Department of Civil and Environmental Engineering

Department of Civil and Environmental Engineering consists of following Core and Cooperative Laboratories.
[The number of laboratories is indicated in parentheses.]

① Core Laboratories

Mathematical System Design (1), Infrastructural Materials (3),
Engineering Mechanics of Infrastructures (2), Water Environmental Engineering and Science (4),
Science of Regional Systems (1)

② Cooperative Laboratories

International Research Institute of Disaster Science [6 Laboratories]

Tsunami Engineering, Environmental Change Risk,
Remote Sensing and Geoinformatics for Disaster Management, Disaster Area Support,
Disaster Reconstruction Design and Management, Computational Safety Engineering

Laboratory	Professor / Associate Professor	Theme of research
Mathematical System Design	Professor Kiyohiko IKEDA Associate Professor Yuki YAMAKAWA	In the Mathematical System Design Laboratory, our research fields encompass a broad range of nonlinear phenomena, especially, bifurcation and stability problems in materials, soils, and structures. The mechanism of pattern formation in population distribution is also studied.
Infrastructural Materials (Mechanics of Materials)	Professor Takashi KYOYA Associate Professor Shotaro YAMADA	Accurate predictions and evaluations of the mechanical behavior of heterogeneous materials, such as soil, rock, concrete and other various composites, are extremely important for a rational design of infrastructure. With this background, this research institute aims to construct numerical models for rational design considering the heterogeneity of materials based on continuum mechanics and computational mechanics. These are compared with experiments from a viewpoint of multi-scale/multi-physics phenomena.
Infrastructural Materials (Concrete Engineering)	Professor Makoto HISADA Associate Professor Hiroshi MINAGAWA	Concrete is one of the most widely used construction materials. The performance of concrete changes according to the production procedure even when the same materials are used. In addition, the requirements for the performance of concrete should be decided by considering the environment factors. The research topics of our laboratory are to clarify the nature of concrete, and to develop the production procedure of concrete to satisfy the required performance. In addition, research on new concrete structural members also is carried out.
Infrastructural Materials (Geotechnical Engineering)	Professor Motoki KAZAMA Associate Professor Tadashi KAWAI	Human activities are closely related to the ground (the soils and the rocks) that forms the surface of the earth. The geotechnical engineering field is an interdisciplinary academic field that ranges from the mechanical properties of soils and rocks to ground related environmental problems. Our laboratory is specifically focused on earthquake geotechnical engineering (seismic motion amplification in the soft ground, liquefaction phenomena, etc.) and geo-environmental problems (ground settlement, soil pollution, the effective use of by-products, such as earth materials, etc.). We conduct actual case studies and also develop methods to elucidate and predict various phenomena by both experimental and analytical approaches.
Engineering Mechanics of Infrastructures (Structural Mechanics)	Associate Professor Isao SAIKI	In order to design structural members and structural systems mainly composed of steel materials, we have to mechanically examine the functions they are required to have, predict their load carrying capacity and create new structural forms. For this purpose, it is necessary to accurately predict mechanical behavior based on the characteristics of steel structure, such as slender and thin-walled. We make new proposals for structural systems and structural materials in accordance with the ultimate behavior of structures predicted mainly through our numerical simulations.

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Engineering Mechanics of Infrastructures (Structural Design Engineering)	Professor Shigeki UNJOH Associate Professor Hideki NAITO	Throughout their lifetime, civil structures are subjected to various loads and actions including earthquake ground motions and environmental effects. Although the loads and actions involve significant uncertainties, the structures have to be designed and maintained to ensure the necessary safety and functionality. Establishing a design concept which integrates quantitative evaluations of uncertainties of earthquake ground motions, the mechanical properties of members and overall structures and the long-term performance is essential to achieve these purposes. Target safety performance levels need to be set up, and the necessary design safety factors must be evaluated, and technology must be developed for the purpose of inspection and damage detection. This laboratory conducts the research and development necessary to propose new design concepts, methodologies for safety evaluation, and technologies to maintain the long-term performance over the whole lifetime of structures.
Water Environmental Engineering and Science (Hydro-Environment System)	Professor So KAZAMA Associate Professor Daisuke KOMORI	The evaluation of the water environment on the earth is fundamental technology for analysis of water resources and disasters. This laboratory investigates the spatial distribution of water environment and water resources using GIS, remote sensing technology, and observes water cycle (rainfall, snow, and evapotranspiration), water quality, and the ecology in the field. Numerical models are also developed to estimate the above amounts and are used to understand the interaction between human activities and water.
Water Environmental Engineering and Science (Environmental Hydrodynamics)	Professor Hitoshi TANAKA Associate Professor Makoto UMEDA	Aquatic zones such as rivers and coasts play an important role in our society as harbors and waterways, and the water is used for domestic, agricultural, and industrial purposes. It is, therefore, critical to keep and manage a good environment in and around those aquatic areas. By combining a hydrodynamic approach and knowledge of environmental science, our group studies sediment and material transport, and ecosystem dynamics in and around rivers, lakes, and coasts.
Water Environmental Engineering and Science (Environmental Protection Engineering)	Professor Yu-You LI Associate Professor Kengo KUBOTA	In other to realize a low-carbon and recycle-oriented society, it is very important to develop new types of environmental protection technologies and planning methods capable of minimizing the load on the natural environment. The research in this laboratory is focused on managing wastewater and the solid waste produced from the living and industry activities of human beings. The research interests of this lab are (1) the biological treatment of wastewater and solid waste, (2) bioenergy and resource recovery using anaerobic biotechnologies, including methane fermentation and hydrogen production, (3) innovative environmental system design, and (4) environmental pollution control. We conduct fundamental and applied process studies in environmental engineering based on the science of environmental microbiology, environmental chemistry and environmental system engineering.
Water Environmental Engineering and Science (Water Quality Engineering)	Associate Professor Daisuke SANO	The diverse water pollutants, including pathogens and toxic chemicals, are emerging in association with changes in life style, which do not allow us to manage health risks in water usage or to protect our water environment appropriately with conventional water quality indicators. In order to create a sustainable system for water quality management and control, the members of the water quality engineering laboratory are devoted to analyzying the fate of water pollutants in water environments, and to improving their removal efficiency in water/wastewater treatment processes.

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Science of Regional Systems (Ecological Engineering)	Professor Osamu NISHIMURA Associate Professor Takashi SAKAMAKI	To mitigate human impacts on aquatic ecosystems and achieve sustainable use of various ecological services, our laboratory aims to enhance the understanding of structures and functions of ecosystems and their applications. The current major research interests of our laboratory are, - The analysis of material dynamics in coastal ecosystems with the aim of developing sound management systems for ecosystems and aquacultures - The sustainable design of water treatment systems based on ecological functions (e.g., heavy metal removal using biomass, microbial treatment systems) - The development of assessment protocols of ecological toxicities of chemical pollutants on aquatic biota.
<Cooperative Laboratories> International Research Institute of Disaster Science (Tsunami Engineering)	Professor Fumihiko IMAMURA Associate Professor Anawat SUPPASRI	The TEL (Tsunami Engineering Laboratory) conducts research from an engineering perspective on tsunamis, the natural disaster most representative of Japan, which are characterized by a low frequency and high impact. The safety and security of the community has been considering as one of the most important issues from the reconstruction and rehabilitation after the 2011 Great East Japan Earthquake. Numerical analysis techniques are developed for the reproduction and prediction of tsunamis and the development of evacuation simulations by adopting cognitive science. These technologies are applicable at a domestic level and are expected to expand to the international level. The final purpose of the TEL is to perform research to protect human life and reduce property loss in societies with complicated human activities and increased informatization.
<Cooperative Laboratories> International Research Institute of Disaster Science (Environmental Change Risk)	Associate Professor Keiko UDO	The Environmental Change Risk Laboratory aims to clarify destructive mechanisms of disasters in coastal areas and rivers caused by high waves, storm surges, and floods including the climate change effect for quantification of disaster risks and development of efficient disaster prevention/mitigation measures. We analyze field data, carry out numerical simulations of disasters, and do remote sensing using satellite images. Economic evaluations are also a focus of our research work.
<Cooperative Laboratories> International Research Institute of Disaster Science (Remote Sensing and Geoinformatics for Disaster Management)	Professor Shunichi KOSHIMURA Associate Professor Erick MAS	With the use of modern computing power, we are developing a new framework to seek and detect the impact of natural disasters by integrating real-time computing, damage/loss estimation models, remote sensing and geo-informatics. The most important mission of our laboratory is to enhance the capabilities of disaster response/relief efforts and humanitarian activities by providing our research outcomes with particular regard to searching and mapping the areas and impacts of natural disasters.
<Cooperative Laboratories> International Research Institute of Disaster Science (Research field of Disaster Area Support)	Professor Makoto OKUMURA	Natural disaster leave a foot print on a large scale area. Victims in disaster areas require a large volume of relief that must be arranged as swiftly as possible in order to save human life and reduce distress. However, the situation after a disaster becomes critical in the event that the communication network (i.e. the transport network, the tele-communication network etc.) is disrupted. In addition, methodologies for relief distribution are developed with a focus on man-power shortage and uncertainty in data. It is required to incorporate relief urgency that depends on demographic and economic statistics in the region obtained in pre-disaster.
<Cooperative Laboratories> International Research Institute of Disaster Science (Disaster Reconstruction Design and Management)	Associate Professor Katsuya HIRANO	In order to make an attractive and vital city, we study the meaning and image of the place and landscape with infrastructure based on cognitive scientific methodology. This knowledge is being used to develop new practices in town planning and civil engineering structure design. In recent years, special focus has been on developing methods for disaster prevention town planning based on assistance given to disaster-stricken areas for recovery in the wake of the Great East Japan Earthquake disaster.
<Cooperative Laboratories> International Research Institute of Disaster Science (Computational Safety Engineering)	Professor Kenjiro TERADA Associate Professor Shuji MORIGUCHI	We develop innovative technologies for the safety assessment of regional and urban areas by means of computational engineering. Specifically, various computational techniques are used to superstruct a variety of theories and methodologies for designing resilient infrastructures. These techniques enable us to evaluate the durability of materials and structures using multi-scale/multi-physics analysis methods, clarify the mechanisms of their deterioration and failure and assess the disaster risks by taking the uncertainties and interactions between structures, ground, and fluids, etc., into consideration.

Note: For more detailed information, please contact the student office. [TEL+81-22-795-7489]