UTSIP Kashiwa 2023 Program A

Host Laboratory List

Division of Transdisciplinary Sciences

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11. Graduate Program in Sustainability Science - Global Leadership Initiative (GPSS)

Division of Transdisciplinary Sciences

Department of Advanced Materials Science

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Mayumi Laboratory	Assoc. Prof. MAYUMI Koichi	The research goal of our group is to reveal molecular mechanisms for macroscopic properties of soft matter systems. One of our targets is to understand toughening mechanisms of polymeric materials. Recently, the fine control of nano-structure has improved significantly the mechanical toughness of polymer-based materials. The tough polymeric materials are expected to be applied for biomaterials, soft robots, and structural materials for automobiles and airplanes. We study nano-structure and dynamics of the tough polymeric materials by means of neutron, X-ray, and light scattering techniques. By combining the nano-scale structure/dynamics measurements, macroscopic mechanical tests, and molecular dynamics simulations, we aim to establish molecular understandings of toughening mechanisms for polymeric materials and discover novel molecular designs for tough materials.	Polymer, Soft Material, Mechanical Property, Nano Structure, Scattering Techniques	We are interested in the microscopic structural change of polymeric materials under stress fields. For example, we have for the first time discovered reversible strain-induced crystallization of polymer chains in hydrogels and developed tough and highly reversible polymer gels (Science, 372, 1078 (2021)). The reversibility of the strain-induced crystallization allows the tough hydrogels to rapidly recover from mechanical stress, which is important for artificial ligaments and joints. In the summer programme, we propose the microscopic structural analysis of polymer gels/solutions under external stress fields by using scattering techniques combined with deformation devices. From the observation of the microscopic structural change under stress fields, we reveal the molecular origin of macroscopic mechanical properties of polymeric materials.

Division of Transdisciplinary Sciences

Department of Advanced Energy

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Ono-Inomoto-Tanabe Laboratory	Prof. ONO Yasushi Dr. INOMOTO Michiaki Dr. TANABE Hiroshi	Our main research fields are Plasma Physics and Engineering, especially development of fusion energy, alternative energy sources, space and solar plasmas and plasma applications. The present fusion research already realized fusion power output larger than the input power as an exhaustless energy without any global warming gas. Its key question is whether we can develop cost-effective /high-beta confinement using some economic high-power heating method, where the beta is the plasma thermal pressure P confined by the unit magnetic field: beta=P/(B^2/2μ_0) ~ fusion output power / coil cost. We have developed a number of new ideas for (1) high-power heating: merging/ reconnection heating and (2) ultra-high-beta confinements: second-stable Spherical Tokamak (ST) , using the TS-3, TS-4, TS-6, UTST and MAST, ST-40 devices (based on UK-Japan collaboration). Since the magnetic field-line reconnections (mergng of two ST plasmas) converts about half of poloidal (reconnnecting) magnetic energy into plasma ion kinetic/ thermal energy, our TS-3 and ST-40 experiments documented significant ion heating over 2.3keV. We found the new scaling law of reconnection heating energy proportional to square of reconnecting magnetic fiels B_rec, indicating that the high-B_rec ST merging will heat ions to the burning plasma regime without using any additional heating facility like neutral beam injection (NBI). This fact leads us to new high-magnetic field ST merging/ reconnection experiments TS-6 with B_rec > 0.3-0.5T for ion heating >1keV. We are now organizing the international world-wide reconnection collaboration program CMSO for physics, application of merging and reconnection and also for international and interdisciplinary plasma education of young scientists among MRX (Princeton U.), MST (Wisconsin Univ.), MAST (Culham lab.) and ST-40 (Tokamak Energy Inc). ■ Web：http://tanuki.t.u-tokyo.ac.jp/	Plasma Experiment; Fusion Energy; Laboratory Astrophysics; Magnetic Reconnection; Spherical Tokamak (ST); Magnetic Self-Organization	We, international plasma research groups composed of Univ. Tokyo, Princeton Univ, NIFS, JAXA etc. are planning annual interdisciplinary schools and workshops of plasma astrophysics in 2023 using bidirectional exchanges of research staffs, graduate and undergraduate students. This new approach focuses on interrelationship of laboratory plasma experiments, space/ astrophysical plasma observations and numerical/ theoretical plasma studies and their applications based on the international and interdisciplinary collaborations. Our annual school and workshop will be held in Tokyo area for graduate and undergraduate students. Mutual visits of faculty members and graduate and undergraduate students will be encouraged and realized. Our initiative will provide a new interdisciplinary and balanced education of plasma astrophysics both in the undergraduate and the graduate schools. This program involves laboratory experiments, space observations and numerical / theoretical studies of plasma astrophysics. Our activities will generate a joint consortium of departments of advanced energy, space-astrophysical science, physics and electrical engineering. We believe that our annual school and workshop will provide new opportunities of international and interdisciplinary lectures, discussions and experiments to all plasma-course students.

Division of Transdisciplinary Sciences

Department of Complexity Science and Engineering

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Ejiri-Tsuji Laboratory	Assoc. Prof. EJIRI Akira	In Ejiri-Tsujii laboratory, fusion-oriented high-temperature plasma research is performed. The main research topic is the start-up and sustainment of a spherical tokamak configuration using RF wave power. This is an important issue to realize an economical reactor producing energy from the nuclear fusion reaction of deuterium and tritium. Besides the issue, we also study various MHD instabilities and wave induced nonlinear phenomena in plasma. We have a spherical tokamak device (TST-2) in our laboratory located at the Kashiwa campus, and we are running it by ourselves. The major radius of the plasma is 0.36 m, and the maximum electron temperature is about 400 eV, and the density is up to about 2x10^19 m^-3, and the discharge duration is less than about 0.1 sec. In order to study the above topics, RF wave technology, plasma measurements, analysis and simulation techniques are important. Please visit our website http://fusion.k.u-tokyo.ac.jp/index-e.html for more information.	plasma physics; nuclear fusion; tokamak; RF wave physics; nonlinear phenomena	The following shows the three planned projects. The participant may also propose another project, which we can discuss after the assignment. (1) Analysis of power spectrum. The strong waves in plasma often induce nonlinear phenomena, and parametric decay instability (PDI) is one typical nonlinear phenomenon. Although such phenomena are clear in the power spectrum of magnetic fluctuations, the spectra show various detailed features. One approach is the application of the machine learning techniques to classify or extract different features. This would provide new information on the nonlinear phenomena. (2) Impurity injection. The majority components of the wave sustained plasmas in our lab are electrons and deuterium ions. The other atoms, such as oxygen, carbon, nitrogen, are called impurity. Although the fraction of the impurity is small it can affect the plasma through radiation cooling, slowing down of fast electrons, etc. In our lab, we can inject helium gas, nitrogen gas, and carbon particles. The project is to see the impurity effects. (3) Electrostatic probe measurement. An electrostatic probe measurement, where a small electrode is inserted to a plasma and the voltage vs current (V-I) curve is analyzed, is a typical low temperature plasma measurement method. When fast electrons (generated by wave-electron interaction) exist, the V-I curve is deformed. From the deformation, we can extract information on the fast electrons.

Division of Biosciences

Department of Integrated Biosciences

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Laboratory of Signal Transduction	Prof.OHYA Yoshikazu Assoc. Prof. SUZUKI Kuninori	The budding yeast Saccharomyces cerevisiae is a very attractive model organism for studying the fundamental theories and concepts of eukaryotic cells. We applied the power of yeast genetics to understand many aspects of yeast cells. Our current research is mainly focused on (1) system biology based on cell imaging, (2) function of cell wall and cell wall integrity checkpoint, and (3) autophagy. (1) To understand biological system as the network of logical and informational process, one of the invaluable tools is genetics. Global analysis of the mutant phenotypes can provide relationships between knockout of the gene and function in the network. We developed CalMorph image analysis system useful to examine high-dimensional quantitative phenotypes under the fluorescent microscope. This method can be applied to identifying intracellular drug target, monitoring fermentation process during culture and studying biological diversity. Our ultimate goal is to place all yeast genes and their corresponding products on a functional signaling network based on phenotyping. (2) The cell wall is an essential cellular component in yeast. The cell wall is dynamic, because it undergoes remodeling during the cell cycle. We demonstrated that small rho type GTPase Rho1 is regulated by the progression of the cell cycle. We also found that there is a new cell cycle checkpoint mechanism called “cell wall integrity checkpoint” which functions to control cell cycle progression in response to cell wall perturbation. We are now studying such signaling mechanism as well as biosynthesis of the cell wall in yeast. (3) Autophagy is a major pathway of bulk degradation of cytoplasmic materials. In yeast, autophagy has been studied as a cellular response for survival during nutrient-limited conditions. During autophagy, cytoplasmic components are enclosed in a membrane compartment, called an autophagosome. We are now studying the mechanisms of autophagosome formation and its degradation. Moreover, we have a particular interest in physiological significance of autophagy.	Budding yeast Saccharomyces cerevisiae; systems biology; imaging, cell cycle; autophagy	(1) Live imaging and biochemical analysis of autophagosome formation and its degradation (2) Cell biological analysis of membrane sources of autophagosomes (3) Chemical genetic analysis of yeast autophagy (4) Multivariate analysis of high-dimensional morphometric data to our understanding of the pharmacology of antifungal drugs. (5) High-Content, image-based profiling to identify drug target. (6) High-dimensional quantitative phenotyping of yeast haploinsufficient genes (7) Single-cell phenomics with morphological data to reveal biodiversity and intraspecies variation in yeast. (8) Genetic study of multiple functional domains of the yeast 1,3-β-glucan synthase subunit by quantitative phenotypic analysis of temperature-sensitive mutants. (9) Phenotypic robustness contributed by the cell wall by protecting the intracellular functional network from environmental conditions.
Laboratory of Evolutionary Anthropology	Assoc. Prof. NAKAYAMA Kazuhiro	We all suffer from diseases. In particular, noncommunicable diseases related to modern lifestyles, such as metabolic syndrome, affect many people. The susceptibilities to such diseases are related to the genetic variants inherited from our ancestors. What was the significance of the disease-prone/resistant variants before the modern lifestyle prevailed? Our primary interest is in the relationship between obesity and adaptation to starvation and cold. We are seeking evidence that environmental adaptations in our ancestors were involved in shaping the susceptibility of modern humans to disease. To achieve this goal, we are developing research that combines a variety of methods, including phenotyping experiments on human subjects, statistical analysis using genome-wide DNA variation data, and population genetic analysis to detect traces of natural selection.	Evolution of modern humans; genome variation; adaptation; lifestyle related diseases	We plan to conduct molecular anthropological experiments on the simple measurement of brown adipose tissue function in humans. Students will learn the basic methodology of a human association study, including DNA extraction from human specimens, small-scale genotyping methods for single nucleotide polymorphisms (Taq-Man real-time PCR, for instance), genotype-phenotype statistical analyses, and measurements of cold-adaptive thermogenesis using a thermal camera. If time permits, students may be able to learn evolutionary genetic studies using genome-wide SNP genotype data. Additionally, students will join the journal club co-hosted with Prof. Shoji Kawamura, Laboratory of Evolutionary Anthropology, GSFS.

Division of Biosciences

Department of Computational Biology and Medical Sciences

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Frith Laboratory	Prof. FRITH Martin	Our aim is to find interesting and useful information in genetic sequences, and to develop algorithmic and mathematical methods for this purpose. We recently discovered the oldest ever "protein fossils": segments of formerly protein-coding DNA, by sensitive probability-based analysis. This revealed a great diversity of transposable elements in vertebrate ancestors of the Paleozoic Era. We also collaborate with medical geneticists to understand complex chromosome rearrangements and tandem repeat expansions / contractions that cause disease. We discovered the cause of neuronal intranuclear inclusion disease: a tandem repeat expansion in a human-specific gene. In related work, we have detected recombination events between LINE and SINE repeat elements, showing that recombination of repeat elements generates somatic complexity in human genomes. Another project found significant non-existence of sequences in genomes and proteomes, providing clues about immune recognition and pathogen/host adaption. Finally, we are developing a mathematically-optimal way to sample big sequence data, so it can be analyzed quickly, based on minimally-overlapping words.	Genome; evolution; probability; algorithms	Students are encouraged to pursue their own ideas on analyzing genetic sequences. There are broadly two types of project: biological investigation, and method development. Examples of biological investigation: survey the evolution of gene structure by gain or loss of splice sites, frameshifting, gene fusion or fission, etc; compare the evolution of mitochondrial versus plastid genomes; compare genome evolution to major body-form evolution (e.g. snakes, whales). Examples of method development: make a sensitive probabilistic model for finding distantly-related DNA sequences; devise a beautiful way to visualize complex sequence rearrangements; develop a way to extract specific rearrangement events from pair-wise alignments of long sequences (e.g. long DNA reads or whole genomes).

Division of Environmental Studies

Department of Ocean Technology, Policy and Environment

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Applied Physical Oceanography	Lecturer KODAIRA Tsubasa	We have studied topics in the field of physical oceanography because environmental conditions are critical factors for the ocean engineering projects and shipping. We have conducted field observations, laboratory experiments, and numerical simulations of such as ocean waves and ocean currents. Recent research target regions include high latitudes such as the Arctic and Antarctica. Arctic sea ice extent is rapidly decreasing during the recent period of global warming, and the change in the region is critical even for the global climate. Because one of the significant factors of the Arctic sea ice loss is oceanic heat transport from lower latitudes, we have studied on the heat input from the Pacific to the Arctic Ocean. Another possible potential factor of the reduction is ocean surface waves. For better understanding of the roll of ocean surface waves in the polar region, we have developed marine IoT wave buoy. Facilities available to us includes the Hiratsuka ocean observation tower, large experimental wave tanks, wave-ice tank, and supercomputers. Applications of our research results include ship navigation, feasibility studies of marine renewable energy and disaster prevention.	marine IoT; ocean waves; ocean currents; Arctic Ocean; Antarctica	Driven by technical advances in low-cost electronics, massive deployment of ocean sensing devices has become increasingly feasible. We have developed an inexpensive MEMS-IMU based small wave buoy with which intensive deployments become possible. The intensive deployments of the wave buoys are effective for several conditions, such as waves under the storms or waves under the sea ice in the high latitudes. The observational results could provide insight to improve the predictions. During the summer program students can participate the development and test of the wave buoy near the Hiratsuka Offshore Experimental Tower
Marine Environmental Modeling and Synthesizing Laboratory	Prof. SATO Toru	Our researches are aimed to form concepts of environmentally harmonizing systems, which coexist with natural environments for the global sustainability. For this purpose, we are developing computational models of environments using physics, chemistry, and biology, etc. Then these models are synthesized into simulation systems in order to predict environmental impacts and construct public acceptance. Our research interests are CO_2 storage in the deep ocean and in subsea underground, biological CO_2 fixation, formation and dissociation of methane hydrate, CO_2 geological storage by hydrate, development of photobioreactors for microalgae, development of multi-scale ocean model, modeling of flashing light effect of photosynthesis and the effects of CO_2 on marine biota.	Floating large plastic debris; Hotspot in Tsushima Strait; Offshore recovery of floating debris; Numerical simulation; Adjoint method	Strong ocean currents from the East China Sea then carry large quantity of plastic waste into the Sea of Japan. Tsushima Island has been seriously polluted by marine plastic. The Tsushima government spends around 300 million JPY annually on beach cleanups. If the concentrated areas of marine plastic are located, then offshore recovery of marine plastic debris could be conducted before it reaches the beaches not only in Tsushima Island but also on the coast of the Sea of Japan. The cost for offshore recovery may be lower than the whole costs the local governments spend for beach cleanup. To recover floating debris efficiently, a proper numerical method may help identify marine plastic pollution hotspots, the positions with concentrated marine plastic. In this research, the adjoint sensitivity method will be used to locate the major pathways or concentrated sea area for floating marine plastic in Tsushima Strait using the measurement data on the Sea of Japan.

Division of Environmental Studies

Department of Environment Systems

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Akizuki Laboratory	Lecturer AKIZUKI Makoto	“Supercritical fluid” refers to a fluid in which the material’s critical points of temperature and pressure are being exceeded. Dramatic physical changes are possible depending on the operating conditions of the material. In particular, the ionic content and dielectric constant of supercritical water changes extensively based on temperature and/or pressure. As a result of this, it becomes possible to select a reaction based on one’s objective: from an ionic atmosphere suitable for acid/base reactions, to one implementing the dissolving of organics, which is equivalent to a non-polar solvent. Taking advantage of these properties, it is expected that this new, inexpensive, environmentally-friendly reaction medium will replace conventional organic solvents. Our laboratory has many research goals, covering a broad range of topics: Degradation of harmful waste products using the oxidation reaction in supercritical water, organic synthesis using solid catalysts, and synthesis of inorganic materials such as nanoparticles. In regards to all of these fields, by designing, analyzing, and controlling reactions based on a study of chemical reaction rate and reaction engineering, we are advancing extensive research, from fundamental research related to the chemical reaction of supercritical fluids, to the cultivation of new engineering application technologies.	Supercritical Water; Reaction Engineering; Organic Synthesis; Tunable Solvent; Catalysis	Supercritical water is a promising reaction medium for organic reactions because its solvent properties can be varied with the temperature and the pressure, and these properties affect reaction kinetics and mechanisms. The aim of this study is to propose a methodology which enables to control the reaction rate and the selectivity of organic synthesis reactions only with the change of temperature and pressure of supercritical water.
Oshima Laboratory	Prof. OSHIMA Yoshito Dr. NEZU Yukiko	In university experimental research, carrying out research safely without losing research creativity and activities is a difficult proposition because research promotion and its risks are inextricably linked. When considering the safety of an academic laboratory, it is important to view the laboratory as a system that consists of human behavior, the transportation of things, and the conditions of the experimental research field, and to analyze this system by acquiring data through scientific methods from actual experimental research sites. Some of the most significant data gathered include tracking the flow line of an experimenter’s movement, the usage of chemical reagent bottles, and the distribution of chemicals induced by indoor airflow. The collected data is then integrated and analyzed by a deep learning method as means of investigating the system configuration of laboratory which enables us to objectively and quantitatively understand the conditions of experimental sites and the characteristics of their research. ""Laboratology"" is a new concept area that is being proposed for future research. Laboratory safety must be discussed more scientifically and quantitatively. Undoubtedly, this concept will contribute to comprehending the characteristics of various research activities more precisely and help facilitate discussing risk assessment of laboratory experiments.	Laboratory safety; Visualization; Airflow analysis; VR; Eye tracking	You can choose one of the following projects. (1) Laboratories are workplaces in which complex airflows are formed, primarily due to the simultaneous and arbitrary work of many experimenters acting according to different experimental purposes and plans. Such complex airflows may inadvertently expose experimenters to hazardous and potentially toxic chemicals and fumes in laboratories. To prevent such exposure, the dynamics of the airflow in the laboratory need to be precisely analyzed. In this project, you will conduct airflow analyses in university laboratory by Particle Image Velocimetry (PIV) analysis and Computational Fluid Dynamics (CFD) simulation. PIV is an optical method of flow visualization used to obtain the velocity of fluids, while CFD is a system that uses numerical analysis to analyze and work out complications concerning fluid flow with the aid of computer-based simulation. Using these techniques, you will investigate the air environment in the laboratory in view of an outlet/inlet ventilation layout and experimenter movement. (2) To consider the sites of experimental research at universities, it is an important proposition to design rationally while ensuring work efficiency and safety. Also, because of the complex operating conditions of experiments, understanding how experimenters perceive the laboratory environment and objects is important to ensure that experiments are conducted safely. In this project, virtual reality (VR) and eye tracking technology are combined to explore the characteristics of the experimenters’ flow line and their visual information distribution in the laboratory, with the aim of improving laboratory design, reducing laboratory hazards, and accumulating basic knowledge of the laboratory.

Geosphere Environment Systems Laboratory	Prof. TOKUNAGA Tomochika	Underground geosphere environment has been extensively used to support highly developed human society; e.g., extraction of energy resources and groundwater, waste disposal, construction of tunnels and underground spaces. Because of these activities, environmental problems which affect the sustainability of our society have emerged. The target of our laboratory is to understand and predict the change of geosphere environment caused by human activities, and to develop necessary engineering measures to attain sustainable use of geosphere environment. Current research topics include, studying and evaluating geosphere environmental changes caused by energy resources development and proposing necessary technological measures for sustainable resources development, securing stable and safe freshwater resources and development of efficient management schemes, and modeling long-term fluid flow and material transport processes through geosphere and its application to waste disposal and energy resources exploration. Research methods include laboratory experiments, field measurements and monitoring, geophysical exploration, and numerical modeling.	Groundwater; coastal zone; seawater intrusion; modeling; field survey	Fresh groundwater in shallow unconfined aquifers is an important water resource for many coastal zones worldwide which, however, is threatened by seawater intrusion. The occurrence of seawater intrusion is controlled by both anthropogenic activities and natural factors. Anthropogenic activities such as land reclamation, abstraction of freshwater and other natural resources, construction of structures such as riverbanks and ditches, and alternation of land surface conditions, could disturb freshwater-seawater interactions from the natural conditions. To what extent seawater intrusion occurs is also dependent on natural factors such as aquifer properties, tidal river dynamics, and meteorological conditions. In this study, computer-based techniques such as numerical modeling combined with field-based geophysical exploration techniques such as 1D and 2D resistivity surveys will be applied to understand seawater intrusion situations both from conceptual cases and realistic sites. Students will learn fundamental knowledge of coastal hydrological processes and gain the ability to analyze environmental issues through hands-on practice of using advanced modeling tools as well as participating field investigation. Also, students will have chances to get involved in other research activities in this laboratory, such as GIS-based mapping, water sampling, and water quality analysis.

Division of Environmental Studies

Department of Human and Engineered Environmental Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Simulation of Complex Systems Laboratory	Prof. CHEN Yu	A wide range of research topics are studied in our lab, including social-economics, complex fluids, and biological systems. There are three research directions: (1) Multi-agent cooperative evolutionary games for modeling and simulations of financial markets; (2) Discrete kinetic models for simulation of complex fluids; (3) Cellular automata and heterogeneous stochastic agent models for simulations of cancer and aging.	Complex Systems; Agent-Based Modeling; Stock Price; Aging; Tumorigenesis	As part of the program, a student will be assigned a small project, involving model construction and computer simulation. The specific complex system for study will depend on the student's interest. A financial market, a solution containing colloid, or a growing tumor could be studied. Apart from research, visits to related laboratories at other universities, and/or scenic sites surrounding Tokyo, etc., will also be scheduled.
Laboratory for Intelligent Systems Design	Prof. HIEKATA Kazuo	Societies and industries can be thought as a system of people, technology, and institutions. Although these social and industrial systems have evolved and met the high expectations of humans, the mechanisms of the systems have become more complex, giving rise to difficult problems to solve, such as global warming and aging populations. This laboratory is engaged in research that contributes to solving such problems by supporting human intellectual activities such as decision-making related to systems with simulation, sensing, and data analysis technologies.	Multi-agent simulation; Model-based design; Maritime Transportation; Decarbonization	We evaluate multiple policy options for decarbonization of International Maritime Shipping. Since the optimal behavior of one shipping company changes depending on the behavior of another, top-down simulations cannot accurately predict the future CO2 emissions. The internship student will customize and develop a multi-agent simulation program for the quantitative evaluation of multiple policy options. In the internship, we will explore better policy options for accelerating decarbonization based on the simulation results.

Division of Environmental Studies

Department of Socio-Cultural Environmental Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Jun SASAKI (Estuarine & Coastal Environment) Laboratory	Prof. SASAKI Jun	We focus on estuarine and coastal environmental studies in the field of civil, coastal, and hydro-environmental engineering: (1) Numerical modeling and application of physical and biogeochemical processes in urban bays and mangroves. (2) Environmental restoration in urban bays. (3) Mitigation of and adaptation to climate change, including blue carbon. (4) Coastal disaster mitigation. (5) Sustainability of community and livelihood in coastal areas in developing countries. Tokyo Bay is one of our main study fields at a short distance from our campus. The bay has suffered from a decline in fishery and water quality, including hypoxia and anoxia, for a long time. We have been considering strategies for environmental restoration, rehabilitation, and mitigation in the bay supported by scientific rationale. Disaster mitigation against storm surges and tsunamis is also our research target, including developing and applying prediction systems for coastal hazards using open-source numerical models. Our focus is also on coastal zone management for sustainability in developing countries, especially in mangrove areas influenced by climate change and associated (relative) sea level rise.	Coastal engineering; numerical simulation; water quality and ecosystems; blue carbon; storm surges	Students will first study physical and biogeochemical processes in estuarine and coastal waters, including coastal circulation, water quality and ecosystems, and sedimentary processes. Secondly, students will choose one of the related problems and learn its mechanism by applying a numerical model. Students will also learn skills in pre-processing and post-processing for numerical computation using Python tools and/or Matlab. Students may select one of the open source models coded in Fortran, including FVCOM (unstructured-grid Finite Volume Community Ocean Model) and ROMS (Regional Ocean Modeling System). Students will plot results, interpret them, and present their works and outcomes at the lab's progress report seminar. Students interested in estuarine and coastal engineering and numerical computation are welcome. Students are expected to have basic IT skills, such as programming in Python and working on Linux.

Division of Environmental Studies

Department of International Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Honda Laboratory	Prof. HONDA Riki	Our society is exposed to various types of risks including natural disasters. Preparation for such risks is essential, but no countermeasure can provide perfect protection against severe disasters. In the presence of various threats such as climate change, huge earthquakes and tsunamis, society needs to be endowed with capability of adaptation and resilience. In our group, mechanism of collective behavior observed in the society coping with the situation with severe uncertainty is discussed from the viewpoints of social networks, game theory, adaptive systems theory, etc. Innovative mathematical approach for uncertainty management, such as financial problems is also in our scope. Development and management of infrastructure systems, advanced design methods, asset management and international technology transfer are also of our interest.	Infrastructure; natural disaster; community resilience	(1) To discuss how community's attitude for disasgers is developed, statistical analysis of survey data using Bayesian approach or social network analysis will be conducted. (2) To synthesize earthquake ground motion for seismic design using machine learning and information theory based approch.

Division of Environmental Studies

Graduate Program in Sustainability Science – Global Leadership Initiative

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Onuki Laboratory	Assoc. Prof. ONUKI Motoharu	Our laboratory belongs to Dept. of International Studies and is working together with Graduate Program in Sustainability Science -Global Leadership Initiative (GPSS-GLI): an interdepartmental master/Ph.D. program in sustainability science. Students select their own research topic related with sustainability by themselves and conduct research by interacting many faculties and students with different academic background in our group. Currently, we are conducting following research: “disaster recovery and resilience”, “environmental pollution and risk”, “sustainability education evaluation”, “negotiation and consensus building for sustainability”, “sustainability of civil infrastructure under shrinking society”, “Smart City Projects in Kashiwanoha”, etc.	disaster; resilience; adaptation; SLR; sustainability	UTSIP students can participate in “disaster recovery and resilience” project. Tokyo downtown Area has experienced the land subsidence in 1960s-70s due to the excess grand water consumption, leading to the creation of ""under zero-meter grounds"". This area is under the sea surface level and is now protected by dikes and seawalls. In this sense, Tokyo has adapted to such a “relative” sea level rise (SLR) in the past, although Tokyo is now facing with the big discussion on whether this protection is enough safe against the future climate change impacts. In this project, students will discuss what kind of lessons can be withdrawn for adaptation to the climate induced sea level rise (SLR) in other countries. In addition to the above-mentioned topic, other topic is possible based on the applicant’s interest.
Yasuko Kameyama (Sustainable Society Design Center)	Prof. KAMEYAMA Yasuko	My research activity covers wide range of climate change mitigation policies' policy making and policy introduction. Among those policy options, policies that stimulate voluntary actions of business sector is becoming important. Carbon pricing, including carbon tax, emissions trading scheme and Carbon Border Adjustment Mechanism (CBAM), is one of those that are becoming increasingly popular. It is also important to focus on business sectors' alliances and initiatives that could make great changes in our society. My laboratory wish to continue making a thorough assessment as to what kind of policies, or what type of voluntary initiatives of non-state actors, could be most effective in reducing GHG emissions, while caring for other aspect of sustainability such as social justice and equity.	climate change; policy assessment; carbon tax; CBAM; taxonomy	Carbon Border Adjustment Mechanism (CBAM) is one of climate change mitigation policies that aims at balancing different price on carbon in and outside of region in scope. There are argument both for and against CBAM, and it is important to know its consequences. The research aims at making an overall assessment of CBAM by collecting the latest information of discussions related to CBAM in major countries and economies, as well as those related to taxonomy of products, and emissions trading scheme.