest currents in the world, plays an important role to redistribute heat by transporting huge amount of water from the south to the north. • Meanwhile, many disturbances called 'mesoscale eddies' slowly migrate westward in the North Pacific Ocean, and interact with the Kuroshio current. • Using satellite observations, in-situ data, and numerical modeling, these influences on the East China Sea and the Japan Sea are investigated. <p><i>Numerical simulation of ocean turbulence using Large Eddy Simulation (LES)</i></p> <ul style="list-style-type: none"> • Fine turbulence in the ocean play key roles in the diffusion of dissolved matter and the reduction of ocean circulation, but the real feature is still unclear. • We aim to reveal it through the numerical calculation using LES.
Acceptable students	<p>One student per a semester can be accepted.</p> <p>Students are required to have basic backgrounds in physical oceanography. Fundamental skills of numerical computing are also necessary.</p>
Other comments (if any)	http://www.esst.kyushu-u.ac.jp/~dmp/index-e.html

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

Department	Earth System Science & Technology
Laboratory	Ocean Dynamics
Staff	Professor : Atsuhiko ISOBE Associate Professor : Shinichiro KIDA Assistant Professor : Katsuto UEHARA
Scientific backgrounds	
Overview	Ocean environmental problems as well as ocean dynamics. Topics include variability of the ocean circulation in coastal and shelf waters, air-sea interaction, and marine plastic pollution. Major tools in our laboratory are numerical modeling, theoretical modeling, field observations, and archived data analyses.
Research subjects	Coastal and shelf ocean processes, open-ocean dynamics, atmosphere-ocean interaction, marine plastic pollution
Acceptable students	Anyone who likes Oceanography. A few experiences of fluid dynamics or Fortran coding may be advantage.
Other comments (if any)	

Interdisciplinary Graduate School of Engineering Sciences, Kyushu University	
Department	Earth System Science & Technology
Laboratory	Atmosphere-Ocean Modeling
Staffs	Professor : Naoki HIROSE Associate Professor : Assistant Professor : Yohei ONUKI
Scientific backgrounds	
Overview	We are studying not only basic theories but also practical applications of the ocean and the atmosphere dynamics. Some topics include variability of the Tsushima Warm Current, inverse estimation of topography, ocean tide, Kyucho, and tracer simulation. One of the major tool here is the data assimilation which combines deductive numerical modeling and inductive data analysis.
Research subjects	<ul style="list-style-type: none"> - Ocean modeling and its application such as atmosphere-ocean interaction, fisheries oceanography, maritime science - Ocean prediction and reanalysis based on satellite data assimilation - Monitoring the Tsushima Warm Current using an international ferryboat
Acceptable students	One student per a semester can be accepted.
	Anyone who is interested in oceanography. A few experiences of fluid dynamics or Fortran may be advantage.
Other comments (if any)	