

## Study Area Groups of the Department of Civil and Earth Resources Engineering

April 2, 2024

Students can complete any of the 5 study areas below besides their normal completion requirements. You don't have to apply to the following study areas in the normal subject registration. However, if you satisfy the completion requirements for any one or several study areas below, you are eligible to receive a completion certificate at the time of completion of your Master's Program after notifying the professor in charge of student affairs 1 or 2 months before your graduation.

### [Study Area 1] Study Area of Structural Design Engineer/Researcher Training

#### (1) Content :

Japan has always been hit by a lot of natural disasters like earthquake and typhoon with various natural environments. Under such condition, it is not easy to construct structures which guarantee a safe, secure, and comfortable social infrastructure as civil life. Therefore, this course aims to bring up such personnel who are capable of planning, designing, constructing, maintaining, and managing the structures which realize energy-saving, eco-friendly and cost-effective aspects. First of all, the students are required to master mathematics, dynamics, and microscopic views toward materials. Then, the students will aim to acquire the skill to plan and practice both hardware and software, the evaluation and improvement of the property of such structure, input operation and static/dynamic response, and long-term maintenance and supply, expanding the object to large scale ones.

#### (2) Required subject groups

Compulsory subjects: 10 credits in total

Continuum Mechanics, Structural Stability, Material and Structural System & Management, Earthquake Engineering/Lifeline Engineering, Structural Engineering for Civil Infrastructure

Elective compulsory subjects (One or more among below subjects are required.)

: 2 or more credits in total

Structural Design, Bridge Engineering, Concrete Structural Engineering, Structural Dynamics, Seismic Engineering Exercise, Ecomaterial Design, Infrastructure Safety Engineering, Computational Fluid Dynamics, Applied Mathematics in Civil & Earth Resources Engineering

### [Study Area 2] Study Area of Hydraulic/Hydrologic Design Engineer/Researcher Training

#### (1) Content :

This course aims to educate engineers and researchers who can suggest practical technologies and develop state-of-the-art technologies to solve various water-related problems and to improve, maintain, and manage such hydraulic infrastructure. Based on the understanding of turbulence phenomenon, Computational Fluid Dynamics, water circulation mechanism, and the sediment transport system from mountains to rivers (coasts), students will acquire the skill to realize advanced hydrologic design and technological development through the designing and planning of hydrologic structure.

#### (2) Required subject groups

Compulsory subjects: 8 credits in total

Viscous Fluid Dynamics, Hydrologic Design and Management, Multiphase Flow Dynamics, Sediment Hydraulics

Elective compulsory subjects (4 or more among below subjects are required.)

: 8 or more credits in total

Hydrology, Free Surface Flow Dynamics, , Hydro-meteorologically based Disaster Prevention, Water Resources Systems, River Basin Management of Flood and Sediment, Coastal and Urban Water Disasters Engineering, Disaster Mitigation for Sustainable Basin Environment, Computational Fluid Dynamics, Hydraulic Engineering for Infrastructure Development and Management, Applied Hydrology, Case Studies Harmonizing Disaster Management and Environment Conservation, Integrated Disasters and Resources Management in Watersheds

[Study Area 3] Study Area of Geo Design Engineer/Researcher Training

(1) Content :

In addition to geomechanics and basic engineering, which are the theoretical and technological fields to deal with various engineering problems of geomechanics consisting of soil, rock and flow, this course aims to cover a wider range relating to geomechanic studies. This course aims to educate engineers and researchers who would be responsible for the improvement, construction, and maintenance of the infrastructure essential to produce and preserve a comfortable life environment and lead enhanced social activity through research, design, construction, disaster prevention, environmental protection, and research and development of the technologies for energy resources.

(2) Required subject groups

Compulsory subjects: 12 credits in total

Geomechanics, Computational Geotechnics, Construction of Geotechnical Infrastructures, Fundamental Geofront Engineering, Environmental Geotechnics, Disaster Prevention through Geotechnics

Note: The class “Geo-Risk Management,” which had been held for students who enrolled in AY2019 or earlier, will not be held in AY2024.

[Study Area 4] Study Area of Urban Design Engineer/Researcher Training

(1) Content :

This course aims to acquire theoretical methods for a comprehensive understanding of global to local environments for the design of urban space and facility, both of which to harmonize with the environment. The course will further raise such personnel who would accurately support the information and propose of practical design, generalizing such information. Therefore, students are required to understand the spatial distribution of natural and human-activity-related various phenomena, elucidate the methodology to analyze physical and social mechanism, urban landscape and cultural environment, to acquire the skill to design organized space and facility.

(2) Required subject groups

Compulsory subject: 4 or credits in total

Remote Sensing and Geographic Information System, Civic and Landscape Design

Elective compulsory subjects (3 or more among below subjects are required.)

: 6 or more credits in total

Public Finance, Urban Environmental Policy, Quantitative Methods for Behavioral Analysis, Intelligent Transportation Systems, Environmental Design Research, Risk Management, Disaster Risk Management, Disaster Information, Urban Infrastructure Management

[Study Area 5] Study Area of Earth Resources and Energy Engineer/Researcher Training

(1) Content :

This course aims to create and develop technologies to explore, develop, and utilize resource energies through the integration and development within the framework of geoscience, geotechnology, computational and experimental mechanics, and theory and applied dynamics inheriting the basic earth resource and energy engineering which has supported the social infrastructure. This course educates engineers who will possess state-of-the-art intelligence which recognizes both the inside and outside of Japan with a high practical ability of focusing the education to the researchers and engineers who would take on the sustainable development of social infrastructure in the future.

(2) Required subject groups

Elective compulsory subjects (6 or more among below subjects are required.)

: 12 or more credits in total

Resources Development Systems, Applied Mathematics in Civil & Earth Resources Engineering, Environmental Geosphere Engineering, Applied Elasticity for Rock Mechanics, Fundamental Theories in Geophysical Exploration, Rock Stress and Physical Properties, Lecture on Exploration Geophysics, Measurement in The Earth's Crust Environment, Energy System Management, Infrastructure Safety Engineering