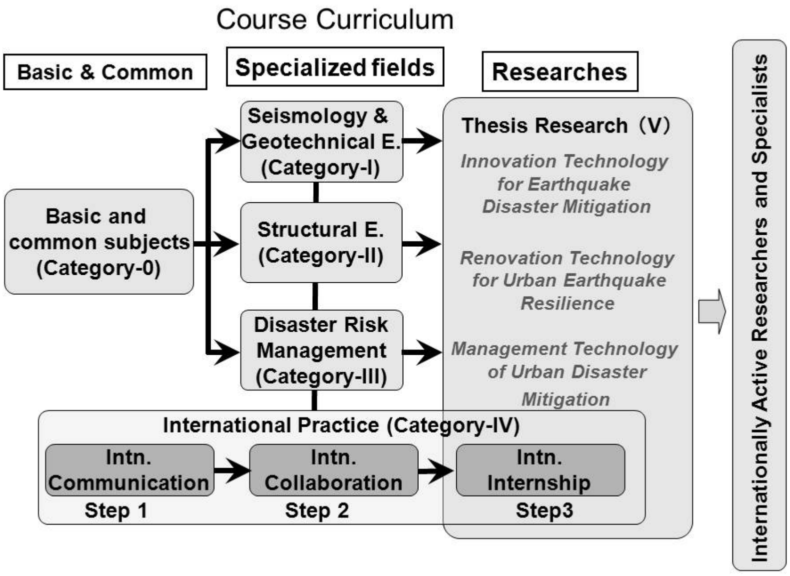
◆ International Program on Earthquake Engineering

1. Program Outline

The Earthquake Engineering Program (EEP) will produce highly skilled engineers and researchers who will make significant contributions to earthquake hazard mitigation world-wide. The EEP program is offered by the Center for Urban Earthquake Engineering (CUEE), Tokyo Institute of Technology.

2. Guide to Study in Earthquake Engineering Program

Earthquake Engineering Program is designed in the scheme of 'Integrated Doctoral Education Program' in which the Master's program is combined with the Doctoral program. All courses are systematically classified from Category-0 to Category-V as shown in the figure. In particular, the courses in Category-IV are intended to diversify its educational mission for Japanese students, foreign students, and professionals, through course exercises, practical training and participation in international workshops and research collaborations with other institutions.



3. Graduation Requirements

The students of Earthquake Engineering Program (EEP) must satisfy the following requirements and recommendations.

【Master's degree】

(1) Credits

18 credits or more must be acquired from the subjects of the program listed in the table of section 4. 3 credits or more must be taken from the subjects of the category IV (International Practice) in the table of section 4.

The students passed by the examination committee can be admitted to the Doctoral program after the completions of certain formalities.

【Doctoral degree】

(1) Off-Campus Project must be taken. 4 credits or more including the credits acquired in Master course must be taken from the subjects of the category IV (International Practice) in the table of section 4.

The candidate who satisfies all the above requirements and passes the final examination is awarded a Doctoral degree in EEP. The minimum period of study is three years in total, which include both the Master's and Doctoral program for both degrees.

Note that the above requirements are minimal for the EEP students and additional requirements are stipulated depending on the department to which the student belongs, as guided below. All students are strongly recommended to consult with their research supervisors about the study plan.

Department of Architecture and Building Engineering

【Master's degree】

(1) Credits

a. 34 credits or more from the Graduate School Courses.

b. Research Courses (研究科目群)

・8 credits from the Seminar Courses (講究科目)

c. Courses by Departments (専門科目群)

・12 credits or more from the Departmental Courses (専攻専門科目)

・2 credits or more from the Courses in Other Departments (他専門科目)

d. Liberal Arts and General Education (G) (大学院教養・共通科目群)

・2 credits or more from Liberal Arts and General Education (G)

(2) Research thesis

The student must complete master thesis research, submit a thesis for the degree and pass the final examination given after the submission of the thesis for the qualification.

【Doctoral degree】

For a Doctoral degree a doctoral candidate must satisfy the following requirements:

(1) Seminar in each term must be taken.

(2) The candidate must complete and upload a thesis for the degree, and pass the final examination and evaluation of the thesis.

Department of Civil Engineering (CE)

Same as those for "International Graduate Program (C) for Department of Civil Engineering". Refer to V.International Graduate Program（IGP-C）Department of Civil Engineering

Department of Built Environment (BE)

【Master's degree】

(1) Credits

a. 30 credits or more from the Graduate School Courses.

b. Research Courses(研究科目群)

・4 credits from the Seminar Courses

・4 credits from the Graduate Research Courses

c. Courses by Departments(専門科目群)

・10 credits or more from the Departmental Courses

・4 credits or more from the Courses in Other Departments

d. Liberal Arts and General Education (G) (**大学院教養・共通科目群**)

・3 credits or more from Liberal Arts and General Education (G)

(2) Research thesis

It passes master's thesis examination and the final examination.

【Doctoral degree】

A doctoral candidate must satisfy the following requirements in order to receive a doctoral degree:

(1) The candidate must get credits from Seminars V to X arranged by his/her academic advisor.

(2) The candidate must show evidence of extracurricular and academic achievement such as publication

of his/her papers in the refereed journals.

(3) The candidate must have interim reviews of his/her doctoral research, submit and succeed in oral defense of the dissertation, and pass the final examination.

Department of Environmental Science and Technology (EST)

Same as those for "International Program for Interdisciplinary Science and Engineering: IGP (A)". Refer to III.International Graduate Program (IGP-A) International Program for Interdisciplinary Science and Engineering (IPISE).

Department of Mechanical and Environmental Informatics (MEI)

Same as those for "International Graduate Program (C) for Department of Mechanical and Environmental Informatics". Refer to V.International Graduate Program（IGP-C）Department of Mechanical and Environmental Informatics

4. Tables of Course Subjects

Course Title	Course Number	Credits	Dept offering course*	Semester S: Spring A:Autumn	Opening year a: Annually e: Even o: Odd	Category**
Earthquake and Tsunami Disaster Reduction	92046	1-0-0	BE	A	a	0
Basics and Applications of Stochastic Processes	92008	1-1-0	BE	S	a	0, I
Strong Motion Prediction	92033	1-0-0	BE	S	a	0, I
Passive Control of Structure against Earthquakes	92038	1-0-0	BE	A	a	0, II
Advanced Analysis and Design of Structures Considering Material Nonlinearity	92023	2-0-0	BE	S	a	II
Dynamics of Structures	92084	2-0-0	BE	A	o	0,II
Advanced Analysis and Design of Structures Considering Geometrical & Material Nonlinearities	92043	1-0-0	BE	A	o	II
Theory of Regional Planning Process	92047	2-0-0	BE	S	e	III
City/Transport Planning and the Environment	92035	1-0-0	BE	A	a	III
Remote Sensing and Geoinformatics for Built Environment	92098	2-0-0	BE	A	e	III
Applied Mathematics for Environmental Study 1A, 1B	98089 98090	1-0-0	EST	S A	a	0
Applied Mathematics for Environmental Study 2A, 2B	98091 98992	1-0-0	EST	S A	a	0
Applied Environmental Science 1A, 1B	98093 98095	1-0-0	EST	S A	a	0, III
Applied Environmental Science 2A, 2B	98096 98097	1-0-0	EST	S A	a	0, III
International Communication on Environmental Protection Problems I^{+}	98081	2-0-0	EST	S	a	IV

International Communication on Environmental Protection Problems , II+	98082	2-0-0	EST	S	a	IV
Environmental Impact Assessment I, II	98087 98088	1-0-0	EST	A	a	III
Structural and Fire Resistant Design of Building Structures	98016	2-0-0	EST	A	a	II
Earthquake Resistant Limit State Design for Building Structures	98027	2-0-0	EST	A	a	II
Exploration Geophysics	98068	1-0-0	EST	S	a	I
Elastic and Plastic Behaviors of Structural Materials	98070	2-0-0	EST	S	a	II
Introduction to Geochemistry	98086	1-0-0	EST	A	a	0, I
Geotechnical Earthquake Engineering	62038	2-0-0	ABE	S	a	I
Applied Structural Design	62051	2-0-0	ABE	S	e	II
Structural Planning in Architecture	62056	1-0-0	ABE	S	o	II
Geo-Environmental Engineering	61049	2-0-0	CE	S	a	0, I
Physical Modelling in Geotechnics	61061	2-0-0	CE	A	a	0, I
Advanced Mathematical Methods for Infrastructure and Transportation Planning	61014	2-0-0	CE	S	o	0, III
Transportation Network Analysis	61081	2-0-0	CE	A	e	III
Transportation Economics	61066	1-0-0	CE	A	e	III
Stability Problems in Geotechnical Engineering	61034	2-0-0	CE	A	a	I
Mechanics of Geomaterials	61038	2-0-0	CE	S	a	I
Coastal Disaster Mitigation	70044	2-0-0	IDE	S	a	0, III
Advanced Concrete Technology	70043	2-0-0	IDE	A	a	II
Mechanics of Structural Concrete	61003	2-0-0	CE	S	o	II
Utilization of Resources and Wastes for Environment	70041	2-0-0	IDE	A	a	0, II
Maintenance of Infrastructure	61083	2-0-0	CE	S	e	II, III
Fracture Control Design of Steel Structures	61005	2-0-0	CE	A	e	II
Introduction to Solid Mechanics	61065	2-0-0	CE	S	a	0
Advanced Course on Elasticity Theory	61048	2-0-0	CE	A	a	0

Principles of Construction Management	61046	2-0-0	CE	A	o	0, III
Probabilistic Concepts in Engineering Design	61047	2-0-0	CE	A	o	0
Civil Engineering Analysis	61013	2-0-0	CE	A	a	0
Advanced Topics in Civil Engineering I	61084	2-0-0	CE	S	a	III
Advanced Topics in Civil Engineering II	61055	2-0-0	CE	A	a	III
Advanced Technical Communication Skills I, II	61062 61063	1-1-0	CE	S A	a	IV
International Collaboration I, II	61071 61072	0-1-0	CE	S A	a	IV
International Internship I, II	61077 61078	0-1-0	CE	S A	a	IV
Disaster investigation and restoration practice A〜D	61100 〜61103	0-0-1	CE	S A	a	V
Analysis of Vibration and Elastic Wave	77019	2-0-0	MEI	S	o	0
Theory & Applications of Urban Spatial Data	77016	2-0-0	MEI	A	o	III
Intellectual Infrastructure Systems	77020	2-0-0	MEI	S	o	III
Off-Campus Project in Architecture and Building Engineering I, II	62511 62512	0-0-4	ABE	S A	a	IV
Civil Engineering Off-Campus Project I or II	61511 61512	0-4-0	CE	S A	a	IV
Built Environment Off-Campus Project I or II	92050 92051	0-4-0	BE	S A	a	IV
Mechanical and Environmental Informatics International Off-Campus Project A,B	77664 77665	0-1-2	MEI	S A	a	IV
Experiment on Steel Structures I-IV***	62543〜6	0-0-1	ABE		a	V C
Experiment on Earthquake Engineering I-IV***	62551~4	0-0-1	ABE		a	V C
Mechanical and Environmental Informatics Project I	77602	0-1-2	MEI	A	a	V
Mechanical and Environmental Informatics Project II	77663	0-1-1	MEI	S	a	V
IPISE Seminar (ENVENG) I -IV***	92705〜8	2-0-0	BE		a	V C
Seminar in Environmental Science Technology, and Engineering I-IV***	98701〜4	0-2-0	EST		a	V C
Seminar in Architecture and Building Engineering I-IV***	62701〜4	0-2-0	ABE		a	V C
Seminar of Civil Engineering I - IV***	61701〜4	0-2-0	CE		a	V C
Seminar in Mechanical and Environmental Informatics I - IV***	77701〜4	0-1-0	MEI		a	V C

Seminar in Built Environment V - X***	92801～6	0-2-0	BE		a	V C
Seminar in Environmental Science Technology, and Engineering V - X***	98801～6	0-2-0	EST		a	V C
Seminar in Architecture and Building Engineering V - X***	62801～6	0-2-0	ABE		a	V C
Seminar of Civil Engineering V - X***	61801～6	0-2-0	CE		a	V C
Seminar in Mechanical and Environmental Informatics V - X***	77801～6	0-2-0	MEI		a	V C

* BE: Dept. Built Environment, EST: Dept. Environmental Science and Technology, ABE: Dept. Architecture and Building Environment, CE: Dept. Civil Engineering, MEI: Dept. Mechanical and Environmental Informatics, IDE: Dept. International Development Engineering

** 0: Basic and Common subject, I: Seismology and Geotechnical Engineering, II: Structural Engineering,
III: Disaster Risk Management, IV: International Practice, V: Research Projects,
C: Compulsory for the student who belongs to the department offering the particular course.

*** I, II: 1st year in Master's course; III, IV: 2nd year in Master's course;
V, VI; 1st year in Doctoral course; VII, VIII; 2nd year in Doctoral course;
IX, X; 3rd year in Doctoral course; even: spring semester, odd: autumn semester.

+ : provided exclusively for students who belong to Department of Environmental Science and Technology.

5. Syllabus of Course Subjects

92046

Earthquake and Tsunami Disaster Reduction

Autumn Semester (1-0-0) (Every Year)

Prof. Hitoshi MORIKAWA et al.

[Scope and outline]

To mitigate the earthquake and tsunami disaster, it is important to know them. This course is devoted to make the lecture with respect to the basics of earthquake and tsunami disaster and their mitigation. This course is a distance-learning class through the Internet and shared with National Central University, Taiwan. The students will be graded by their reports.

The topics of this class are follows:

1. Earthquake and Earthquake Disaster
2. Tsunami Disaster
3. Earthquake Geo-Hazard
4. Basis of Steel Structures
5. Remote Sensing for Disaster Mitigation
6. Dynamics of Bridge Structures
7. Earthquake Ground Motion and Modeling Ground Structure

92008

Basics and Applications of Stochastic Processes

Spring Semester (1-1-0) (Every Year)

Prof. Hitoshi MORIKAWA

[Scope and outline]

This course discusses the basic theory of probability and stochastic process with some applications to the earthquake engineering. As the applications, techniques of analysis for array observation data of microtremors are dealt with: that is, spatial auto-correlation (SPAC) method and so on. The students are encouraged to study with the course "Introduction to Time-Frequency Analysis". To understand the theory, students will be required to finish a project including programming and numerical calculation. The grading policy is based on the project and its presentation.

92033

Strong Motion Prediction

Spring Semester (1-0-0) (Every Year)

Prof. Saburoh MIDORIKAWA

[Scope and outline]

The subject aims to introduce methodologies for strong motion prediction by which the design earthquake motion for seismic design of structures is specified. Topics dealt in this course include

1. Observation of strong ground motion
2. Local site effects on ground motion
3. Empirical prediction methods
4. Theoretical and Semi-empirical prediction methods
5. Seismic hazard maps

92038

Passive Control of Structure against Earthquakes

Autumn Semester (1-0-0) (Every Year)

Prof. Kazuhiko KASAI

[Scope and outline]

This course discusses various methods to evaluate effectiveness of the passive control dampers and building framing schemes. Characteristics of four main types of dampers are explained. Design and analytical methods for three types of framing systems having distinct architectural features, damper connecting schemes, as well as control efficiencies are explained. Topics are as follows:

1. Fundamental Theory on Passive Control
2. Mechanical Characteristics of Dampers
3. Framing Systems and Their Control Efficiencies
4. Analytical Methods for Passive Control Dampers and Systems
5. Design Methods for Passive Control Dampers and Systems

92023

Advanced Analysis and Design of Structures Considering Material Nonlinearity

Spring Semester (2-0-0) (Every Year)

Prof. Kazuhiko Kasai

[Scope and outline]

This course discusses nonlinear force-deformation characteristics of structural members/materials and their effects on performance of the structural systems. Various static and dynamic analysis methods will be presented. Homework assignments provide extensive hands-on experience of the analytical methods, and they are designed to cultivate students' physical understanding of the nonlinear behavior. Topics are as follows:

1. Review of Linear Matrix Structural Analysis Methods.
2. Nonlinear Analysis Strategies for Truss Systems.
3. Nonlinear Beam Elements.
4. Nonlinear Analysis Strategies for Frames with Beam Elements.
5. Nonlinear Dynamic Analysis Methods.
6. Linear Analysis Using Finite Elements (may replace Chap. 5)

92084

Dynamics of Structures

Autumn Semester (2-0-0) (Odd Year)

Assoc. Prof. Daiki SATO

[Scope and outline]

This course addresses several introductory and intermediate topics in dynamic behavior of structural systems. Structures are idealized as single-degree of freedom (SDOF) or multi-degree of freedom (MDOF) systems. Special attention is given to seismic topics including earthquake response history analysis and estimation of maximum response by response spectrum analysis.

92043

Advanced Analysis and Design of Structures Considering Geometrical & Material Nonlinearities

Autumn Semester (1-0-0) (Odd Years)

Prof. Shojiro MOTOYUI

[Scope and outline]

This course discusses analytical methods to simulate collapse behavior of building structures. Particularly, it presents treatment of both geometrical nonlinearity and complex material nonlinearity which are essential in these analytical methods.

1. Formulation of Geometrical Nonlinearity with finite rotation
2. Co-rotational Beam Element including Geometrical Nonlinearity

92047

Theory of Regional Planning Process

Spring Semester (2-0-0) (Even Years)

Prof. Tetsuo YAI

[Aims and scope]

Systems of Regional Planning and Transportation Planning are studied in this class. To achieve a goal of the class, first we learn about those systems in Europe, USA and Japan. Then we study on the fundamental principle of planning process and regulations/institutions. We discuss on the citizen participatory process for those planning fields. This class will cover SEA (Strategic Environmental Assessment) and refer to litigation against governmental decision at administrative court system in Japan. Besides, planning practices will be discussed with students during the class. The students are required to make two presentations by reviewing the specific planning system and its process in any country or region.

[Outline]

The content of the class is as follows:

1. Overview
2. National and Regional Planning systems in Japan
3. Planning systems in Europe and USA
4. Fundamental theory of planning process
5. Citizen Participation and Public Involvement
6. Administrative court system
7. Planning and SEA process.

92035

City/Transport Planning and the Environment

Autumn Semester (1-0-0) (Every Year)

Assoc. Prof. Yasunori MUROMACHI

[Scope]

Following introduction, this course focuses on air pollution, global warming, noise and other elements of the environment which city/transport planning should cover. Theoretical issues such as externality and public goods as well as practical concerns such as EIA are also discussed.

[Outline]

1. Air Pollution
2. Global Warming
3. Noise
4. Other Elements of the Environment
5. Basics of Environmental Economics
6. Measures for Protecting the Environment

[Evaluation]

Attendance and Home Work Assignments

[Texts]

Lecture materials will be provided by the lecturer.

92098

Remote Sensing and Geoinformatics for Built Environment

Autumn Semester (2-0-0) (Even Year)

Assoc. Prof. Masashi MATSUOKA

[Scope]

This course discusses remote sensing technology and basics of geographical information system (GIS) which are the generation and management tool of geo-spatial information. The monitoring procedure by onboard sensors and image analysis for evaluating built environment are explained through examples such as land classification and the detection of changed areas due to natural disasters. Topics are as follows:

[Outline]

1. Fundamentals of Remote Sensing and GIS
2. Satellite Observation and Sensor
3. Digital Imagery and Image Processing
4. Optical Remote Sensing
5. Basic and Application of Radar Remote Sensing
6. Urban Monitoring
7. Disaster Monitoring
8. Radar Interferometry and Surface Deformation Measurement

98089

Applied Mathematics for Environmental Study 1A

Spring Semester (1-0-0) (Every Year)

Prof. T. ISHIKAWA

[Scope and outline]

In the first two lectures, idea of “the best approximation” is introduced on the basis of high school mathematics. The idea is applied to a linear differential equation to deduce Galerkin Method in the third lecture. In other lectures, extensions of the method such as relaxation of boundary conditions, the Finite Element Method are introduced. Exercise is considered as an important part of the course to obtain practical meaning of approximation.

98090

Applied Mathematics for Environmental Study 1B

Autumn Semester (1-0-0) (Every Year)

Assoc. Prof. T. NAKAMURA

[Scope and outline]

The lecture focuses on basic aspects in numerical analysis for environmental studies. While some basic acknowledgements on numerical calculation are introduced, approximate solutions of several essential partial differential equations by Finite Difference Method are explained.

98091

Applied Mathematics for Environmental Study 2A

Spring Semester (1-0-0) (Every Year)

Prof. H. YAMANAKA

[Scope and outline]

The lecture focuses on mathematical aspects in environmental data processing. Basic theories on random variable, probability, error analysis, spatial and temporal data processing and least square method are explained with examples of recent actual environmental data.

98092

Applied Mathematics for Environmental Study 2B

Autumn Semester (1-0-0) (Every Year)

Assoc. Prof. T. ASAWA

[Scope and outline]

The lecture focuses on probability and statistics in environmental data processing. Basic theory on statistical analysis, multivariate analysis, and quantification method are explained with actual examples of processing of recent environmental data.

98093

Applied Environmental Science 1A

Spring Semester (1-0-0) (Every Year)
Prof. T. TAMURA
[Scope and outline]
Regarding the physical dynamics in natural environment of the atmosphere as well as in natural disaster and its mitigation problems, the scientific methods of formulation are explained in views of fundamental and complex phenomena. Also, this lecture gives understanding of the physical mechanism on heat and mass transport problems in feasibility stage and the schemes to solve them.
1. Fundamental scientific techniques for understanding physical dynamics in the nature
2. Technical evolution and its concept for solving the complex problems in natural environment

98095
Applied Environmental Science 1B
Autumn Semester (1-0-0) (Every Year)
Prof. T. KINOUCHI
[Scope and outline]
Regarding the physical dynamics in natural environment of water and atmospheric areas as well as in natural disaster and its mitigation problems, the scientific methods of formulation are explained in views of fundamental and complex phenomena. In particular, this lecture focuses on the contaminant transport and kinetics in the aquatic and geospheric environment to acquire knowledge for real environmental phenomena and their problem-solving.
1. Scientific understanding of contaminant transport in the environment
2. Conservation and transport theory of mass, energy and transport
3. Formulation and analysis of contaminant transport in the environment

98096
Applied Environmental Science 2A
Spring (1-0-0) (Every Year)
Assoc. Prof. Y. KATO and Prof. K. TAKESHITA
[Scope and outline]
The understanding of material transport in the environment is indispensable to consider various environmental problems. Fundamental knowledge of chemistry and chemical engineering is required to analyze and evaluate the mass transport in the environment. In this lecture, the fundamentals of chemistry and chemical engineering for environmental analysis on undergraduate course level are explained.
1. Fundamentals of chemistry and chemical engineering
2. Fundamental theory of material transport including chemical and biochemical reactions

98097
Applied Environmental Science 2B
Autumn Semester (1-0-0) (Every Year)
Assoc. Prof. Y. KATO and Prof. K. TAKESHITA
[Scope and outline]
The understanding of material transport in the environment is indispensable to consider various environmental problems. Fundamental knowledge of chemistry and chemical engineering is required to analyze and evaluate the mass transport in the environment. In this lecture, the application of chemistry and chemical engineering for environmental analysis on graduated course level are explained.
1. Application of chemical reaction engineering of reactor design
2. Applications of material transport theory to environmental analysis

98081

International Communication on Environmental Protection Problems I

Spring Semester (2-0-0) (Every Year)

Assoc. Prof. S. NISHIKIZAWA and Assoc. Prof. Y. SATO et al.

[Scope and outline]

We have established the present economical and social system through the overcoming of severe environmental pollutions of air, water and so forth. Those experiences could be suggestive for developing countries as well as taking principal roles with a view to creating a sustainable society in Japan. In this course, students learn fundamental factors and social background by reviewing past environmental pollutions. In addition to lectures, group works and presentations by students in English will be conducted.

98082

International Communication on Environmental Protection Problems II

Spring Semester (2-0-0) (Every Year)

Prof. K. YOSHIKAWA and Assoc. Prof. F. TAKAHASHI et al.

[Scope and outline]

A drastic review of Japanese energy strategy has been started after the accident of the Fukushima nuclear power station associated with a big earthquake. In this course, scenarios for Japanese energy supply will be proposed by Japanese students which enable gradual decrease of the dependence on the nuclear power down to zero within 20-30 years. In the case of foreign students, scenarios for energy supply increase in their home countries matching with the economic growth will be proposed without relying on the nuclear power. In the course of preparation of energy supply scenarios, lectures by external professionals, visits to power stations and the group activities mixing Japanese and foreign students will be done.

98087

Environmental Impact Assessment I

Autumn Semester (1-0-0) (Every Year)

Assoc. Prof. S. NISHIKIZAWA

[Scope and outline]

Environmental Impact Assessment (EIA) is an important tool for public and private developments toward creating a sustainable society. In this course, students learn EIA theories, challenges and methods with several case studies. As well as scientific aspects such as forecast and evaluation, democratic aspects relating to public participation will be explained. We will also explore “strategic environmental assessment” as new areas of EIA.

98088

Environmental Impact Assessment II

Autumn Semester (1-0-0) (Every Year)

Prof. T. MURAYAMA

[Scope and outline]

Environmental Impact Assessment (EIA) is an important tool for public and private development and planning decisions toward creating a sustainable society. In this course, students learn EIA theories, methods, regulations and its historical outline with several case studies. Scientific aspects such as prediction and evaluation methods as well as democratic aspects relating to public participation will be explained. We will discuss about environmental and social consideration for international cooperation in developing countries.

98016

Structural and Fire Resistant Design of Building Structures

Autumn Semester (2-0-0) (Every Year)

Prof. H. SAKATA and undecided

[Scope and outline]

This lecture aims at mastering the synthetic knowledge about a fire-protection and fire-resistance of a building. The fundamental knowledge about a building fire-protection, urban fire-resistance, and a fire-resisting-construction design of a building is explained. Furthermore, the mechanical properties of the main structural materials (concrete and steel which constitute a building-construction) at elevated temperatures is explained.

1. Fire safety in buildings
2. Actual circumstances of a fire disaster
3. Phenomenon of a fire disaster
4. Fire detection and extinguishing a fire
5. Evacuation safety under a fire condition
6. Controlling a fire spread
7. Mechanical properties of structural materials at elevated temperatures
8. Structure performance in a fire

98027

Earthquake Resistant Limit State Design for Building Structures

Autumn Semester (2-0-0) (Every Year)

Prof. Satoshi YAMADA and undecided

[Scope and outline]

Earthquake Resistant Limit State Design is a design method based on a balance of input energy by the earthquake and energy absorption capacity of building structures. In this lecture, the basic theory of design method based on a balance of the energy and the evaluation method of earthquake resistant performance of the building structures based on the deformation capacity of members are explained.

1. Basic theory of the design method based on a balance of the energy
2. Earthquake input evaluated as the energy input
3. Hysteresis behavior of the steel material
4. Ultimate behavior of steel members under cyclic load
5. Energy absorption capacity of steel members
6. Damage evaluation of the structure
7. Damage distribution in the multi-story structure
8. The relationship between deformation capacity of members and deformation capacity of the frame
9. Estimation method of the required earthquake resistance
10. Energy spectrum of earthquake
11. Outline of the base isolated building structure
12. Design of the base isolated building structure

98068

Exploration Geophysics

Spring Semester (1-0-0) (Every Year)

Prof. Hiroaki YAMANAKA

[Scope and outline]

Exploration geophysics, one of techniques for understanding geo-environments in shallow and deep soil layers, is explained in this lecture with wide view of applications to disaster prevention, natural resource development, and environmental protection.

98070

Elastic and Plastic Behaviors of Structural Materials

Spring Semester (2-0-0) (Every Year)

Prof. S. KONO and Assoc. Prof. Y. SHINOHARA

[Scope and outline]
The elastic and plastic behaviors of the concrete and steel currently most extensively used as a structural material of a high-rise building are explained. In particular, the three-dimensional stress and strain, the three-dimensional constitutive laws (Hooke's law), the three-dimensional plasticity theory of steel, and the failure criteria of concrete under multiaxial stresses are discussed to acquire an appropriately evaluating knowledge of an analytical result by a three-dimensional FEM.

1. Introduction
2. Some basic properties of concrete and steel
3. Stress in three dimensions
4. Principal stresses and principal Axes
5. Strain in three dimensions
6. Stress-strain relationship in elasticity
7. Two dimensional problems in elasticity
8. Yield criteria and stress-strain relationship in plasticity
9. Failure criteria of concrete
10. Examples of finite element analysis

98086

Introduction to Geochemistry

Autumn Semester (1-0-0) (Every Year)

Assoc. Prof. S. TOYODA

[Scope and outline]

Geochemistry is a discipline that aims to elucidate origin, constituents, and phenomenon of the earth, solar system, and universe. In this lecture, basic theories and methods for understanding origin and composition of materials of the earth and their cycles are explained from the view point of chemistry.

62038

Geotechnical Earthquake Engineering

Spring Semester (2-0-0) (Every Year)

Prof. Kohji TOKIMATSU and Assoc. Prof. Shuji TAMURA

[Outline]

1. Introduction to Geotechnical Earthquake Engineering
2. Seismic Geotechnical Hazards
3. Laboratory and In-Situ Tests for Determining Dynamic Soil Properties
4. Dynamic Soil Properties and Modelling
5. Wave Propagation
6. Ground Response Analysis and Local Site Effects
7. Liquefaction
8. Soil Improvement for Remediation of Seismic Hazards
9. Dynamic Earth Pressure Problem
10. Dynamic Soil-Pile-Structure Interaction
11. Seismic Design of Pile Foundations

62051

Applied Structural Design

Spring Semester (2-0-0) (Even Years)

Prof. Toru TAKEUCHI

[Scope and outline]

This course discusses up-to-date structural technologies in the field of spatial structures and seismic response controlled structures into practical building design. The topic includes methodology collaborating with architects and past experience of structural failures. Homework provides detailed design experience using such technologies using practical Japanese design standards and their supporting theories.

1. Architectural design and structural design
2. Design of spatial structures
3. Seismic design and retrofit
4. Design of base-isolated structures
5. Design of response controlled buildings

62056

Structural Planning in Architecture

Spring Semester (1-0-0) (Odd Years)

Prof. Toru TAKEUCHI

[Scope and outline]

This course provides the basic knowledge of the structural design for architectural students. The topic includes the information of the latest developments in structural engineering including technologies in the field of spatial structures and seismic design.

1. Structural planning for architects
2. Characteristics of structural systems and materials
3. Latest technologies of spatial structures
4. Latest technologies of seismic design

61049

Geo-Environmental Engineering

Spring Semester (2-0-0) (Every Year)

Assoc. Prof. Jiro Takemura

[Aims and Scope]

Various aspects on soil contamination and waste disposal system, i.e., laws, fundamental theories and technologies, will be explained.

[Outline]

1. Introduction
2. Characteristics of ground water and geochemistry
3. Ground contamination (I) – mechanism
4. Ground contamination (II) -- physical laws
5. Non-aqueous phase liquid
6. Remediation: requirement and laws
7. Remediation technology:
8. Waste disposal: landfill facility
9. Offshore landfill
10. Monitoring and prediction methods
11. Simulation of contaminant process
12. Site visits

[Evaluation] Attendance, Assignments, Examination

[Texts] Handouts will be provided by the lectures.

[Prerequisites] None

61061

Physical Modelling in Geotechnics

Autumn Semester (2-0-0) (Every Year)

Assoc. Prof. Jiro TAKEMURA and Assoc. Prof. Akihoro TAKAHASHI

[Aims and Scope]

This course covers scaling laws and modeling considerations for physical modeling in geotechnical problems both for static and dynamic conditions with laboratory exercises.

[Outline]

1. Introduction + visit TIT geotechnical centrifuge facilities
2. Similitude and modeling principles
3. Design of physical model and model ground preparation
4. Modeling exercise -1: preparation of dry sand model ground
5. Measurements strategy and sensors.
6. Modeling exercise -2: Modeling of liquefaction in 1 G field
7. Modeling exercise -2: continue
8. Recent developments in physical modeling – foundation
9. Recent development in physical modeling - excavation
10. Recent development in physical modeling - dynamic problems
11. Modeling exercise -3: Response of a single pile in sand during earthquake in a centrifuge
12. Modeling exercise -3: continue
13. Resent development in physical modeling - cold regions' problem
14. Examination and interview

[Evaluation] Assignments, Exercise, Examination

[Texts] Handouts on each topic will be provided by lecture.

[Prerequisites] None

61014

Advanced Mathematical Methods for Infrastructure and Transportation Planning

Spring Semester (2-0-0) (Odd Years)

Assoc. Prof. Daisuke FUKUDA

[Aims]

Mathematical methodologies for infrastructure, transportation and city planning will be lectured. These include: (1) Advanced statistical techniques for transportation data analysis, (2) Econometric methods for travel demand forecasting, and (3) Mathematical optimization techniques for project evaluation.

[Outline]

1. Introduction
2. Overview of Systems Analysis
3. Fundamentals of Mathematical Optimization Problem
   (Optimization with equality constraints)
4. Advanced Topics of Mathematical Optimization Problem
   (Optimization with inequality constraints and Dynamic programming)
5. Fundamentals of Statistical Regression Analysis
   (Multiple regression analysis)
6. Advanced Topics of Statistical Regression Analysis
   (Simultaneous equation system, Time-series analysis)
7. Fundamentals of Discrete Choice Model
   (Derivation and Estimation of Logit Model)
8. Advanced Topics of Discrete Choice Model
   (Demand Forecasting, Extended Discrete Choice Models)

[Evaluation] Attendance, Home Work Assignments and Examination

[Text] Lecture materials will be provided by the lecturer.

61081

Transportation Network Analysis

Autumn Semester (2-0-0) (Even Years)

Prof. Yasuo ASAKURA

[Aims and Scope]

Mathematical formulation and solution algorithms for User Equilibrium models in transportation networks are described based on the nonlinear optimization framework. A variety of UE models are introduced including deterministic UE model with fixed OD demand and stochastic UE model with variable OD demand. Possible applications of those models to transportation planning are also discussed.

[Outline]

1. Roles of transportation network analysis
2. Nonlinear optimization theory
3. Solution algorithms
4. User Equilibrium model with fixed OD demand
5. User Equilibrium model with variable OD demand
6. Stochastic User Equilibrium
7. Application of UE models

61066

Transportation Economics

Autumn Semester (1-0-0) (Even Years)

Assoc. Prof. Daisuke FUKUDA

[Aims and Scope]

This course is designed to introduce graduate students with engineering background a solid grounding in the economic analysis of transportation.

[Outline]

1. Consumer behavior theory
2. Theory of the firm
3. Transportation costs
4. Congestion pricing: Theory
5. Congestion pricing: Practice
6. Benefit-Cost Analysis of Transport Facilities

[Evaluation]

Attendance and Home Work Assignments

[Texts]

Lecture materials will be provided by the lecturer.

61034

Stability Problems in Geotechnical Engineering

Autumn Semester (2-0-0) (Every Year)

Assoc. Prof. Akihiro TAKAHASHI, Assoc. Prof. Jiro TAKEMURA and Prof. Masaki KITAZUME

[Aims and Scope]

The lecture focuses on various approaches to stability problems in geotechnical engineering, including limit equilibrium method, limit analysis and slip line method. The lecture also covers soil-structure interaction problems, seismic stability problems and recent ground improvement methods for increasing the stability of the structures.

[Outline]

1. Introduction
2. Stability analysis
   1) limit equilibrium
   2) limit analysis

3) slip line method

3. Soil-Structure Interaction problems
    1) pile-soil interaction
    2) braced wall excavation
4. Underground construction
5. Soil improvements & reinforcement
6. Design philosophy and design code

[Evaluation] Attendance, Assignments and Examination

[Texts] Handouts will be provided by the lectures.

[Prerequisites] None

61038

Mechanics of Geomaterials

Spring Semester (2-0-0) (Every Year)

Prof. Masaki KITAZUME

[Aims and Scope]

Explain mechanical behaviour of various geomaterials

[Outline]

1. Behaviour of grains and packing of granular materials
2. Stress space and failure criteria
3. Micro-scopic view of geo-materials
4. Sampling and disturbance
5. Behaviour of naturally deposit soils
6. Behaviour of improved geo-materials
7. Behaviour of reinforced geo-materials
8. Time dependent behaviour of geo-materials
9. Constitutive equations

[Evaluation] Assignments, Examination, Interview

[Texts] Handouts on each topic will be provided by lectures.

[Prerequisites] None

70044

Coastal Disaster Mitigation

Spring Semester (2-0-0) (Every Year)

Assoc. Prof. Hiroshi TAKAGI

[Aims]

Coastal disasters due to such as tsunamis, storm surges, and high waves lead to considerable loss of human life and property. The threat from coastal disasters may exacerbate because of the impact of climate change and economic development that accelerate rapid population increase in coastal areas. This course comprises lectures on basic theories, engineering, and management for mitigating such risks caused by coastal disasters.

[Outline]

1. Introduction
2. Basic of Water Wave Theory
3. Theory of Astronomical Tides
4. Earthquakes and Tsunamis
5. Tropical Cyclones and Storm Surges
6. High Waves
7. Coastal Erosion
8. Earth’s Climate System and Climate Change

9. Structures for Coastal Protection
10. Coastal Management and Ecosystem
11. Case studies
12. Oral Presentation

70043

Advanced Concrete Technology

Autumn Semester (2-0-0) (Every Year)

Prof. Nobuaki OTSUKI

[Aims and Scopes]

Lectures on the state of the art of concrete technology will be presented, including some topics related to developing countries.

[Outline]

1. Introduction
2. Cementitious materials－past, present and future
3. Structure of hardened concrete
4. Strength
5. Cements (1)
6. Cements (2)
7. Admixtures (1)
8. Admixtures (2)
9. Aggregates
10. Light weight Aggregates
11. Flowable concrete, including anti-washout concrete
12. Pre-stressed concrete
13. Durability
14. Maintenance

[Evaluation] By examination

[Texts] Ref. Concrete, Prentice Hall

[Prerequisites] None, however, basic knowledge of undergraduate level may be necessary

61003

Mechanics of Structural Concrete

Spring Semester (2-0-0) (Odd Years)

Prof. Junichiro NIWA

[Aims and Scopes]

Fundamental mechanical behaviors of structural concrete will be explained. Some concepts for the limit state design method will also be given.

[Outline]

1. Introduction
2. Structural Design Concept of Concrete Structures
3. Ultimate Limit States
    - 3.1 Flexural Capacity of RC Members
    - 3.2 Capacity of RC Members Subjected to Combined Flexural Moment and Axial Force
    - 3.3 Shear Capacity of RC Members
    - 3.4 Application of Fracture Mechanics
    - 3.5 Size Effect in Diagonal Tension Strength
    - 3.6 Lattice Model Analysis
    - 3.7 Torsion Capacity of RC Members

4. Serviceability Limit State
5. Fatigue Limit States
6. Special Topics

[Evaluation] Attendance, Reports and Examination
[Text] Lecture notes will be provided by the lecturer.
[Prerequisites] None

70041

Utilization of Resources and Wastes for Environment

Autumn Semester (2-0-0) (Every Year)
Prof. Nobuaki OTSUKI, Prof. Kiyohiko NAKASAKI and Assoc. Prof. Ryuichi EGASHIRA
[Aim]
In order to achieve “sustainability” in our society, we have maximized resources productivity (product generated per unit resources) in industrial activities and minimized material/energy load (wastes) to the environment. In addition, wastes have been reused and recycled properly, even if wastes are generated. This lecture provides several examples of such industrial processes and technologies as above which effectually utilize resources and wastes.
[Outline]

1. Introduction
2. Bio-refinery (1)
3. Bio-refinery (2)
4. Solid waste treatment (1)
5. Solid waste treatment (2)
6. Outline of waste utilization in construction industry
7. Slags from steel and other metal manufacturers
8. Waste utilization in cement manufacturers
9. Researches in this field
10. Petroleum Refinery (1)
11. Petroleum Refinery (2)
12. Water Treatment (1)
13. Water Treatment (2)
14. Summary

61083

Maintenance of Infrastructure

Spring Semester (2-0-0) (Even Years)
Prof. Mitsuyasu IWANAMI
[Aims and Scopes]
It is of importance to appropriately maintain our infrastructure, that is constructed to achieve comfortable and safe life and integrated economical activity. In the lecture, basic concept of appropriate maintenance, constituent technology such as inspection, evaluation, prediction, and countermeasure, linkage with structural design are explained. Furthermore, recent examples of infrastructure maintenance are analyzed as case studies, aiming to acquiring the relevant knowledge.
[Outline]

1. Introduction
2. Objective of maintenance
3. Basic concept of maintenance
4. Inspection and investigation
5. Performance evaluation and its future prediction
6. Repair and reinforcement

7. Linkage with structural design
8. Case studies (recent example of maintenance)

[Evaluation]

Attendance and Reports

[Text]

None(some handouts are distributed by the lecturer if necessary)

[Prerequisites]

None

61005

Fracture Control Design of Steel Structures

Autumn Semester (2-0-0) (Even Years)

Assoc. Prof. Eiichi Sasaki

[Aims]

Damage cases in steel structures are categorized and the control design concepts for fracture are lectured.

[Outline]

1. Classification of Fracture Modes if Steel Structures
2. Damage Cases I Steel Structures during Earthquakes
3. Fundamental Concepts of Fracture Mechanics
4. Fracture Toughness of Steels
5. Predominant Factors of Brittle Fracture
6. Fatigue Strength of Structural Elements
7. Nominal Stress Based Fatigue Design
8. Structural Stress Based Fatigue Design
9. Quality Control of Structural Elements
10. Fatigue Strength Improvement Methods
11. Maintenance of Steel Bridges
12. Characteristics and Prevention of Brittle Fracture during Earthquakes
13. Lessons learned from Failure
14. Discussions: Case Studies

61065

Introduction to Solid Mechanics

Spring Semester (2-0-0) (Every Year)

Assoc. Prof. Anil C. WIJEYEWICKREMA

[Aims]

The course is designed for the students to attain the following four objectives:

(1) Understand index notation used in equations in any subject area.
(2) Understand the fundamentals of stresses and strains.
(3) Obtain a good knowledge of linear elasticity.
(4) To be able to formulate and solve basic problems in solid mechanics.

[Outline]

1. Mathematical preliminaries -- Index notation
2. Mathematical preliminaries -- Vectors and Cartesian tensors
3. Mathematical preliminaries - Eigen-value problems, vector and tensor calculus
4. Stress and strain - Stresses, traction and equilibrium equations
5. Stress and strain - Principal stress and maximum shear stress
6. Stress and strain - Strain tensor
7. Stress and strain - Cylindrical polar coordinates

8. Stress and strain - Spherical coordinates
9. Linear elasticity - Hooke's law
10. Linear elasticity - Introduction to anisotropic elasticity
11. Elastostatic plane problems - Classification of two-dimensional elasticity problems
12. Elastostatic plane problems - Airy stress functions
13. Elastostatic plane problems - Infinite plate problem and Kirsch solution
14. Elastostatic plane problems - Infinite plane with a uniform body force in a circular region
15. Elastostatic plane problems - Hertz solution

[Evaluation] Homework - 20%, Quizzes - 20% and Final Exam - 60%

[Texts] Timoshenko, S. P. and Goodier, J. N., 1970, "Theory of Elasticity", 3rd edition, Mc-Graw-Hill, New York / Barber, J. R., 2002, "Elasticity", 2nd edition, Kluwer, Dordrecht.

[Prerequisites] None

61048

Advanced Course on Elasticity Theory

Autumn Semester (2-0-0) (Every Year)

Assoc. Prof. Anil C. WIJEYEWICKREMA

[Aims and Scope]

Non-linear elastic behavior is studied in detail. Anisotropic elasticity will also be introduced.

[Outline]

1. Finite Elastic Deformations -- Mathematical preliminaries (Cartesian tensors)
2. Finite Elastic Deformations -- Mathematical preliminaries (Tensor algebra)
3. Finite Elastic Deformations -- Kinematics (Configurations and motions)
4. Finite Elastic Deformations -- Kinematics (Deformation gradient and deformation of volume and surface elements)
5. Finite Elastic Deformations -- Kinematics (Strain, stretch, extension and shear)
6. Finite Elastic Deformations -- Kinematics (Geometrical interpretation of the deformation)
7. Analysis of motion -- Deformation and strain rates
8. Balance laws
9. Stress tensors -- Cauchy stress tensor
10. Stress tensors -- Nominal stress tensor
11. Conjugate stress analysis
12. Constitutive laws
13. Anisotropic Elasticity -- Linear anisotropic elasticity
14. Anisotropic Elasticity -- Lekhnitskii formalism
15. Anisotropic Elasticity -- Stroh formalism

[Evaluation] Home Work Assignments and Examination

[Texts] Holzapfel, G. A., 2001, "Nonlinear solid mechanics", John Wiley, Chichester.
Ogden, R. W., 1984, "Non-linear elastic deformations", Ellis Horwood, Chichester, also published by Dover publications, New York in 1997. Ting, T. C. T., 1996, "Anisotropic elasticity", Oxford University Press, New York.

[Prerequisites] Students should have previously followed a course on Fundamentals of Elasticity or Introduction to Solid Mechanics.

61046

Principles of Construction Management

Autumn Semester (2-0-0) (Odd Years)

Prof. Atsushi HASEGAWA

[Aims and Scopes]

Considering international construction projects, elements of construction/project management will be lectured focusing on basic knowledge/skills/methodology, such as scheduling, cost management, risk management, bid, contract, legal issues, and project cash flow.

[Outline]

1. Course Introduction/ General Flow and Scheme of Construction Project (1)
2. General Flow and Scheme of Construction Project (2), - Bid/Contract (1)
3. Bid/Contract (2)
4. Time Management (1)
5. Time Management (2)
6. Cost Management (1)
7. Cost Management (2)
8. Estimation
9. Project Funding / Cash Flow
10. Special Topics on Management (1), - Client Management -
11. Risk Management
12. Legal Issue, Claim (1)
13. Legal Issue, Claim (2)
14. Special Topics on Management (2), - Project Case - / Course Closure

[Evaluation]

Final Report (50%) + Exercise (30%) + Participation (20%)

[Text] “Construction Management” by Daniel Halpin/ “A Guide to the Project Management Body of Knowledge” by PMI

[Prerequisites] None

61047

Probabilistic Concepts in Engineering Design

Autumn Semester (2-0-0) (Odd Years)

Assoc. Prof. Eiichi Sasaki

[Amis and scope]

This course enhances fundamental understandings on probabilistic approach for engineering design. Engineers must make an optimal decision with unknown or uncertain parameters. For the purpose of smart, reasonable and reliable design, this course provides quite important materials. This course aims 1) to develop profound learning about reliability and safety on structural design and 2) to understand designing methods invoking probabilistic approach.

[Outline]

1. Introduction
2. Role of probability in Engineering Design
3. Design and Decision Making Under Uncertainty
4. Basic probability Concepts
5. Analytical Models of Random Phenomena
6. Functions of Random Variables
7. Estimating Parameters form Observations
8. Empirical Determination of Distribution Models
9. Decision Analysis
10. Statistics of Extremes
11. Reliability and Reliability Based Design

[Text]

Probability Concepts in Engineering Planning and Design Volume 1 and Volume 2, A.H. Ang and W.H. Tang

John Wiley & Sons

[Prerequisites] None

61013

Civil Engineering Analysis

Autumn Semester (2-0-0) (Every Year)

Prof. Sohichi HIROSE

[Aims]

Lecture on fundamentals of forward and inverse analyses of initial and boundary value problems in civil engineering

[Outline]

1. Introduction – forward and inverse problems
2. Variational method 1
3. Variational method 2
4. Variational method 3
5. Weighted residual method
6. Finite element method 1
7. Finite element method 2
8. Boundary element method 1
9. Boundary element method 2
10. Numerical implementation
11. Linearized inverse problems
12. Generalized inverse matrix
13. Instability and regularization of inverse problems

[Evaluation] Report (40%) and Examination (60%)

61084

Advanced Topics in Civil Engineering I

Spring Semester (2-0-0) (Every Year)

Unfixed: Visiting Professor

[Aims and Scope]

The advanced topic is given by a visiting professor.

61055

Advanced Topics in Civil Engineering II

Autumn Semester (2-0-0) (Every Year)

Unfixed: Visiting Professor

[Aims and Scope]

The advanced topic is given by a visiting professor.

61062

Advanced Technical Communication Skills: ATC I

Spring Semester (1-1-0) (Every Year)

Prof. David B. Stewart

[Aims and Scope]

In this roundtable seminar we intend to identity and improve skills in academic writing (i.e., those used for technical journals) and also to improve oral presentation techniques, assisted by Power Point or similar media.

[Outline]

The basic approach to technical writing in the fields of engineering and the sciences is unified. It can be learned through content analysis and close attention to style. Each journal has its own house requirements. Still, the structure of all peer-reviewed research follows what is referred to as IMRaD: Introduction, Methods, Results, and Discussion. You describe (1) what you did and (2) why you did it; then you tell (3) how you did it and (4) what you found out.

Finally, you must explain clearly what all this means for your readers.

You will learn to be clear and logical in approach and to write from the point of view of a prospective reader. This is <u>not</u> a translation course. On the contrary, *you will be encouraged to think and write in English.*

In presentation, you'll be requested to speak so that you can be heard and also to make your visual materials uniform and consistent, as well as attractive, effective, and persuasive.

All this takes hard work and for some students may at first feel unfamiliar. To achieve your aims, you must take risks, make mistakes, and then start again. To do this, we must meet twice a week on a regular basis and you will spend a certain amount of time outside class in preparation.

61063

Advanced Technical Communication Skills: ATC II

Autumn Semester (1-1-0) (Every Year)

Prof. David B. Stewart

[Aims and Scope]

In this roundtable seminar we intend to identity and improve skills in academic writing (i.e., those used for technical journals) as well as to improve oral presentation techniques, assisted by Power Point or similar media.

[Outline]

This seminar is a continuation of ATC 1. (NOTE: new students are accepted in both terms.)

Requirements are identical and students are will proceed at their own pace within the context of what the group achieves. Students themselves, as well as the instructor, will provide constructive criticism and overall support for everyone's work.

Class meeting times are the same as in the spring term, and regular attendance is both compulsory and vital to your success.

61071

International Collaboration I

Spring Semester (0-1-0) (Every Year)

Prof. Junichiro NIWA

[Aims and scope]

Through collaborative works on earthquake hazard prediction and mitigation for the home countries of the student and discussions on the related issues, such as the strategy of urban earthquake disaster prevention, the student will foster the ability of international communication, negotiation, collaboration, and leadership.

61072

International Collaboration II

Autumn Semester (0-1-0) (Every Year)

Prof. Junichiro NIWA

[Aims and scope]

Through collaborative works on the project evaluation related to earthquake hazard prevention for the specific region and discussions on the related issues, the student will foster the ability of international communication, negotiation, collaboration, and leadership.

61077

International Internship I

Spring Semester (0-1-0) (Every Year)

Prof. Junichiro NIWA

[Aims and scope]

Enrolled students are required to visit a foreign country to have the experience on the site visit, field work, investigation, and make a report with students of the counterpart university under the supervision of Professors. Finally, enrolled students are required to make the presentation of their report through the collaboration.

61078

International Internship II

Autumn Semester (0-1-0) (Every Year)

Prof. Junichiro NIWA

[Aims and scope]

Enrolled students are required to visit a foreign country to have the experience on the site visit, field work, investigation, and make a report with students of the counterpart university under the supervision of Professors. Finally, enrolled students are required to make the presentation of their report through the collaboration.

61100, 61101, 61102, 61103

Disaster investigation and restoration practice A, B, C, D

1st Quarter:A, 2nd Quarter:B, 3rd Quarter:C, 4th Quarter:D (0-0-1)

[Aims and scope]

Aim of this course is to learn actual situation of disaster area and disaster mitigation practice through experience in site investigation and support service for restoration and recovery from disaster.

77019

Analysis of Vibration and Elastic Wave

Spring Semester (2-0-0) (Odd Years)

Prof. Sohichi HIROSE

[Aims]

Theories of vibration and elastodynamic waves will be introduced and some engineering applications are presented.

[Outline]

1. Theory of wave and vibration for one dimensional problem
   - 1-1. Fundamental equations
   - 1-2. Reflection and transmission
   - 1-3. Dispersive waves
   - 1-4. Fundamental solutions and integral formulation
2. Theory of elastodynamics
   - 2-1. Fundamental equations
   - 2-2. Reflection and transmission of plane waves
   - 2-3. Surface waves
   - 2-4. Fundamental solutions and Green's functions
   - 2-5. Integral representation of elastic waves
   - 2-6. Numerical analysis of elastic waves
3. Engineering applications of wave and vibration
   - 3-1. Application in seismic engineering
   - 3-2. Application in nondestructive testing

[Evaluation] Report (50%) and examination (50%)

77016

Theory & Applications of Urban Spatial Data

Autumn Semester (2-0-0) (Odd Years)

Prof. Toshiyasu OSARAGI

[Aims and Scopes]

This course will focus on the theory and applications of spatiotemporal information for statistical / mathematical modeling of the sort typically used in urban and metropolitan policy, planning, and environmental analysis. Participants will learn example applications from their area of interest and then develop a simple application in the form of a model that incorporates spatiotemporal data.

77020

Intellectual Infrastructure Systems

Spring Semester (2-0-0) (Odd Years)

Assoc. Prof. Takamasa MIKAMI

[Aims and Scopes]

Social infrastructure is becoming smart with the progress of information science and technology. This lecture gives an overview of the state of the art in intellectual infrastructure systems. This course also provides an opportunity to study advanced technologies on lifeline networks and related anti-disaster facilities. Your presentations and discussions will form an important part of this class.

62511, 62512

Off-Campus Project in Architecture and Building Engineering I-II (0-0-4)

61511, 61512

Civil Engineering Off-Campus Project I or II (0-4-0)

92050, 92051

Built Environment Off-Campus Project I or II (0-4-0)

77664, 77665

Mechanical and Environmental Informatics International Off-Campus Project A, B (0-1-2)

for Doctor Degree

[Aims and scope]

The student will take part in an actual project done by an institution or private company internationally or domestically. Project period is from three to six months. Through this internship projects the student will experience the actual practice in her/his own field and have proper prospects of her/his future profession.

62543 - 62546

Experiment on Steel Structures I-IV (0-0-1)

62551 - 62554

Experiment on Earthquake Engineering I-IV (0-0-1)

For Master Degree

[Aims and scope]

Experiments, exercises and field works on topics relating to each field.

77602

Mechanical and Environmental Informatics Project I (0-1-2)

For Master Degree

77663

Mechanical and Environmental Informatics Project II (0-1-1)

For Master Degree

92705 – 92708

IPISE Seminar (ENVENG) I –IV (2-0-0)

98701 - 98704

Seminar in Environmental Science Technology, and Engineering I-IV (0-2-0)

62701 - 62704

Seminar in Architecture and Building Engineering I-IV (0-2-0)

61701 - 61704

Seminar of Civil Engineering I – IV (0-2-0)

77701 - 77704

Seminar in Mechanical and Environmental Informatics I – IV (0-1-0)

for Master Degree

[Aims and scope]

Colloquium on topics relating to each study filed by means of reading research papers and books, and discussion with each supervisor and the program coordinators.

92801 - 92806

Seminar in Built Environment V – X (0-2-0)

98801 - 98806

Seminar in Environmental Science Technology, and Engineering V – X (0-2-0)

62801 - 62806

Seminar in Architecture and Building Engineering V – X (0-2-0)

61801 - 61806

Seminar of Civil Engineering V – X (0-2-0)

77801 - 77806

Seminar in Mechanical and Environmental Informatics V – X (0-2-0)

for Doctor Degree

[Aims and scope]

All are offered for Master degree holders. Advanced and high level researches including colloquium, practice and experiment are required.