SYLLABUS *2012*

[A] Global Engineering

Kyoto University, Faculty of Engineering

[A] Global Engineering

Global Engineering

230100

Exercises in Information Processing Basics

基礎情報処理演習

【Code】230100 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】1

【Restriction】 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	1	
	2	
	3	
	2	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30010

Introduction to Global Engineering

地球工学総論

【Code】30010 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】Related Teachers

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Guidance	1	
Safety and Engineering Ethics	1	
General Lectures	5	
Seminars	6	
Laboratory Visit	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30040

Computer Programming in Global Engineering

情報処理及び演習

【Code】30040 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	2	
	2	
	2	
	2	
	4	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22010

Information Processing Basics

基礎情報処理

【Code】22010 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

35010

Introduction to Global Engineering

Introduction to Global Engineering

【Code】35010 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】English 【Instructor】Related Faculty members

【Course Description】This course focuses on the improving students’ understanding about the Global Engineering. The course also explores the way how the global engineering contributes to sustainability of human society on a global scale. In addition, this course is designed to provide students with a personal and professional foundation for working in professions and roles that utilize knowledge of the global engineering.

【Grading】Coursework will be graded based on the reports and attendance.

【Course Goals】To understand conceptions of the global engineering. To understand subjects and contents which they should study at the department of global engineering within 4 years.

【Course Topics】

Theme	Class number of times	Description
Guidance	1	Introduction to the course.
Safety & Engineering ethics	1	Introduction to the safety on their study and research, and engineers' obligations to the public, their clients, employers and the profession.
Lecture	5	Major roles in solving problems on a global scale from civil, enviromental and resources engineering point of views.
Small group seminar	6	Each small group of participants visits a laboratory associated with the global engineering and take a seminar. Students have to choose a theme relating to the global engineering as a group project and perform the project under supervision of a faculty member concerned.
Introduction of latest research	2	Visit laboratories of the global engineering department to widen students' knowledge and to deepen their understanding of the role and importance of the global enineering.

【Textbook】The textbook is not required. Materials will be supplied by instructors.

【Textbook(supplemental)】

【Prerequisite(s)】No prerequisite is required.

【Web Sites】

【Additional Information】

35020

Exercises in Infrastructure Design

Exercises in Infrastructure Design

【Code】35020 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar 【Language】English 【Instructor】Shimamoto

【Course Description】The purpose of this course is to understand how Civil Engineering relates to our society. For the sake of this purpose, this course firstly explains the target area and new topics related to Civil Engineering with some concreate examples. Then, students examine one of the social infrastructure in their countries and make a presentation. After introducing brainstorm and KJ method, which is methods for structuring problems, students discuss disirable social infrastracture with group members and make a presentation about the result.

【Grading】The total point is scored based on the attendance rate and the report of the exercise

【Course Goals】To understand how Civil Engineering relates to and contributes to our society. Furthermore, throughout the exercise, it is expected to enhance the ability of discussion for reaching solutions and the ability of making a presentation of the solutions.

【Course Topics】

Theme	Class number of times	Description
Guidance	1	Introduction of this course
Introduction of Civil Engineering	5	To help the exercise, the target area of civil engineering is explained with some concrete examples.
Individual exercise	8	Students are asked to pick up one of the social infrastructure in their own coutries and to sumarize the outline about it.
Presentation	4	Each student is asked to make a presentation about the social infrastracture he/she examined.
Structuring problems	2	For designing infrastructures appropriately, it is important to reveal problems in the society and find their solutions. For the sake of this, the concept of brainstorm and KJ method, which can help structuring problems, is explained. Furthermore, to understand the concept of these method, the exercise is conducted.
Group exercise	8	Students are divided into several groups and discuss disirable social infrastracture with group members.
Presentation	2	Each group is asked to make a presentation about disirable social infrastracture based on the discussion.

【Textbook】The printed handout will be distributed as appropriate

【Textbook(supplemental)】

【Prerequisite(s)】None

【Web Sites】

【Additional Information】

23050

Exercises in Information Processing Basics

Exercises in Info Processing Basics

【Code】23050 【Course Year】1st year 【Term】1st term 【Class day & Period】 【Location】 【Credits】1

【Restriction】 【Lecture Form(s)】Seminar 【Language】English 【Instructor】Tamrakar・Flores

【Course Description】The aim of this lecture is to learn the basic skills needed for engineering computing. A UNIX based OS will be used (Linux) in terminals at the Media Center.

【Grading】The grading will be based on the results of the weekly exercises, the final report and the written exam.

【Course Goals】To understand and master: "program writing for problem solving," "program execution," "making graphics from numerical results," and "writing reports."

【Course Topics】

Theme	Class number of times	Description
Overview, character input and file creation	3	Information security (highly recommended to follow the information security e-learning course), introduction of available Media Center software, perform basic operations from the terminal such as login, logout, input of alphabet and Japanese characters, create, save and print documents, and submission of results.
UNIX command shell	2	Use of basic UNIX commands, understanding of the file system, build redirections and pipes to deal with important files.
Formatting text	3	Text formatting using LaTeX. Inclusion of charts, graphics, tables and equations
Graphics	2	Basics of charting (plot, axis scale, notes). Use of GNUPLOT to graphic functions and numerical data.
Programming	5	Basics of programming. Understanding of the structure of programs and how to alter their flow by using repetition and conditional branching. Use of Fortran to create actual programs.

【Textbook】"Exercises in Information Processing Basics," provided during the first lecture.

【Textbook(supplemental)】Stephen Chapman: "Fortran for Scientists and Engineers: 1995-2003"

【Prerequisite(s)】None

【Web Sites】

【Additional Information】This class is mainly for International Course Students. This lecture is done using Media Center equipment, for which a valid account at the Educational Computers System of Kyoto University (ECS-ID) is required. Office hours of the instructors will be provided at the first lecture. It is strongly recommended that you take "Information Processing Basics" after this course. The "Computer Programming in Global Engineering" lecture will be conducted with the assumption that students have mastered this course.

22050

Information Processing Basics

Information Processing Basics

【Code】22050 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】Lecture 【Language】English 【Instructor】Kim(C)

【Course Description】This course focuses on improving students basic knowlegde on hardware and software of computers even including the information network. In addition, the course provides lectures on safety of networks and information ethics.

【Grading】Coursework will be graded based on the final exam, take home exams and attendance.

【Course Goals】To understand basic knowlegde on hardware, software and network of computers.

【Course Topics】

Theme	Class number of times	Description
Global Engineering and Information Processing	1	Introduction to information processing in the global engineering using examples of how the information processing is applied to the field of the global engineering.
Introduction to computer	1	Introduction to computer, which covers the structure of computers, a history of computers, computer literacy, etc.
Introduction to digital information	1	Advantages of using digital information, how to express digital data, data compression, etc.
Computer and data communication	1	Basics for data communication, LAN, Internet, Search engines, etc.
Introduction to programming	2	Introduction to various types of programming languages: FORTRAN, C, JAVA, etc.
Algorithm	1	Designing for an algorithm and deepen knowledge for algorithm through excercises.
Basics of hardware design	1	Baisic for the structures of hardware of computers, algebra of logic, etc.
Computer as a system	1	Hierarchy of memory, OS, parallel computing, etc.
Information processing	1	Database, searching algorithm, computer graphics, etc.
Intellectual information processing	1	Artificial intelligence, pattern recognition, etc.
Problems to be solved in computer science	1	Software engineering, game theory, the next generation computer, etc.
Information ethics	2	Introduction to information ethics.
Achievement assessment	1	The achievement assessment is intended to measure students’ knowledge, skill and aptitude on the subject using a quiz and viva-voce.

【Textbook】Materials and handouts will be distributed by the instructor.

【Textbook(supplemental)】TBA

【Prerequisite(s)】Participants should completed the course "Exercises in Information Processing Basics".

【Web Sites】

【Additional Information】

35030

Computer Programming in Global Engineering

Computer Programming in Global Eng

【Code】35030 【Course Year】1st year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Seminar 【Language】English 【Instructor】Tamrakar・Flores

【Course Description】This course aims to introduce the basic IT tools needed in Global engineering fields, and to learn and practice a computer programming language. This course will focus on a scientific language, Fortran90, that will be used to make calculations and programs.

【Grading】This course will grade the student's ability to do programming using Fortran90, via small tests, reports and a final exam.

【Course Goals】To understand basic IT processing capabilities in Global engineering areas. To acquire basic logic and syntax Fortran90 programming knowledge.

【Course Topics】

Theme	Class number of times	Description
Overview	1	Use of computers in Global engineering, IT and future needs. Overview on using computer terminals and description of programming language (Fortran90)
I/O parameters and variables	1	Main parts of a basic program: input, calculations, output, intrinsic functions, etc. Data types and commanding statements are also described.
Branches and Loops	2	Conditional branching to change the flow of a program and create repetition is explained. The structure of a program is explained by using a flow chart.
Array	2	The array concept is explained for practical calculations, and its declaration and operation methods (declaration, I/O, multiplication, referencing) are explained via a programming exercise.
File I/O	2	The basics of reading and writing to disk files is presented. Methods and formats will be explained via an example.
Subroutines	2	Explanation of the use of subroutines and function subprograms to work with large-scale programs.
Applied Calculation	5	Programming based on all previously explained examples of computational geo-engineering. A report will be submitted after an algorithm and flowchart are prepared dealing with all those topics (statistics, chart creation, random number generation, simulation, numerical methods, etc.)

【Textbook】None

【Textbook(supplemental)】Stephen Chapman: "Fortran for Scientists and Engineers: 1995-2003"

【Prerequisite(s)】None

【Web Sites】

【Additional Information】This class is mainly for International Course Students. It's not allowed start attending this class from the mid of the semester. Office hours of the instructors will be provided at the first lecture. This lecture corresponds to a subject of Information Education Groups 1 and 3.

30100

Fundamental Mechanics

一般力学

【Code】30100 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	2	
	1	
	2	
	3	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31330

Resources and Energy

資源エネルギー論

【Code】31330 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	6	
	5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30030

Probabilistic and Statistical Analysis and Exercises

確率統計解析及び演習

【Code】30030 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】Japanese

【Instructor】S.Tohno, E.Nakakita, T.Hori and H.Shimamoto

【Course Description】Theory and methodology of probabilistic and statistical analysis is introduced as a basic tool to cope with uncertainty in natural and social systems dealt with in global engineering. The main topics are concept and basic theorems of probability, probability distributions and its use, statistical estimation and testing, and multivariate analysis.

【Grading】Grading is done based on the mark on regular examination. Performance in classes and exercises, marks in quiz and mid-term exams are also taken into account. Minimum passing grade is sixty percent.

【Course Goals】The goal is to understand fundamental theory of probability and to be capable of using well-known distributions to analysis and design. It is also required that students understand the fundamentals on population and samples, and principle of statistical estimation and testing

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Role of probabilistic and statistical approach in global engineering and in other engineering fields.
Basic theory for probabilistic analysis	4	The concept and basic theory on probability: random variables, probability mass function, probability density function, distribution function, Bayes ' theorem, moment generating function, characteristic function, multi-dimensional distribution, transform of random variables.
Probability distribution models	4	Probability distributions often used in global engineering are introduced: Bernoulli series and binomial distribution, Poisson series and distribution, normal distribution, return period.
Statistical estimation and testing	3	Basic theory on sampling. Chi-square, t-, and F-distributions. Methods for statistical estimation and testing.
Multivariate analysis	2	Basic methods in multivariate analysis: regression analysis and principal component analysis.
Attainment check	1	Evaluation of the attaiment level.

【Textbook】Kitamura,S and Hori,T(eds.): An introduction to Probability and Statistics for Engineering, Asakura Publishing Co., Ltd.,
3,600 .

【Textbook(supplemental)】Supplemental materials will be introduced in the class.

【Prerequisite(s)】Prerequisite courses are infinitesimal calculus and linear algebra.

【Web Sites】

【Additional Information】

30140

Environmental Health

環境衛生学

【Code】30140 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】,

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	14	
	6	
	4	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31810

Introduction to Civil Enginnering I

社会基盤デザインI

【Code】31810 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】J. Kiyono, N. Uno, T. Shiotani, and Y. Tachikawa

【Course Description】Civil Engineering is the study which provides the essential technology and knowledge to improve social infrastructures. Various science, technology and knowledge are required in order to realize "convenient and comfortable cities", "safe countries to live in", "eco-friendly global society" and "sustainable civilization based on resources and energy". As an introduction to learn Civil Engineering, this course explains the essence of Civil Engineering from four fields in Civil Engineering (Structural Engineering, Hydraulics and Hydrology, Geotechnical Engineering and Planning and Management). Throughout the lectures and exercises including visiting lecturers, it is expected to learn the essence of Civil Engineering and the ethic of the engineering.

【Grading】The score is evaluated comprehensively from reports for each lecture (including presence point) and the final examination. The full score is 100 marks which consists of 50 marks from reports and 50 marks from the final examination.

【Course Goals】To understand that Civil Engineering is the organization of the technology and knowledge related to social capital improvement, prevention or mitigation of disaster and creation of environment.

【Course Topics】

Theme	Class number of times	Description
Introduction to Civil Engineering	2	The content of the course is introduced. Then, the study field of Civil Engineering including latest topics and the ethic of Civil Engineers throughout the achievement of predecessors is introduced.
Structual Enginnering	3	Civil Engineering is introduced in the viewpoint of Structural Engineering, which includes natural disasters and structural engineering, introduction of new technology and research, the collaboration with other fields, etc.
Hydraulics and Hydrology	3	Civil Engineering is introduced in the viewpoint of Hydraulics and Hydrology, which includes conservation and construction of river environment, prediction of rainfall and flood, prediction of environmental change, global warming etc.
Geotechnical Engineering	3	Civil Engineering is introduced in the view point of geotechnical Engineering, which includes soil mechanics, soil environment, international cooperation, etc.
Planning and Management	3	Civil Engineering is introduced in the view point of designing and managing social Infrastructure, which includes an asset management of social infrastructure, soft measures for traffic jam, logistic vehicles in urban area, etc.
Achievement confirmation	1	Achievement assement is intended to measure students' knowledge, skill and aptitude on the subject.

【Textbook】Handouts will be distributed as appropriate.

【Textbook(supplemental)】

【Prerequisite(s)】No specific prior knowledge is required

【Web Sites】

【Additional Information】

30050

Mathematics for Global Engineering

地球工学基礎数理

【Code】30050 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31340

Systems Analysis and Exercises for Planning and Management

計画システム分析及び演習

【Code】31340 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	6	
	6	
	6	
	6	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31620

Soil Mechanics I and Exercises

土質力学 I 及び演習

【Code】31620 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese

【Instructor】Oka, Katsumi, Inui, Kimoto, Shiotani, Mimura

【Course Description】The student is expected to learn:the basics of soil formation, classification for engineering purposes, soil compaction, soil water and water flow, consolidation theory, problems on final and time rate of consolidation, the fundamentals of shear strength and deformation behaviour of different soils.

【Grading】Grading Policy:Final exam(70%), Midterm exams and assigned homeworks(30%)

【Course Goals】After undergoing this course, the student gains adequate knowledge on engineering properties of soil.

Course objective is to provide a fundamental understanding of mechanical behavior of soil materials, including soil classification, compaction, permeability, consolidation, and strength.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Introductory concepts:Understand the principles of soil behavior and the fundamentals of geotechnical practices in soils.
Geo-disaster, Geo-engineering ethics	1	Understanding of the geological disasters with soil. Understand geoengineering ethics
Soil classification and compaction	2.5	Understand the geology of soils, soil classification system, fundamental properties, effective stress, compaction, unsaturated soil and frozen soil
Water flow through soil	3	Understand the permeability and Darcy's law, quick sand condition, seepage and flow nets.
Midterm exam	0.5	
Consolidation and settlement	3	Understand Terzaghi's one dimensional consolidation theory, the total and effective stress distribution in soil.
Shear Strength of soil	3	Understand shear strength of cohesive and cohesionless soil, Mohr-coulomb failure theory, drained and undrained behavior of clay and sand

【Textbook】Text book: Fusao Oka, "Soil Mechanics", Asakura publishing Co., Ltd .

【Textbook(supplemental)】Fusao Oka, "Soil Mechanics Exercises", Asakura publishing Co., Ltd .

【Prerequisite(s)】The course is designed for students in any major;an earth science background is not required.

【Web Sites】

【Additional Information】Oka, Kimoto, Shiotani & Mimura: Contact Information will be delivered in their first lecture Katsumi & Inui: Visit their office in Yoshida Campus directly

30130

Hydraulics and Exercises

水理学及び演習

【Code】30130 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese

【Instructor】Gotoh(H), Hosoda, Kishida, Sanjo, Harada, <DPRI>Kawaike, <DPRI>Yoneyama

【Course Description】Hydrodynamics being fundamental of design for hydraulic structure is explained systematically in relation to fluid dynamics. Fluid statics, elementary fluid dynamics, viscous flow and turbulence, dimension analysis, and steady flow related to pipe flow and open channel are main topics. Systematic understanding of fundamental hydraulics through exercises are cultivated.

【Grading】Based on the results of examinations

【Course Goals】Systematic understanding of fundamental hydraulics through exercises

【Course Topics】

Theme	Class number of times	Description
Fluid Statics, Buoyancy, Flotation Stability	3	Hydrostatic pressure, buoyancy force, stability of floating body are explained and their exercises are implemented.
Elementary Fluid Dynamics	5	Continuum dynamics, control volume method, continuum equation, momentum equation and one-deimensional analysis are explained and their exercises are implemented.
Potential Flows	2	Bernoulli's theorem and two-dimensiional irrotational flow is explained and their exercises are implemented.
Viscous Flow and Turbulence	2	Deformation stress, Navier Stokes equation, shear stress for laminar flow and frictional loss, laminar and turbulent flow and velocity distribution of turbulent flow are explained.
Comprehensive Exercise	4	Comprehension check regarding to each term is implemented.
Intermediate examination	1	Intermediate examination is carried out.
Dimensional Analysis, Similitude	1	Dimensional analysis, pi-theorem and similarity rule are explained and their exercises are implemented.
Viscous Flow in Pipes	4	Energy equation, frictional law, form drag loss, siphon and pipe flow are explained and their exercises are implemented.
Open-Channel Flow	7	Energy equation, momentum equation, open channel equation, specific energy, specific force, hydraulic jump and analysis of gradually varied flow are explained and their exercises are implemented.
Achievement confirmation	1	Comprehension check of course contents.

【Textbook】It is announced in the first lecture. Handout is used in the Lectures related on open-channel flow and exercise.

【Textbook(supplemental)】Non

【Prerequisite(s)】Differential and integral calculus, linear algebra etc., standard mathematics of general education course

【Web Sites】Non

【Additional Information】Lecture is opened along with exercise. How to get in touch with instructors is announced during lecture and exercise.

20510

Engineering Mathematics B1

工業数学 B1

【Code】20510 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Yoshikawa

【Course Description】The course introduces theory of complex functions and its applications.

【Grading】Term-end examination and attendance.

【Course Goals】To understand the properties of regular function. To learn Taylor expansion and Laurent expansion. To calculate residues. To learn some applications for engineering.

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Definition of complex numbers, complex plane and review of vector analysis
Basic theory of complex functions	8	Derivative of complex functions. Cauchy-Riemann equations. Concept and properties of regular functions. Cauchy's integral theorem. Cauchy's integral formula. Taylor series and Laurent series. Classification of singularities. Residue theorem. Various complex functions and their properties.
Application of theory of complex functions	4	Application of residue theorem to calculation of definite integrals. Multivalued functions.
Learning achievement test	1	Learning achievement test.

【Textbook】None.

【Textbook(supplemental)】Useful material is introduded during the lecture.

【Prerequisite(s)】Basic Calculus (From the university curriculum: Calculus A and B, Advanced Calculus A).

【Web Sites】

【Additional Information】

30080

Structural Mechanics I and Exercises

構造力学 I 及び演習

【Code】30080 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】The following topics are covered: external forces exerted on structures; properties of forces; sectional forces; stress; strain and displacement/deformation; cross sectional properties; relationship between stress and strain; computation of displacement; buckling of column. Statically determinate structures are to be focused on.

【Grading】Grade is given based on the final examination, mid-term examination and reports.

【Course Goals】To understand the methods for studying structures at static equilibrium conditions; to understand stress and strain, and the relationship between them; to understand the buckling phenomenon in columns.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Structures and elements Purpose and application scope of structural mechanics Assumptions Examples related to engineer's ethics
Properties of forces	1	External forces Modeling of external forces Force equilibrium conditions Static determinate, static indeterminate and unstability
Sectional forces	9	Equilibrium of free body Sectional forces Sectional forces on differential portion Axial force Flexural moment and shear force Torsion moment Influence lines
Stress	2	Stress: force per unit area Stresses and coordinate system
Displacement and deformation	5	Displacement Deformation Strain Curvature and torsional ratio
Sectional properties	2	Geometrical moment of area Moment of inertia of area
Stress and strain	2	Hooke ’ s Law Sectional force and deformation Sectional modulus
Calculation of displacement	4	Element in tension/compression Deflection of beam Deflection of truss Statically determinate and indeterminate structures
Buckling of column	2	Buckling phenomenon Euler ’ s buckling load Eccentrically compressive column
Confirmation of the attainment level of learning	2	Confirm the attainment level of learning

【Textbook】To be informed by individual lecturer in his/her first lecture

【Textbook(supplemental)】To be announced by individual lecturer in his/her first lecture

【Prerequisite(s)】calculus A and B

【Web Sites】

【Additional Information】There are five classes which will be taken in the meantime by corresponding teacher. Office hour (contact information and consultation hours) of the individual lecturer will be given in his/her first lecture.

31320

Fundamental Environmental Engineering I

基礎環境工学 I

【Code】31320 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	3	
	3	
	3	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31350

Geophysical Prospecting

物理探査学

【Code】31350 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Hitoshi Mikada, Katsuaki Koike, Tada-nori Goto

【Course Description】Geo-exploration principles, data acquisition, data processing, and interpretation methodologies for earth's surface down to deep are explained in this lecture. Applications of such geo-exploration technologies are introduced in terms of energy, earth resources, geo-environment, geotechniques, civil engineering areas.

【Grading】Merit rating based on the result of paper-test. The attendance to a series of lectures is considered for the final rating (Attendance was rated 40% of the final in 2012). Each lecturer will their policy during the lectures.

【Course Goals】The final goal of the lectures is to deepen the understanding of geoelectromagnetics, seismology, geochemistry, and petrophysics that are used in geo-exploration.

【Course Topics】

Theme	Class number of times	Description
Geoelectromagnetics and geo-exploration	5	Geoelectromagnetic exploration technologies will be explained. The understanding of the fundamentals of survey methods and targeted physical properties with their physical meanings are the major objective of the lectures.
Seismology and geo-exploration	6	The fundamental theories of seismology with application to geo-exploration are given. The understanding of physical meaning of parameters derived from seismological methods are aimed.
Geochemical exploration and remote sensing	3	Geochemical properties of earth's crust, mantle and core, and the fundamentals of geochemical measurements for the exploration of metal mines and energy resources are given first. Then the interactions between materials and electromagnetic waves, the fundamental principle of optical sensors and synthetic aperture radars, data processing of remote sensing images, topographic interpretation, resources exploration, and geoenvironmental modeling are briefly explained.
Performance evaluation	1	The understanding of enrolled students is checked.

【Textbook】No textbook particular.

【Textbook(supplemental)】K. Sassa, Y. Ashida, and T. Sugano, itGeo-exploration for construction and disaster mitigation engineers, Morikita Publ.,
Japan Remote Sensing Society, itRemote sensing for beginners, Rikoh Publ., .

【Prerequisite(s)】Physics, chemistry of the level of the general education of universities.

【Web Sites】Could be provided in the course.

【Additional Information】Merit rating policies are explained by every lecturer.

35040

Fundamental Mechanics

Fundamental Mechanics

【Code】35040 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】An

【Course Description】Newtonian mechanics and its application to engineering are interpreted with concentration on single particle, multi-partical system and rigid body. Especially,some mathematical approaches necessary for mechanics are introduced based on those mathematical knowledge learned in the first academic year. Meanwhile, the relationship between mechanical interpretation and mathematical treatment of some classical problems are specifically emphasized. Study of this lecture would not only make the students grasp basic principles of mechanics but also think more logically and systematically.

【Grading】Grade is evaluated based on the final examination mid-term examination and assignments.

【Course Goals】As an intermediate course in mechanics at undergraduate level, this course aims at training students to think about mechanical phenomena in mathematical terms, developing an intuition for the precise mathematical formulation of mechanical problems and for the mechanical interpretation of the mathematical solutions.

【Course Topics】

Theme	Class number of times	Description
Kinematics of a single particle in space	2	algebra and calculus of vectors tangent and normal vectors to a curve definition of velocity and acceleration in 2-D motion by plane polar coordinates definition of velocity and acceleration in 3-D motion by cylindrical polar coordinates and spherical polar coordiantes
laws of motion	3	Newton's laws of motion discussion of the general problem of 1-D motion linear differential equations with constant coefficient linear oscillations,resonance,principle of superposition discussion of the general problem of 2-D and 3-D motion
Problems in particle dynamics	1	the Law of Gravitation center of mass and center of gravity motion through a resisting medium constrained motion
energy conservation	2	energy theorems definition of potential energy, conservative force conservation of mechanical energy in 3-D conservative field energy conservation in constrained motion
motion of a system of particles	2	degrees of freedom, energy principle linear momentum principle, conservation of linear momentum, collision theory and two-body scattering angular momentum principle, conservation of angular momentum
Rotating reference frames	1	transformation formulae particle dynamics in a non-frame motion relative to the Earth multi-particle system in a non-inertial frame
motion of rigid body	2	dynamical problem of the motion of a rigid body rotation about an axis statics of rigid bodies statics of structures equilibrium of flexible strings and cables equilibrium of solid beams angular momentum of a rigid body inerital and stress tensors
foundation of analytical mechanics	1	Constraint condition,constraint force, generalized coordinate, generalized for, Lagrange's equations
confirmation of achievement	1	The achievement assessment is intended to measure students' knowlege, skill and aptitude on the subject using quiz and viva-voce.

【Textbook】R.DOUGLAS GREGORY: Classical Mechanics, Cambridge University Press, 2006

【Textbook(supplemental)】Keith R.Symon: Mechanics, Third Edition, Addision-Wesley, 1971

Fedinand P.Beer, E.Russell Johnston, etc.: Mechanics for Engineers, Dynamics, McGraw Hill, 2007

【Prerequisite(s)】calculus A and B, Linear Algebra A and B

【Web Sites】

【Additional Information】

35050

Probabilistic and Statistical Analysis and Exercises

Probabilistic and Statistical Analysis and Exercises

【Code】35050 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】Qureshi

【Course Description】Theory and methodology of probabilistic and statistical analysis is introduced as a basic tool to cope with uncertainty in natural and social systems dealt with in global engineering. The main topics are concepts and basic theorems of probability, probability distributions and their uses, statistical estimation and testing, and multivariate analysis.

【Grading】Grading is done based on the marks in regular examination. Performance in classes and exercises, marks in quiz and mid-term exams are also taken into account. Minimum passing grade is sixty percent (60%).

【Course Goals】The goal is to understand fundamental theory of probability and to be capable of using well-known distributions in analysis and design. It is also required that students acquire knowledge of fundamentals of statistical population and samples, and principle of statistical estimation and testing.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Role of probabilistic and statistical approaches in global engineering and in other engineering fields.
Basic theory of probabilistic analysis	4	The concepts and basic theories of probability: Conditional probability, Bayes' theorem and total probability. Random variables: probability mass function (PMF), probability density function (PDF), cumulative distribution function (CDF), moment generating function, characteristic function, multidimensional probability distribution, transform of random variables.
Probability distribution models	4	Probability distributions often used in global engineering are introduced: Bernoulli series and binomial distribution, Poisson series and distribution, normal distribution, geometric distribution (return period), etc.
Statistical estimation and testing	3	Basic theory on sampling. Chi-square distribution, t- distribution, and F-distribution. Methods for statistical estimation and testing.
Multivariate analysis	2	Basic methods in multivariate analysis: regression analysis and principal component analysis.
Computer-based simulation methods in probability	1	Introduction to the computer-based simulation methods such as Monte-Carlo simulation, will be given.

【Textbook】

【Textbook(supplemental)】A.H.S. Ang and W.H. Tang: Probability Concepts in Engineering: Emphasis on Applications in Civil and Environmental Engineering.

【Prerequisite(s)】Prerequisite courses are calculus and linear algebra.

【Web Sites】

【Additional Information】Office hours will be allocated for students to consult with the instructor and ask relevant questions as needed.

35060

Design for Infrastructure I

Design for Infrastructure I

【Code】35060 【Course Year】2nd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】English

【Instructor】J. Kiyono, N. Uno, T. Shiotani, H. Shimamoto, and Y. Tachikawa

【Course Description】Civil Engineering is the study which provides the essential technology and knowledge to improve social infrastructures. Various science, technology and knowledge are required in order to realize "convenient and comfortable cities", "safe countries to live in", "eco-friendly global society" and "sustainable civilization based on resources and energy". As an introduction to learn Civil Engineering, this course explains the essence of Civil Engineering from four fields in Civil Engineering (Structural Engineering, Hydraulics and Hydrology, Geotechnical Engineering and Planning and Management). Throughout the lectures and exercises including visiting lecturers, it is expected to learn the essence of Civil Engineering and the ethic of the engineering.

【Grading】The score is evaluated comprehensively from reports for each lecture (including presence point) and the final examination. The full score is 100 marks which consists of 50 marks from reports and 50 marks from the final examination.

【Course Goals】To understand that Civil Engineering is the organization of the technology and knowledge related to social capital improvement, prevention or mitigation of disaster and creation of environment.

【Course Topics】

Theme	Class number of times	Description
Introduction to Civil Engineering	2	The content of the course is introduced. Then, the study field of Civil Engineering including latest topics and the ethic of Civil Engineers throughout the achievement of predecessors is introduced.
Structual Enginnering	3	Civil Engineering is introduced in the viewpoint of Structural Engineering, which includes natural disasters and structural engineering, introduction of new technology and research, the collaboration with other fields, etc.
Hydraulics and Hydrology	3	Civil Engineering is introduced in the viewpoint of Hydraulics and Hydrology, which includes conservation and construction of river environment, prediction of rainfall and flood, prediction of environmental change, global warming etc.
Geotechnical Engineering	3	Civil Engineering is introduced in the view point of geotechnical Engineering, which includes soil mechanics, soil environment, international cooperation, etc.
Planning and Management	3	Civil Engineering is introduced in the view point of designing and managing social Infrastructure, which includes an asset management of social infrastructure, soft measures for traffic jam, logistic vehicles in urban area, etc.
Achievement confirmation	1	Achievement assement is intended to measure students' knowledge, skill and aptitude on the subject.

【Textbook】Handouts will be distributed as appropriate.

【Textbook(supplemental)】

【Prerequisite(s)】No specific prior knowledge is required.

【Web Sites】

【Additional Information】

35070

Systems Analysis and Exercises for Planning and Management

Systems Analysis and Exercises for Planning and Management

【Code】35070 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】Schmcker

【Course Description】Attendants of this course should already have a basic knowledge about planning of civil engineering projects. In this course students will learn about this subject in a more systematic way. Students will be introduced to policy-making, management and planning and in particular to useful mathematical tools for doing so. They will gain a deeper understanding of linear, nonlinear and dynamic programming. This is achieved through lectures, and practical exercises with these methods.

【Grading】Report 40%; Exam 60%

【Course Goals】This course aims to provide students with the basic knowledge required for planning of civil engineering projects and to provide an understanding of basic planning theory and its role. The focus is on mathematical planning methods for system design. By attending this lecture students should obtain the basic knowledge and thinking of planners. Further, students should understand the importance of the above mentioned three programming methods as useful mathematical tools for creating plans. Finally students should obtain practical skills through exercises.

【Course Topics】

Theme	Class number of times	Description
Basic Theory of Civil Engineering Planning (CEP)	2	These lectures provide a basic overview of CEP and teach about the science underpinning CEP. Therefore lectures introduce the students to the role of OR, economics, psychology, sociology and political science in CEP.
Linear programming (LP)	5	Lectures about LP as basic method for mathmatecial planning. Various issues of LP are discussed and in particular the Gauss Jordan Elimination Method and the Simplex methods are taught. Further the dual problem, marginal value and sensitivity analysis are introduced.
Non linear programming (NLP)	5	NLP formulation of problems, global optimality, and description as programming problem. Optimality conditions of nonlinear programming problems (Lagrange function, Kuhn Tucker conditions) are examined.
Dynamic programming (DP)	3	These lectures will introduce DP as a useful tool to solve complex systems. Formulation and solution of DP problems are discussed. Further, PERT as DP network method is introduced, describing process management based on arrow diagrams.

【Textbook】Handouts distributed during lectures

【Textbook(supplemental)】Hillier,F.S. Lieberman,G.J.: Introduction to Operations Research
Iida, Y.: Civil Engineering Planning System Analysis (Optimization Guide)
Iida, Y./ Okada, N.: Civil Engineering Planning System Analysis (Behaviour Analysis)
Fujii, S.: Infrastructure planning studies

【Prerequisite(s)】Students are assumed to have taken the calculus courses.

【Web Sites】Presented during the first lecture.

【Additional Information】

35080

Soil Mechanics I and Exercises

Soil Mechanics I and Exercises

【Code】35080 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】Tamrakar・Flores

【Course Description】The student is expected to learn: the basics of soil formation, classification for engineering purposes, soil compaction, soil water and water flow, consolidation theory, problems on final and rate of consolidation, the fundamentals of shear strength and deformation behavior of different soils.

【Grading】Grading Policy : Final exam (70%), Midterm exams and assigned homeworks (30%)

【Course Goals】After undersgoing this course, the student gains adquate knowledge on engineering properties of soil. Course objective is to provide a fundamental understanding of mechanical behavior of soil materials, including soil classification, compaction, permeability, consolidation, and strength.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Introductory concepts : Understand the principles of soil behavior and the fundamentals of geotechnical practices in soils.
Geo-disaster, Geo-engineering ethics	1	Understanding of geological disasters with soil. Understand geoengineering ethics.
Soil classification and compaction	2.5	Understand the geology of soils, soil classification system, fundamental properties, effective stress, compaction, unsaturated soil and frozen soil.
Water flow through soil	3	Understand the permeability and Darcy's law, quick sand condition, seepage and flow nets.
Midterm Exam	0.5	
Consolidation and settlement	3	Understand Terzaghi's one dimensional consolidation theory, the total and effective stress distribution in soil.
Shear Strength of soil	3	Understand shear strength of cohesive and cohesionless soil, Mohr-coulomb failure theory, drained and undrained behavior of clay and sand
Evaluation of understanding of the course materials	1	Evaluating the students understanding of the course materials.

【Textbook】TBA

【Textbook(supplemental)】Fusao Oka, "Soil Mechanics Exercises", Asakura publishing Co. Ltd.

【Prerequisite(s)】

【Web Sites】

【Additional Information】TBA

35090

Hydraulics and Exercises

Hydraulics and Exercises

【Code】35090 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】Gotoh(H), Hosoda, Khayyer, Puay

【Course Description】Hydrodynamics being fundamental of design for hydraulic structure is explained systematically in relation to fluid dynamics. Fluid statics, elementary fluid dynamics, viscous flow and turbulence, dimension analysis, and steady flow related to pipe flow and open channel are main topics. Systematic understanding of fundamental hydraulics through exercises are cultivated.

【Grading】Based on the results of examinations

【Course Goals】Systematic understanding of fundamental hydraulics through exercises

【Course Topics】

Theme	Class number of times	Description
Fluid Statics, Buoyancy, Flotation Stability	3	Hydrostatic pressure, buoyancy force, stability of floating body are explained and their exercises are implemented.
Elementary Fluid Dynamics	5	Continuum dynamics, control volume method, continuum equation, momentum equation and one-deimensional analysis are explained and their exercises are implemented.
Potential Flows	2	Bernoulli's theorem and two-dimensiional irrotational flow is explained and their exercises are implemented.
Viscous Flow and Turbulence	2	Deformation stress, Navier Stokes equation, shear stress for laminar flow and frictional loss, laminar and turbulent flow and velocity distribution of turbulent flow are explained.
Comprehensive Exercise	4	Comprehension check regarding to each term is implemented.
Intermediate examination	1	Intermediate examination is carried out.
Dimensional Analysis, Similitude	1	Dimensional analysis, pi-theorem and similarity rule are explained and their exercises are implemented.
Viscous Flow in Pipes	4	Energy equation, frictional law, form drag loss, siphon and pipe flow are explained and their exercises are implemented.
Open-Channel Flow	7	Energy equation, momentum equation, open channel equation, specific energy, specific force, hydraulic jump and analysis of gradually varied flow are explained and their exercises are implemented.
Achievement confirmation	1	Comprehension check of course contents.

【Textbook】It is announced in the first lecture. Handout is used in the Lectures related on open-channel flow and exercise.

【Textbook(supplemental)】Non

【Prerequisite(s)】Differential and integral calculus, linear algebra etc., standard mathematics of general education course

【Web Sites】Non

【Additional Information】Lecture is opened along with exercise. How to get in touch with instructors is announced during lecture and exercise.

35100

Engineering Mathmatics B1

Engineering Mathmatics B1

【Code】35100 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】Qureshi

【Course Description】The course introduces the theory of complex functions and their applications.

【Grading】Class participation, quiz, mid-term and end of term examination.

【Course Goals】To understand the properties of holomorphic functions. To learn Taylor and Laurent series' expansion. To calculate the residue and to learn the engineering applications of complex function theory.

【Course Topics】

Theme	Class number of times	Description
Review	2	Definition of complex numbers, complex plane and review of vector analysis.
Basic theory of complex functions	8	Derivative of complex functions, Cauchy-Riemann equation. Concept and properties of holomorphic functions. Cauchy's integral theorem, Cauchy's integral formula, Taylor series and Laurent series. Classification of singularities. Residue theorem. Various complex functions and their properties.
Application of theory of complex functions	5	Application of residue theorem to calculate the definite integral. Deviation principle and its application. Solution of boundary value problems of partial differential equations.

【Textbook】

【Textbook(supplemental)】Materials given during the lecture.

【Prerequisite(s)】Basic Calculus (From the university curriculum: Calculus A and B, Advanced Calculus A)

【Web Sites】

【Additional Information】Office hours will be allocated for students to consult with the instructor and ask relevant questions as needed.

35110

Structural Mechanics I and Exercises

Structural Mechanics I and Exercises

【Code】35110 【Course Year】2nd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】 【Lecture Form(s)】 【Language】English 【Instructor】An

【Course Description】The following topics are covered: external forces acted upon structures; properties of forces; sectional forces; stress and strain; displacement/deformation; cross sectional properties; calculation of displacement; buckling of column. Statically determinate structures are to be focused on.

【Grading】Grade is given based on the final examination, mid-term examination and assignments.

【Course Goals】To grasp the methods for studying structures at static equilibrium conditions; to understand stress and strain, and the relationship between them; to understand the buckling phenomenon in columns.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Structures and elements Purpose and application scope of structural mechanics Assumptions
Forces	1	External forces Modeling of external forces Force equilibrium conditions Static determinate, static indeterminate and unstability
Sectional forces	9	Equilibrium of free body Sectional forces Axial force Flexural moment and shear force Torsion moment Influence lines
2	2	Stress: force per unit area stress and coordinate system
Displacement and deformation	5	Displacement Deformation Strain Curvature and torsional ratio
Sectional properties	2	Geometrical moment of area Moment of inertia of area
Stress and strain	2	Hooke’s Law Sectional force and deformation Sectional modulus
Calculation of displacement	4	Element in tension/compression Deflection of beam Deflection of truss Statically determinate and indeterminate structures
Buckling of column	2	Buckling phenomenon Euler’s buckling load Eccentrically compressive column
confirmation of achievement	2	confirmation of achievement

【Textbook】Text books will be informed at the first lecture.

【Textbook(supplemental)】To be announced at the first lecture

【Prerequisite(s)】Classical mechanics

【Web Sites】

【Additional Information】

Dynamics of Soil and Structures

波動・振動学

【Code】31110 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Kiyono, Igarashi

【Course Description】This course deals with fundamentals and application of vibration theory and elastic wave propagation in civil engineering.

【Grading】Based on the performance during the course (including homework) and the results of a final examination.

【Course Goals】At the end of this course, students will be required to have a good understanding of:

- Vibration phenomena, response to dynamic loads, fundamental principle of vibration measurement, including manipulation of mathematical manipulation and calculation
- Treatment of vibration problems for multi-degree-of-freedom systems and elastic media
- Fundamental properties of elastic waves that propagate in elastic media and layers

【Course Topics】

Theme	Class number of times	Description
Vibration of structures and equation of motion	1	Vibration phenomena encountered in civil engineering structures. Impotance and engineering issues of vibration. Derivation of equation of motion.
Free vibration	1	Definition of the natural period and damping ratio for single degree-of-freedom systems. Derivation of free vibration response.
Force vibration	1	Resonance curves and phase response curves for forced harmonic vibration. Frequency response characteristics.
Principle of vibration measurement	1	Background theory of vibration measurement. Accelerometers and seismometers.
Response to arbitrary input	2	Evaluation of dynamic response to arbitrary forcing and earthquake excitation. Response spectra.
Nonlinear vibration	1	Fundamental properties of nonlinear dynamic response of structures associated with elasto-plastic behavior.
Vibration of 2-DOF systems	1	Solution of equations of motions for 2-degree-of-freedom systems representing free vibration. Concept of normal vibration modes.
Natural frequencies and natural modes of vibration	1	Relationship between the natural frequencies, normal vibration modes of multi-degree-of-freedom systems and eigenvalue analysis.
Damped free vibration of MDOF systems	1	Vibration of multi-degree-of-freedom systems with damping. Analysis of MDOF systems using damping using normal vibration modes.
Forced vibration and response to arbitrary input for MDOF systems	1	Modal analysis to evaluate the dyanmic response of multi-degree-of-freedom systems for harmonic and arbitrary excitation.
Vibration of continuum	1	Vibration of shear beams. Flexural vibration. Wave equation. Solution of shear vibration problem.
Elastic wave	2	Properties of elastic waves travelling in elastic media and elastic layers. Fundamental concept in deriving solutions of elastic wave propagation problems.
Achievement evaluation	1	Students' achievements in understanding of the course material are evaluated.

【Textbook】Not used; Class hand-outs are distributed when necessary.

【Textbook(supplemental)】

【Prerequisite(s)】Calculus, Linear algebra, Structural Mechanics I and Exercises (30080), Structural Mechanics II and Exercises (30110)

【Web Sites】

【Additional Information】Office hours are not specified; Questions to instructors are accepted by appointment

31400

Atmospheric and Global Environmental Engineering

大気・地球環境工学

【Code】31400 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	1	
	1	
	1	
	1	
	1	
	1	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

32000

Fundamental Theory of Elasticity and Stress Analysis

弾性体の力学解析

【Code】32000 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】4
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese
【Instructor】Assoc. Prof. Tsukada & Assoc. Prof. Murata
【Course Description】Stress, strain, displacement and basic equations in linear elasticity are first lectured, and then Airy's stress function and its application to solve two dimensional problems in linear elasticity are explained. Moreover, energy theorems and their application to a numerical stress analysis method are explained.
【Grading】Several Exercises are presented in the term. Midterm exam and final exam are also presented. Grade is evaluted by the sum of the exercieses and the exams. The weight for grading is 30% and 70% respectively.
【Course Goals】One objective of this course is to master the basis in linera elasticity to solve the problems analitically and numerically. Another one is to obtain the basic knowledge for the programing a numerical stress analysis method such asFEM and BEM.
【Course Topics】

Theme	Class number of times	Description
Stress, strain and displacement	2	Introduction of linear elasticity containing its history is first presented, and then stress, strain, displacement, equations between them, principal stress and strain, Mohr's circle of stress and strain, and etc. are lectured.
Basic equations of linear elasticity and boundary condition	2	Basic equations of linear elasticity in Cartesian coordinate system and polar coordinate system are presented, and then the methods to solve the equations are lectured.
Airy's stress function and solution of 2D problem of elasticity	5	Airy's stress function that is a biharmonic function is presented for Cartesian coordinate system and polar coordinate system, and a method to obtain the stress and displacement in a two dimensional elastic body using Airy's stress function is lecured.
Energy theorems in elasticity and solution of boundary value problem	3	Strain energy function, principle of virtual work, and principle of minimum potential energy are lectured, and then the relation between basic equations in linear elasticity and these energy princile is lectured. Moreover the method to solve a boundary value problem in linear elasticity based on the energy theorems is explained.
Numerical stress analysis	2	Overview of FEM, FDM and BEM is presented, and then formulation of FEM using the energy theorems is explained. Moreover some examples of stress analysis using FEM and BEM are shown.
Learning achievement check	1	Students are asked to solve several problems teached in this class and cheked their learning achievement.

【Textbook】Not specified.
【Textbook(supplemental)】Shigeo Takezono et al., Introduction of Mechanics of elasticity-from basic theory to numerical analysis-, Morikita Publishing Co., ISBN:978-4-627-66641-2
【Prerequisite(s)】Differential calculus, integral calculus, and linear algebra are necessary for taking this course.
【Web Sites】This course does not have a web site. But some lecture documents may be deribered by the net. The URL to download the lecture documents will be announced in the class.
【Additional Information】Additional information is presented in the first class of each teacher.

30240

Construction Materials

材料学

【Code】30240 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】Knowledge and techniques to use construction structural materials from micro-structures to macro-structures are introduced.

【Grading】Evaluate considering the scores of final examination and the submitted reports.

【Course Goals】The student will understand the properties, production and testing methods of concrete, steel, composite materials etc. In addition, the student will understand the way of thinking for construction materials.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Classification of materials, history of construction materials, ethics for civil engineers and current topics are introduced
Basic structure	1	Bond between atoms, ideal strength, dislocation, yield, and mechanical properties are introduced.
Metallic materials	1	Metallic material, iron, blast furnace, refine, steel, transformation, heat treatment and metallic new materials are introduced.
Corrosion & protection	1	Corrosion and corrosion protection of metals are explained.
Polymer materials	1	Resin, rubber, fiber, polymer concrete and organic new materials are explained.
Cement	1	Types of cements, chemical composition, chemical compound, hydration, hydration heat and blended cement are introduced.
Admixture	1	Chemical admixture, water-reducing admixture, air-entraining admixture, mineral admixture, pozzolanic reaction, latent hydraulic property and high-range admixture are introduced.
Aggregate, mixing water and fresh concrete	1	Aggregate, mixing water and fresh concrete (workability, rheology, consistency, segregation) are explained.
Mechanical properties of concrete	1	The water cement ratio, compressive strength, flexural strength, tensile strength and toughness are introduced.
Durability of concrete	1	Durability, alkali-silica-reaction, shrinkage are introduced.
Corrosion of reinforcing steel	1	Corrosion of reinforcing steel, carbonation, chloride induced corrosion are introduced.
Mix design of concrete	1	Mix desig of concrete is explained.
HIgh performance concrete and reinforcement	1	High performance concrete and special reinforcement are introduced.
Non-destructive testing method	1	Surface hardness, ultrasonic pulse, elastic wave, thermography, half cell potential and polarization resistance are explained.
Understanding check	1	Students' understanding of construction materials is checked.

【Textbook】Toyoaki Miyagawa and Keitetsu Rokugo: Construction materials, Asakura ltd (in Japanese)

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30530

Water Quality

水質学

【Code】30530 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31650

Fluid Mechanics

流体力学

【Code】31650 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31410

Environmental Engineering, Laboratory I

環境工学実験 1

【Code】31410 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】3

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	5	
	6	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31640

Structural Mechanics II and Exercises

構造力学 II 及び演習

【Code】31640 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】3

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】Fundamentals of structural analysis based on energy principle

Principle of virtual work and some energy principles for structural analysis

Approaches for study of statically indeterminate structures

Fundamentals of elastic stability

Fundamentals of structural analysis by matrix methods

【Grading】Grade is given based on the final examination, mid-term examination and reports.

【Course Goals】To solve structures such as truss and beam by the principle of virtual work/energy principles

To solve statically indeterminate structures by force method and displacement method

To understand the stability of equilibrium

to get the stiffness matrix of simple trusses

【Course Topics】

Theme	Class number of times	Description
Work, energy and virtual work	13	Introduction Work, virtual work and energy Castigliano’s theorems and principle of minimum potential energy Virtual work and complementary virtual work Principle of virtual work (virtual displacement) Principle of complementary virtual work(virtual force) Reciprocal theorems
Static determinate and indeterminate	1	Degree of freedom and degree of indeterminacy
Solutions to statically indeterminate structures	6	Introduction of force method and displacement method By equations of elasticity By displacement method
Structural stability	3	Stability criteria Deformation of rigid body-elastic spring system Deformation of elastic beam- column system
Basis of matrix method of structural analysis	4	Matrix adapted to equilibrium equations/displacement conditions Analysis of plane truss
Structral analysis engineer's ethics	1	Examples on structral analysis engineer's ethics related to safety of structure analyses such as application scope, precision of analysis and reliability of structural analysis
Confirmation of the attainment level of learning	2	Confirm the attainment level of learning

【Textbook】To be informed by individual lecturer in charge in his/her first lecture

【Textbook(supplemental)】M. Matsumoto, E. Watanabe, H. Shirato, K. Sugiura, A. Igarashi, T. Utsunomiya, Y. Takahashi: Structure mechanics Ⅱ, Maruzen Ltd.

【Prerequisite(s)】calculus A and B, Linear Algebra A and B, Structure mechanics Ⅰ and Exercises

【Web Sites】

【Additional Information】There are four classes which will be taken in the meantime by corresponding teacher. Office hour (contact information and consultation hours) of the individual lecturer will be given in his/her first lecture.

31390

Fundamental Environmental Engineering II

基礎環境工学 II

【Code】31390 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	3	
	3	
	3	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31360

Hydraulics and Hydrodynamics

水理水工学

【Code】31360 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Nakakita, Sanjou

【Course Description】Lecture of fundamental theories of fluid dynamics and applications to hydraulic engineerging

Basic equations, potential flow theory, boundary layer theory and turbulent flow Introduction of basic modelings about fluid motion and heat transfer in atmosphere related to hydrology and meteorology

【Grading】Attendance, reports and final examination

【Course Goals】Learning elementary knowledge of hydraulics and important topics of hydrodynamics science

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Academic history of hydraulics and fluid dynamics
Momentum equation and potential flow theory	2	Theories of perfect fluid and potential flow
Basic study of boundary layer theory	2	Appearance of boudary layer theory
Application of boundary layer theory	1	Application of boundary layer theory to hydraulic engineering
Fluid force	1	Lift force, drag force and shear stress
Introduction of turbulent flow	1	Introduction of turbulent flow
Hydrology and Meteorology	2	Vertical stability of atmosphere Generation process of rain fall Fundamental knowledge of atmospheric physics
Atmospheric boundary layer	2	Atmospheric boundary layer related to global warming problems Heat and momentum exchanges
Dynamics of rotational fluid	2	Generation theory of low pressure system
Achievement confirmation	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Hydraulics and Exercises

【Web Sites】

【Additional Information】

30570

Radiological Health Engineering

放射線衛生工学

【Code】30570 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	4	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31170

Continuum Mechanics

連続体の力学

【Code】31170 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese
【Instructor】Oka, F. and Hosoda, T.
【Course Description】Continuum Mechanics is a branch of the physical sciences concerned with the deformations and motions of continuous media under the influence of external effects.

The following basic items are explained with exercises: Fundamentals of tensor analysis, Mathematical formulation of srain, motion and stress, Conservation laws of continuous media (mass, momentum, angular momentum, energy consevation laws), Constitutive laws of elastic body and Newtonian fluids, Principle of vurtual work and minimum potential energy based on the calculus of variations, Finite Element Method, Applications in Elasticity and Fluid Dynamics.

【Grading】Regular examination (90 p.c.) and Midterm examination(10 p.c.)
【Course Goals】Based on the clear understanding of the mathematical formulation on deformation, stress and constitutive laws, students are requested to understand the derivation of the Equation of motion, Conservation laws of angular momentum and energy, certainly. Principle of vurtual work and minimum potential energy are attached inportance as the basis of Finit Element Method.
【Course Topics】

Theme	Class number of times	Description
Elementary knowledge on tensor analysis	2	Definition of tensors, Integral theorem, Material derivative over a material volume, Transformation of components of tensors, etc.
Stress, strain and strain rate tensors	3	Definition of stress, strain and strain rate tensors, Transformation of components of these tensor variables, Invariants under coordinates transformation, Compatibility condition of strain, etc.
Mathematical formulation of conservation laws	2	Mathematical expression of conservation laws of continuous media (mass, momentum, angular momentum, energy)
Constitutive law of solids and fluids	2	Constitutive laws of elastic & visco elastic body and Newton fluids
Principles based on the calculus of variations and FEM	2	Principle of vurtual work and minimum potential energy based on the calculus of variations, Finite Element Method, etc.
Applications in elasticity and fluid dynamics	3	Applications in Elasticity and Fluid Dynamics. Wave propergation in elastic body, Thermal convection and Lorentz Chaos etc.
Confirmation of understanding	1	Students are examined on the understanding of this subjet through a paper test.

【Textbook】Printed materials on the contents of this subjetc are distributed in class.
【Textbook(supplemental)】
【Prerequisite(s)】Basic understanding on differential and integral calculus and linear algebra
【Web Sites】
【Additional Information】Students can contact with Professors by sending e-mail to hosoda.takashi.4w@kyoto-u.ac.jp or visiting Hosoda's office (Katsura C1-3-265).

31080

Engineering Geology and Exercises

地質工学及び演習

【Code】31080 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】3

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】Koike/Mito/Yamada/Tsuji

【Course Description】The roles of Engineering Geology on construction and resource exploration/development, as well as survey/testing/measurements/evaluation will be lectured with exercises.

【Grading】by exercise reports and test.

【Course Goals】understanding of the roles of engineering geology.

【Course Topics】

Theme	Class number of times	Description
introduction	1	
geologic survey	3	
testing and evaluation	2	
structural analysis	1	
measurements of doscontinuities	1	
underground excavation	2	
resource exploration/development	3	
geostatics	1	
evaluation	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】Have to have taken 'Introduction to Earth Science'

【Web Sites】

【Additional Information】

31370

Coastal Environmental Engineering

海岸環境工学

【Code】31370 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Gotoh(H), Harada, Ikari

【Course Description】Fundamental items related to coastal engineering (i.e., coastal process, sediment transport, near shore current, shoaling, irregular wave, tsunami, storm surge, tidal wave, wave force)are to be lectured. Especially, sediment transport controlling physical environment significantly around coastal area is to be explained systematically together with river sediment transport.

【Grading】Based on the results of examinations

【Course Goals】Our goal is systematic understanding of fundamental hydraulic phenomena around coastal zone which is indispensable for designing coastal environment.

【Course Topics】

Theme	Class number of times	Description
Introduction to Coastal Engineering	1	Introduction to coastal engineering with focusing on beach deformation
Small Amplitude wave theory	2	Characteristics of small amplitude wave theory and its application are explained.
Wave Statistics / Wave Transformation	2	Developing process of wind wave and expression method of irregular waves are explained. Mechanics of wave transformation is outlined.
Wave Force on Coastal Structures	1	Several experimental formulae of wave force acting on coastal structures are introduced. Problems for stability of rubble mound is mentioned.
Design of Coastal Structures (Exercise)	1	Exercise of design of coastal structures.
Introduction to Computational Design of Coastal Structures	1	State-of-the-art numerical wave flume and its applications are explained.
Sediment Hydraulics	4	Sediment hydraulics (i.e., basic characteristics, calculation of river-bed, bed load and suspended load, non-equilibrium sediment transport) is explained.
Nearshore Current / Coastal Sediment Transport	1	Near-shore current due to wave deformation and resultant coastal sediment transport are outlined.
Tsunami and Storm Surge: Evacuation Planning under Coastal Disasters	1	Characteristics of tsunami and storm surge are explained. Additionally, evacuation process and evacuation planning are introduced.
Achievement confirmation	1	Comprehension check of course contents.

【Textbook】Handout is used in the lectures as needed.

【Textbook(supplemental)】Supplemental textbook is announced in the first lecture.

【Prerequisite(s)】It is desirable to study Hydraulics and Exercises.

【Web Sites】Non

【Additional Information】How to get in touch with instructors is announced in the first lecture.

Fundamentals of Hydrology

水文学基礎

【Code】30300 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese
【Instructor】M. Shiiba, K. Takara, Y. Tachikawa and S. Kim
【Course Description】The fundamental concept of hydrology is the hydrological cycle, which is various scale physical processes of water movements in the atmosphere, continents, and oceans. Solar energy and gravity forces play major roles for the hydrological cycle. Solar energy drives the dynamic processes of water vapor formation from oceans and continents, and transport of vapor in the atmosphere. The vapor changes to liquid and fall the the surface of the Earth as precipitation, then the flow of water on and under the Earth’s surface are driven by gravity. Hydrology is the study of the movement of water on and under the surface of the Earth and its applications to mitigate water-related disasters, develop water resources and preserve the environment. In the class, basic hydrological processes and numerical representations of the hydrological processes are described. Concepts of probability in hydrology is also explaned for the hydrological design.
【Grading】The score is evaluated comprehensively with a quiz for each lecture, reports and and the final examination.
【Course Goals】1) To understand basic equations of hydrological processes to phisically analyse the hydrologic phenomenon, and 2) based of the understanding of hydrological processes, to aquire the basis of hydrologic design and planning.
【Course Topics】

Theme	Class number of times	Description
The Hydrologic Cycle	0.5	The contents of the class is overviewed and the concept of the hydrological cycle is provided. The role of hydrology in the field of civil engineering is described.
Solar Radiation and Energy Balance of the Earth	1.5	Energy and water cycle driven by solar radiation is described. Land surface information obtained by satellite remote sensing is explained.
Precipitation	1	The mechanism of precipitation is described. A numerical rainfall prediction model and the mechanism of radar rainfall observation are described.
Evaporaion and Transpiration	2.5	The mechanism of water and energy cycle through evapotranspiration is described. Energy balance at land surface and the wind of boundary layer is introduced. Then, methods to measure the evapotranspiration is described.
Infiltration and Unsaturated	1.5	The mechanism of unsaturated flow and infiltration is described. The governing equation of unsaturated flow and the basic equations of the potential infiltration are explained.
Slope Runoff	2	The mechanism of rainfall-runoff in mountainous slope is explained. The kinematic wave equation is derived from the momentum equation of water flow, and then the analytical solutions of the kinematic wave model are provided. Rainfall-runoff modeling using the kinematic wave equation is explained.
Flood routing	1.5	The mechanism of flood routing is explained. Numerical representation method to represent channel network structure is introduced, then typical flow routing methods are described.
Rainfall-runoff Model	1.5	A physically-based rainfall-runoff model which consists of various hydrologic processes is described. Typical lumped hydrologic models are also introduced.
Frequency Analysis in Hydrology	2	Frequency analysis of hydrologic variables is introduced. To analyze the frequency and magnitude of extreme hydrologic variables, fitting of distribution functions, return period, and T-year hydrologic variable are explained. The methods to evaluate the fitting of distribution functions and uncertainty of the probabilistic hydrological variables are also described.
Achievement confirmation	1	Achievement assement is intended to measure students' knowledge, skill and aptitude on the subject.

【Textbook】
【Textbook(supplemental)】
【Prerequisite(s)】It is desiarable to study Hydraulics (2nd year) and probability and statistical analysis (2nd year)
【Web Sites】
【Additional Information】

31070

Soil Mechanics II and Exercises

土質力学 II 及び演習

【Code】31070 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】3 【Restriction】No Restriction 【Lecture Form(s)】【Language】Japanese 【Instructor】Ohtsu, Oka, Kimura, Iai, Nishiyama

【Course Description】The student is expected to learn:soil consolidation and stress distribution in soil media, shear strength of soil, lateral earth pressure-active and passive conditions, bearing capacity of shallow and deep foundations, stability of slope and soil dynamics.

【Grading】Grading Policy:Final exam(70%), Midterm exam and assigned homework(30%)

【Course Goals】The course objective is to provide an understanding of key engineering properties and mechanical behavior of soil materials including consolidation, shear deformation and strength properties, bearing capacity of foundations, stability of slopes and excavations, and dynamic properties of soil.

At the end of the course, students will be able to:

1.Understand the principles of strength and deformation behavior of different soils.

2.Understand and apply the fundamentals of soil mechanics and geotechnical compitation methods.

3.Understand the soil-structutes interaction.

【Course Topics】

Theme	Class number of times	Description
Consolidaton	2	Understand Terzaghi's theory of consolidation, laboratory consolidation test, field consolidation curve, normally consolidated condition and over consolidated condition, and problems on final and time rate of consolidation.
Stresses in ground	1	Understand stresses in the ground due to loading, soil strength and pressure distribution below foundation.
Shear derormation and shear strentgh	2	Understand measurement of shear strength and triaxial compression tests, strength parameters, drained and undrained behavior of clay and sand, and stress path for conventional triaxial test.
Theories of earth pressure	2	Understand the lateral earth pressure in active and passive states, Rankine's theory in cohesive and cohesionless soil, Coloumb's wedge theory with condition for critical failure plane, earth pressure on retaining walls of simple configurations.
Midterm exam	0.5	
Bearing capasity of foundation	1.5	Understand the definition of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure, and derivation of Terzaghi's general bearing capacity equation for continuous footing and basic numerical problems associated with it.
Slope stability	2	Understand the failure mechanisms of both infinite and finite slopes and methods of slope stability analysis.
Soil dynamics	2	Understand the nature of dynamic loads, mchanism of liquefaction and liquefaction parameters, and stress conditions on soil element under earthquake loading.
Infrastructure and ground	1	Understand the recent geoengineering projects and ethical responsibility for geoengineers.

【Textbook】Text book:Fusao Oka,"Soil Mechanics",Asakura publishing Co., Ltd .

【Textbook(supplemental)】Fusao Oka,"Soil Mechanics Exercises",Asakura publishing Co., Ltd .

【Prerequisite(s)】A required prerequisite is knowledge of soil mechanics. Soil mechanics I and Exercises(31620) would be helpful as a prerequisite.

【Web Sites】

【Additional Information】Contact Information Associate professor S.Nishiyama

Email:nisiyama@geotech.kuciv.kyoto-u.ac.jp

30590

Environmental Plant Engineering

環境装置工学

【Code】30590 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	2	
	2	
	3	
	2	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31380

Experiments on Soil Mechanics and Exercises

土質実験及び演習

【Code】31380 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Seminar and Exercise 【Language】Japanese
【Instructor】Inui, Kishida, Kimoto, Shiotani, Nishiyama, Mimura, Inazumi, Koyama, Takai, Higo, Goto, Tobita
【Course Description】The first aim of this course is to acquire laboratory and in situ testing methods to assess engineering properties of soil, which were taught in the soil mechanics course.
【Grading】Laboratory: Each student is expected to conduct the experiments to gain hands on experience.
Attendance: Full attendance to lecture and laboratories is compulsory.
Grading policy:Laboratory Report, 100% of the course grade.
【Course Goals】To help students in understanding the soil mechanics concepts given in the Soil Mechanics course with hands on experience.
To be able to carry out all soil mechanics fundamental experiments.
To collect, analyze and interpret experimental data.
To have a feeling of engineering properties of geomaterials.
【Course Topics】

Theme	Class number of times	Description
Introduction and Orientation	1	
Physical properties of soils	1	Structure of soil, Engineering classification of soils, Consistency Limits, Grain size distribution
Compaction Test	1	Laboratory compaction tests, Factors affecting compaction
Hydraulic Conductivity Test	2	Permeability and seepage, Darcy's law, Hydraulic gradient, Determination of hydraulic conductivity, Flow net analysis
Consolidation Test	1	Fundamentals of consolidation, Laboratory tests, Settlement-time relationship
Uniaxial compression test	1	Stress-strain and strength behavior of clays
Direct Shear Test	1	Mohr-Coulomb failure criterion, Laboratory tests for shear strength determination
sounding methods	0.5	N-values of standard penetration test and elastic wave exploration
Centrifuge model test	0.5	Experiments using the similarity law of centrifuge test
Computer Exercise and numerical analysis	2	Fundamentals of math and physics for geotechnical engineering
Special Lecture	1	Special lecture on soil mechanics
Exercise & Summary	2	Practical application of laboratory testing data

【Textbook】To be announced in the class.
【Textbook(supplemental)】
【Prerequisite(s)】Soil mechanics I and exercises(31620)
It is recommended to take soil mechanics II and exercises in parallel.
【Web Sites】
【Additional Information】Contact information will be announced in the orientation.

Physical Chemistry

物理化学

【Code】31660 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	4	
	4	
	2	
	2	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30440

Planning and Management of Social Systems

社会システム計画論

【Code】30440 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Yamori, Yokomatsu

【Course Description】The aim of “Planning and Management of Social Systems” is to provide the basic knowledge of infrastructure planning and management. In the first half of the class, the basic concepts and frameworks of typical mathematical models are explained. In the second half, theories in social science that includes social psychology and disaster information science are introduced. Furthermore, objectives and methods of social survey and the action research are instructed.

【Grading】On the presumption of sufficient attendance, 20% of score is valuated on reports and 80% on examination.

【Course Goals】It is targeted to understand roles of infrastructure planning and management, typical models for systems analysis, fundamental viewpoints of social science and methods of social survey.

【Course Topics】

Theme	Class number of times	Description
Guidance, Queuing theory	2	Fundamental structure of queuing system, Formulation and solution of M/M/S system
Marcov model	2	Marcov process, Transition probability matrix, Steady state
Time-series predicting model	1	Serial correlation, Auto-Regressive model, AutoRegressive-Moving Average model
Multivariate analysis	1	Principal component analysis, Quantification theory
Game theory	2	Strategic interdependency, Nash equilibrium, Mixed stratedy, Typical models
Infrastructure planning problem in social science	2	Introduction of social science, Social psychology and group dynamics, Collective decision making on infrastructure planning
Social survey	2	Objective and methods of social survey and the action research, Case examples
Ethnography and content analysis	2	A case study: Historical change of public image of civil engineering
Comprehension test	1	Comprehension test

【Textbook】Systems analysis for Infrastructure planning: phenomenal analysis, Morikita pub. (in Japanese)

【Textbook(supplemental)】Wordmap: Human science for disaster prevention and reduction science, Shinyosha pub. (in Japanese)

【Prerequisite(s)】Fundamental understanding of probability

【Web Sites】None

【Additional Information】Office-hours are not specified whereas the ways to make contact with teachers are informed in classes.

31730

Engineering Mathematics B2

工業数学 B2(土木工学コース)

【Code】31730 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Yoshikawa

【Course Description】This course deals with Fourier analysis and with the solution of partial differential equations as its application. It discusses Fourier series for periodic functions and its relation to integrable non-periodic functions. Once the student gets familiar with its characteristics, the course aims to develop the ability to apply Fourier analysis to various engineering problems. The lecture emphasises the relationship between the numerical analysis and today’s applications.

【Grading】Attendance, term-end exam.

【Course Goals】To get students acquainted with an understanding of Fourier series analysis and its basic concepts. Further, to get students familiar with the various types of partial differential equations and their applications.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	What is Fourier Analysis? How to apply it? Clarify the necessary background knowledge.
Fourier series	4	A periodic function which is expanded into an infinite series of trigonometric functions is called a Fourier series. Convergence behaviour and series properties are discussed with specific example calculations.
Fourier transform	4	Fourier analysis of non-periodic function leads to the Fourier transform. The lecture discusses how to represent the non-periodic functions and shows the various properties of the Fourier transform using examples. The relationship to the Laplace transform is further discussed.
Application to Partial Differential Equations	5	Second order partial differential equations (Laplace equation, wave equation, thermal equation, etc.) are discussed. The applications of Fourier series and Fourier transform to initial-boundary problems are discussed.
Learning achievement test	1	Learning achievement test.

【Textbook】None.

【Textbook(supplemental)】Useful material is introduded during the lecture.

【Prerequisite(s)】Calculus, Linear Algebra, Engineering Mathematics B1.

【Web Sites】

【Additional Information】

31740

Engineering Mathematics B2

工業数学 B2(資源工学コース)

【Code】31740 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Mikada,H. and Tsukada,K.

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Fourier Series and Fouier Transform	3	
Fourier Transform Appllied to Boundary Value Problem of Differential Equation	2	
Interporation and Approximation	2	
Laplace Transform	2	
Solution of Differential Equations by Laplace Transform	3	
Liniar System and Laplace Transform	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

Experiments on Hydraulics

水理実験

【Code】30870 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Exercise 【Language】Japanese 【Instructor】
【Course Description】Guidance of laboratory experiments in hydraulics and measurement instruments.
Eight experiments are conducted about pipe flow, open-channel flow, waves, flow in porous media, density flow, hydrodynamic force, sediment transport
【Grading】Attendance : 40 points
Reports and homework : 60 points
total : 100 points
【Course Goals】Understanding hydraylic phenomena through various flows observed in the hydraulic laboratory
【Course Topics】

Theme	Class number of times	Description
Guidance	1	Guidance of hydraulics laboratory and course goals
Instruments in hydraulics laboratory	1	Introduction of measurement instruments Methods and principles of hydraulic experiments
Experiments 1 - 4	8	Rotation for eight experiments A to H as mentioned below
Guide for writing reports	4	Guide for writing reports
A)Transition from lamiar to turbulent flows, friction law in pipe flows	(1)	Observation of dye patterns in lamiar and turbulent flows in pipes Understanding Hagen-Poiseuille flow and Prandtl-Karman flow
B)Velocity and free-surface profiles in open-channel flows	(1)	Measurements of free-surface and velocity profiles Comparison measured results with theories
C)Hydraulic jump in horizontal bed	(1)	Understanding hydraulic jump Comparison measured free-surface variations with theories
D)Transmission and deformation behaviors of waves	(1)	Measurements of wave deformations, wave height and orbits of water particles Comparison measured data with small amplitude wave theory and breaking-wave formula
E)Flow in porous media and underground water	(1)	Measurments steady flows in porous media by using pipenet model and Hele-Shaw model
F)Density flow	(1)	Measurement and understanding transport mechanisms in density flows Evaluations of front speed and related friction laws
G)Hydraulic force on cylinder	(1)	Measurements of pressure distributions on cylinder surface in open-channel flows Observation of Karman vortex behind cylinder
H)Sediment transport	(1)	Measurements and observations of bed load in open-channel flows. Comparison with theories and formulae
Presentations of experimental resutls	1	Presentations for experimental results and related discussions

【Textbook】
【Textbook(supplemental)】
【Prerequisite(s)】Hydraulics and Exercises
【Web Sites】
【Additional Information】

32200

Experimental Basics in Earth Resources and Energy Science, Laboratory.

資源工学基礎実験

【Code】32200 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	2	
	6	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30850

Public Economics

公共経済学

【Code】30850 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】K. Kobayashi, Tatano, Matsushima

【Course Description】

【Grading】Final Exam:70-80%, Reports during classes: 20-30%

【Course Goals】To understand basic concept of micro economics for project evaluation about infrastructure

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
Consumers' behavior	3	
Exercise (1)	1	
Firms' behavior	3	
Exercise (2)	1	
Perfect Comititive Market	1	
Externality	1	
Public Goods	1	
Exercise (3)	1	
Cost benefit analysis	2	

【Textbook】Hal R. Varian: Intermediate Microeconomics: A Modern Approach, Seventh Edition, W. W. Norton & Company, 2005

【Textbook(supplemental)】

【Prerequisite(s)】Students are supposed to have earned a credit for "Systems Analysis and Exercises for Planning and Management".

【Web Sites】

【Additional Information】Contact email: pub@psa2.kuciv.kyoto-u.ac.jp

30400

Surveying and Field Practice

測量学及び実習

【Code】30400 【Course Year】3rd year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese
【Instructor】Tamura, Susaki, Hatayama, Ohnishi, Nakamura, Maki, Yamaguchi
【Course Description】Lectures and field practice of the surveying are conducted. In the lectures, survey techniques, details on the instruments, adjustment of the errors contaminated in the measured data are introduced. In the field practice, the student will understand the survey procedure using the instruments.
【Grading】Evaluate considering the scores of the intermediate and final examinations, and the reports and attendance of the field exercise.
【Course Goals】The student will understand the background and theory to reduce the errors contaminated in the measured data and to estimate the reliable parameters.
The student will be able to derive the most probable value and standard error using the least square method and the law of error propagation.
The student will understand the purpose of the various kinds of survey.
In the field exercise, the student will acquire the preparedness to plan the survey and the attitude to cooperate with other students for the accomplishment of the survey.
【Course Topics】

Theme	Class number of times	Description
Introduction of survey	1	The purpose, history and content of the surveys are introduce. In addition, the survey applications and the advanced technology of the surveys are also introduced.
Distance and angular measurement	3	Distance and angular measurement, simple and fundamental surveys, are introduced. The student will learn how to set the instrument properly, and the technique to measure the angles using theodolite.
Control survey	6	The survey plan for the control survey is introduced, and the practice of the traverse survey, one of the most traditional control surveys, is conducted.
Leveling	3	The methodology of leveling and the adjustment of the errors are introduced, and the practice is conducted.
Plane survey and topographic survey	4	The methodology of the plane survey and topographic survey is introduced. The features of the topographic map produced through the survey are explained.
Theory of errors	4	The concept of the errors and the law of the error propagation are introduced.
Least square method	6	The concept of the least square method (LSM), popular approach to the processing of the survey data, is introduced. The student will learn how to apply the LSM for the practical application through the exercise.
Error adjustment	4	The methodology to adjust the errors in the traverse survey is introduced, and the student will learn how to obtain the most probable parameters through the exercise.
Photogrammetry	4	The overview of photogrammetry is introduced, and the practice using the instrument is conducted.
GPS survey	4	The theory of GPS and GPS survey are introduced, and the practice of GPS survey is conducted.

【Textbook】Chuji Mori, "Surveying 1: basic" (in Japanese)
【Textbook(supplemental)】
【Prerequisite(s)】Linear Algebras, Mathematical Statistics
【Web Sites】
【Additional Information】

30550

Sewerage System Engineering

下水道工学

【Code】30550 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	3	
	5	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

32100

Numerical Methods for Engineering and Exercises

数値計算法及び演習

【Code】32100 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31630

Urban and Landscape Design

都市景観デザイン

【Code】31630 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese

【Instructor】M. Kawasaki, Y. Kubota, K. Yamaguchi

【Course Description】To design the urban facilities, open spaces, landscapes of streets and district, is to create the place for the people and their activities. It enabls to make places in harmony with the environment by making connections of each space of the city, region, and nature. The class aims to consider the vision of cityscape and learn the practical design skills and representation.

【Grading】Total points will be scored in design practice and reports.

【Course Goals】To understand the ways of design of the urban facilities, open spaces, landscape of streets and district. To acquire basic skills of landscape design.

【Course Topics】

Theme	Class number of times	Description
Guidance, Basic ideas of landcape design	2	Guidance Significance and scope of urban and landscape design Fundamentals of visual perception
Theory of urban and landscape design	3	Aesthetics of bridges Waterfront Fundamentals of color planning
Basic practice	4	Techniques of drawings: lines and elements Paley Park
Design practice	6	Team practice individual practice Presentations

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】Office hours are not especially set. Ask any questions by mailing or visiting professors (Kawasaki, rm.202; Kubota, rm.201; Yamaguchi, rm.203 at C1-1, Katsura Campus). The theme of design practice could be changed partially.

30540

Water Supply Engineering

上水道工学

【Code】30540 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction【Lecture Form(s)】Lecture【Language】Japanese【Instructor】Itoh, Echigo, Ohkouchi

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	4	
	2	
	5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31530

Transport Policy

交通政策論

【Code】31530 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31440

Advanced Resources and Energy Engineering

先端資源エネルギー工学

【Code】31440 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】['', '']

【Course Topics】

Theme	Class number of times	Description
	1-2	
	1-2	
	1-2	
	1-2	
	1-2	
	1-2	
	1-2	
	1-2	

【Textbook】['', '']

【Textbook(supplemental)】['', '']

【Prerequisite(s)】

【Web Sites】['', '']

【Additional Information】

30580

Solid Waste Management

廃棄物工学

【Code】30580 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	2	
	2	
	1	
	2	
	2	
	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30450

Urban and Regional Planning

都市・地域計画

【Code】30450 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】This lecture aims to learn the process of urban planning and basic measures in urban facility planning, land use planning and transportation planning and to understand the basic theory and models for urban planning.

【Grading】Grades will be based on the results of the final examinations, report and class participation.

【Course Goals】To learn fundamental knowledge on urban planning and to understand the structure of urban problems.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	
Basic measures in urban planning	2	
Land use plan and district plan	2	
Urban models	2	
Urban environmental problems	3	
Funding systems for urban planning	2	
Urban transport policy	2	
Summary	1	

【Textbook】No textbook

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31520

Transportation Management Engineering

交通マネジメント工学

【Code】31520 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】This lecture is aimed at explaining methodologies of survey, desigin and operation for urban traffic and transportation system, which may contribute to enhancement in safety and efficiency of travel.

【Grading】Students will be graded considering both assingnments and term paper.

【Course Goals】The students who complete this course are expecting to explain well the significance in the methodologies used for survey, desgin and operation of transportation planning and traffic engineering. In addition, these students are expecting to apply the methodolgies for the actual case.

【Course Topics】

Theme	Class number of times	Description
Outlines of Traffic and Transportation Engineering	1	
Road Transportation Planning	2	
Survey and Analysis of Travel Behavior	2	
Approaches for Travel Management	2	
Survey and Analysis of Road Network	2	
Traffic Flow Theory	2	
Plannig and Design of Road	1	
Traffic Operation	2	
Examination	1	

【Textbook】Y. Iida and R. Kitamura: Traffic Engineering (written in Japanese), Ohmsha, 2008 .

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】The way to contact with the professors for Q & A is provided at the first class of this course.

31750

Rock Engineering

岩盤工学 (土木工学コース)

【Code】31750 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Ohtsu, Kishida
【Course Description】Design and construction technology of rock structure (Underground cavern, tunnel, rock slope, etc.), geology, mechanical properties of rock and rock fracture, laboratory tests and field measurements of rock and rock mass are introduced and lectured. Design exercise of rock structure is also introduced.
【Grading】Evaluation is decided overall as 35% first examination, 45% final examination and 20% of reports and subjects.
【Course Goals】
【Course Topics】

Theme	Class number of times	Description
Introduction of Rock Engineering and Underground Space Techonology	1	Introduction of real examples and problems in rock engineering field in relation to rock and civil engineering, disaster prevention, energy and environmental areas. Also, outline of underground space technology which includes the benifit of underground space for human being, effective underground space utilization, etc., will be described.
Geology and Rock Engineering	2	Basic knowledge of geology required to study rock engineering will be explained. Deeper understanding of minerals and rocks, their compositions, geological structures and geological features, etc. will be made.
Mechanical propeties of rock and rock masses	2	Understanding to strength and deformation characteristics of rock, experimental methods to determine those characteristics and method of interpreting the experimental results. Also, difference between rock and rock masses, non-homogeneity, anisotropy and scale effects will be explained.
Classification and and identification of discontinuity (rock fracture)	2	Explaination of mechanical and hydraulic charactersics of discontinuity planes such as fault, joint, etc. and understanding the modelling of crack network .Also, understanding of stereographic projection of notation used for three dimensionaly distributed discontinuity planes.
Hydraulics in rocks and groundwater investigation	1	Methods of understanding the behavior of underground water that flows through the rockbeds, their analysis methods and environmental problems related with it will be explained.
Methods of investigation and testing of rock masses	3	Introduction of ground investigation methods such as geological survery, load test and borehole test of rock masses, geophysical exploration, intial stresses, etc. which are carried out for the design and construction of rock structures will be introduced. Understanding of principles of those methods, interpretation of data measured and the proper use of those data will also be explained.
Application of Rock Mechnicas in Engineering for Underground Opening, Rock Slop, Tunneling and Foundation	3	Explaination of methodolgy and the problems for the construction of structures on the bedrocks such as foundation of dams and bridges and slopes is made. Also, methods of constrution of tunnels in the mountain region and representative shield method for tunneling at city area are also explained. Simple design exercises and special lecture from experienced person
Confirmation of understanding	1	Students are examined on the understanding of this subjet through a paper test.

【Textbook】
【Textbook(supplemental)】Society of Material Science, Japan: Rock Mechanics
【Prerequisite(s)】
【Web Sites】
【Additional Information】

31760

Rock Engineering

岩盤工学 (資源工学コース)

【Code】31760 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31510

Geoenvironmental Engineering

地盤環境工学

【Code】31510 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】This course provides the knowledge on geotechnical engineering related to soft ground improvement, natural disaster mitigation, and geo-environmental issues.

【Grading】Grading will be made based on the final exam and attendances.

【Course Goals】The goal of this course is to understand the geotechnical engineering contributing to disaster prevention and environmental issues.

【Course Topics】

Theme	Class number of times	Description
Soft ground improvement	3	(1) Principle of ground improvement, (2) innovative materials including geosynthetics, and (3) road and pavement engineering.
Environmental Geotechnics	5	(1) Remediation of contaminated soils and groundwaters, (2) waste containment, and (3) reuse of waste materials in geotechnical applications.
Geo-disaster (1)	3	(1) Types of natural disasters, geo-disasters, hazard map, mechanism of liquefaction, (2) landslides, (3) damages to river embankment
Geo-disaster (2)	3	(1) Performance-based design for geo-disaster, (2) measures against liquefaction, (3) environmental vibrations and measures.
Exam	1	

【Textbook】Handouts will be provided.

【Textbook(supplemental)】

【Prerequisite(s)】"Soil mechanics I and Exercises (31620)" would be helpful as a prerequisite.

【Web Sites】

【Additional Information】Contact Information: Professor T. Katsumi at tkatsumi$_{am}$box.kudpc.kyoto-u.ac.jp.

31800

Materials and Plasticity

材料と塑性

【Code】31800 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	3	
	4	
	3	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

32300

Geological and Geophysical Survey,Field Excursion

資源工学フィールド実習

【Code】32300 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】Seminar and Exercise 【Language】Japanese

【Instructor】Mikada/Goto/Mito/Yamada/Takekawa/Chen/Tsuji

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	6	
	2	
	2.5	
	2.5	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31540

Environmental Engineering , LaboratoryII

環境工学実験 2

【Code】31540 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Exercise 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	2	
	2	
	2	
	6	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31820

Design for Infrastructure II

社会基盤デザイン II

【Code】31820 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Related Teachers

【Course Description】Civil Engineering is the study which provides the essential technology and knowledge to improve social infrastructures. In this course, the fields of Civil Engineering are explained clearly in terms of how technologies and knowledge, which have been evolved as academic disciplines, have been applied and integrated to realize a safe, comfortable and sustainable society. It is expected to learn the essence of Civil Engineering, especially on expected roles of civil engineers including engineering ethics. Also, lecturers are invited from outside of school.

【Grading】Grade is given based on the examination (or reports) and attendance to class.

【Course Goals】To understand how technologies and knowledge developed in Civil Engineering can be applied in the field of development of infrastructure, disaster management and mitigation, creation of environment and so on; to understand challenges of Civil Engineering and its directions of development, through recent research trends.

【Course Topics】

Theme	Class number of times	Description
Expected roles of civil engineers	2	Introduction Explanation on roles of civil engineers, active areas for them and engineering ethics, introducing the recent examples
Application of Civil Engineering to real world	7	Explanation on how technologies and knowledge developed in Civil Engineering can be applied in the field of development of infrastructure, disaster management and mitigation, creation of environment Explanation on the relation between Civil Engineering as a discipline and its practical application, and real facts of Civil Engineering as global engineering, including recent topics in major business fields of civil engineer, such as civil service, construction, electricity, gas, transportation and communications, consulting and so on
Research trends in Civil Engineering	5	Explanation on recent research trends in Civil Engineering, which aims to realize a safe, comfortable and sustainable society Aim to learn independently status, issues and possibility of developing in the specified research field
Confirmation of the attainment level of learning	1	Confirm the attainment level of learning

【Textbook】Distribute printed materials as needed

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30460

River Engineering

河川工学

【Code】30460 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Hosoda, T. & Takemon, Y.

【Course Description】This subject deals with a wide range of basic knowledge on rivers required to make an integrated river basic management plan based on natural & social sciences and engineering. The contents included in the class are described as follows: various view-points in relation to river systems, long term environmental changes of rivers and their factors, river flows and river channel processes, structure and function of river and lake ecosystems, recent characteristics of flood disasters, integrated river basin planning including flood control, sustainable reservoir management, nature restoration, and sediment transport management.

【Grading】regular examination, quiz in class, attendance and reports

【Course Goals】to learn the basic knowledge to consider river environments from the various points of view such as flood control, natural environment conservation, water utilization based on natural science, social sciences and engineering & technology.

【Course Topics】

Theme	Class number of times	Description
Various viewpoints on rivers and river basins	1	Various viewpoints on rivers and river basins, Vvrious rivers and their landscapes on the Earth, formation processes of river basins, long term environmental changes of rivers and main factors
Precipitation, water cycle and run-off phenomena	1	Basic knowledge on Meteorology, Water Resources, Statistical Hydrology of precipitation and Rain Fall Run-off Analysis
River flow and river channel processes(1)	2	Basics on unsteady open channel flows andflood flow simulation, sediment transport in alluvial streams, formation processes of sand bars, etc.
Application of numerical hydraulics to environmental issues	1	Relation between the behavior of an endangered bird called 'Kamogawa-Chidori' and sand-bar formation, Mechanism on DO depletion near the bottom of the northern part of Lake Biwa due to climate change, Dam reservoir sedimentation due to sediment run-off from a catchment area, etc.
Structure and functions of river and lake eco-system(1)	3	(1) Hierarchical structure and classification of river ecosystems, Relations between river geomorphology and habitat structure, Classification of microhabitats and their maintenance mechanisms, Longitudinal distribution of biological communities (2) Function of river ecosystems, Roles of biodiversity, Sustainable conditions of habitats for biological communities, Mass transfer mechanism in rivers, Nutrient spiraling, Impact assessment of river environments and Physical Habitat Simulation Model (3) Function of lake ecosystems, Classification of natural lakes and ponds by thermal stratification and thermal convection, Relations between lake types and biota (fauna and flora), Characteristics of man-made reservoir ecosystems
Integrated river basin planning(1)	3	(1) River law, Fundamental river management plan, River improvement plan, Procedures to make a flood control planning (2) Flood invasion analysis and Hazard Map, Excessive floods and comprehensive flood disaster prevention measures, River structures(groines and levees) (3) Cost-Benefit Analysis of flood control projects, Evaluation of people ’s awareness to river improvement projects by means of CVM and Conjoint Analysis in view of flood control, water utilization and natural environmental conservation
Integrated river basin planning(4)	3	(1) River environmental improvement plan, Normal discharge, River restoration projects, Environmental assessment, etc. (2) Classification of river structures and their functions, Impact assessment for construction of dam reservoirs and estuary barrages, etc. (3) Comprehensive management of sediment outflow and sediment budgets in river basins, concepts of recent sediment control dams, asset management of dam reservoirs, management of sediment dynamism for integrated river planning, etc.
Confirmation of understanding	1	Students are examined on the understanding of the contents through a paper test.

【Textbook】Printed materials on the contents will be distributed in each lecture.

【Textbook(supplemental)】

【Prerequisite(s)】Elementary knowledge of Hydraulics, Hydrology and Ecology

【Web Sites】http://www.geocities.jp/kyoto(under-bar)u(under-bar)rivereng/

【Additional Information】Students can contact with instructors by sending e-mail to hosoda.takashi.4w@kyoto-u.ac.jp & takemon.yasuhiro.5e@kyoto-u.ac.jp.

30760

Measurement Systems

工業計測

【Code】30760 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Tsukada,K.

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
Configulations and Characteristics of Measurement Systems	2	
Physics on Transducers	2	
Measurement of Fundamental Physical Quantities	4	
Transformation and Recording of Signals	2	
Statictical Processing of Data	2	
Modern Instrumentation	2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30320

Water Resources Engineering

水資源工学

【Code】30320 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】T.Hori , Y.Tachikawa

【Course Description】Methodology for water resources development, management and conservation is introduced from the engineering viewpoint. Main topics are distribution of water resource on the earth, grasp and prediction of water demand, planning and design of water resources systems, estimation and prediction of river flow, policy and water rights, and operation of reservoirs.

【Grading】Grading is done based on the mark on regular examination. Minimum passing grade is sixty percent.

【Course Goals】The goal is to understand the basic theory and methodology for water demand prediction, water resources systems design, river flow estimation, water resources policy and reservoir operation.

【Course Topics】

Theme	Class number of times	Description
Introduction, distribution of water resources	1	Purpose and target of water resources engineering. spatial and temporal distribution of water resources.
Water resources systems planning	3	Concept and measures of water resources develeopment. Efficiency and limit of water resources development.
Design of water resources systems	2	Estimation and predictin of water demand. Facility planning for water resources developemt and supply.
Operation of water resources systems	2	Planning and management, off-line and real time operation, optimization of reservoir control.
Social and legal system for water resources	2	Social and legal system related to water resources. Water rights. Public and private water. Management and defect.
Evaluation of river flows	4	Evaluation of river flows under uncertainty conditions. Impact and its assessment of climate change.
Attainment check	1	Evaluation of attainment level.

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】It is desirable that students have already learned fundamental hydrology and systems analysis for planning and management.

【Web Sites】

【Additional Information】

31900

Mechanical Properties of Solids and Fracture Mechanics

固体の力学物性と破壊

【Code】31900 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese

【Instructor】Assoc. Prof. Tsukada and Assoc. Prof. Murata

【Course Description】For crystalline materials such as rock and metal, macroscopic deformation behavior and destruction behavior is explained from the microscopic standpoint of fracture mechanicas and solid mechanics.

【Grading】A quiz or a report problem is given in every class. The grade is evaluated by the sum of scores of the quiz or the report and the final exam. The grading weights of them are 30% and 70% respectively.

【Course Goals】The goals of this course are to master the evaluation of elastic modulus of crystalline materials considering its anisotropy and to master the fracture mechanics for a crack containing material by estimating stress intensity factor, energy release rate and J integral. By taking this course, students can understand the elastic deformation and strength of the crystalline materials and the crack containing material.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Overview of this course is presented, and then material testing method is simply explained.
Structure of crystalline material	3	Basic form of space lattice of crystalline materials are lecutured, and then the indication method of each crystalline form is presented.
Elastic modulus and theoretical strength	3	Elastic modulus of single crystal and crystalline material is lectured from the point of atomic bond form, and then theoretical strength of a material is explained from atom level.
Fracture mechanics	5	Linear fracture mechanics and nonlinear fracture mechanics for a crack containing material are lectured. Stress intensity factor, energy release rate, J integral etc. are explained. Fracture in mixed mode is also explained.
Mechanical model of composite	1	Mechanical models of composite such as Vogit model, Reuss model, Eshelby's equivalent inclusion method, and Mori-Tanaka’s mean field theory are lectured.
Rheology	1	Macroscopic rheology models are reviewed, and then microscopic rheology based on the Eyring's rate process theory is explained.
Learning achievement check	1	Students are asked to solve problems teached in this class and checked their learning achievement.

【Textbook】Not specified

【Textbook(supplemental)】Naohiro Igata, Strength of matrials, Baifukan Co., ISBN:4-563-03186-0

【Prerequisite(s)】Differential calculus, integral calculus and linear algebra are necessary for this course.

【Web Sites】This course does not have a web site.

【Additional Information】Additional information is presented in the first class of each teacher.

31570

Materials testing for mineral science and technology

資源工学材料実験

【Code】31570 【Course Year】3rd year 【Term】2nd term 【Class day & Period】【Location】【Credits】1 【Restriction】【Lecture Form(s)】 【Language】Japanese

【Instructor】Ishida, Takuda, Mabuchi, Kusuda, Hama, Fujimoto, Murata, Chen, Nara, Hakamada

【Course Description】Fundamental experiments and microscopic observation of rock and metal materials are conducted. Through the experiments and microscopic observation, students can learn how to measure mechanical properties of these materials and how to use the equipments to carry out the experiments and observation.

【Grading】Students are divided into several groups. Every student is asked to conduct the experiments and microscopic observation with group members and to make an experimental report individually for every theme. Grading is made by the attitudes for the experiments and the grade points of every experimental report. The grading weights of these two items are 50% each.

【Course Goals】The goal of this course is to master the evaluation method of mechanical properties for both rock and metal materials and the mineralogical observation method and the metallographic observation method.

【Course Topics】

Theme	Class number of times	Description
Orientation	1	The course goals, schedule of this class, and various attention for safety are presented.
Material testing and failure criterion of rock	4.5	Overview of the rock material testing, the method to obtain Young's modulus, Poisson's ratio, uniaxial compressive strength, and tensile strength are explained. First, in this theme, rock specimen is prepared. Second, uniaxial compression test is conducted. During the uniaxial compression test, strain measurement using strain gauges is performed, and the uniaxial compressive strength, Young's modulus and Poisson's ratio are determined. Third, Brazilian test is conducted and the tensile strength is determined. Finally, the failure criterion of the specimen is determined.
Tensile test and mechanical properties of metal	4.5	Overview of the testing for metal materials is explained first, and then a uniaxial tensile tests of steel and aluminum alloy are conducted. The true stress-true strain curve and the mechanical properties of the specimen are determined.
Mineralogical observation and metallographic observation	4.5	The mineralogical observation for rock specimen and the metallographic observation for metal specimen are conducted. Observation procesures including how to use a microscope are explained first. In the metallographic observation, every group makes a specimen and observe the metal crystal. In the mineralogical observation, student observe rock minerals using a mineralogical microscope. In addition, techniques to visualize the pores and cracks inside of rock are explained, and crack observation is conducted using a visualization technique.

【Textbook】This course does not specified a textbook. Lecture documents may be deribered from teachers in each experimental theme.

【Textbook(supplemental)】Not specified

【Prerequisite(s)】It is desirable that students take the "Experimental Basics in Earth Resources and Energy Science, Laboratory" offered in the previous semester. It is also desirable to take "Materials and Plasticity", "Rock Engineering", and "Geological and Geophysical Survey, Field Excavation" of the Undergraduate Course Program of Earth Resources and Energy Engineering that are offered in the same semester.

【Web Sites】This course does not have a web site.

【Additional Information】It is desirable that all students belonging to the Undergraduate Course Program of Earth Resources and Energy Engineering take this course. Additional information is presented in the first class.

30770

Separation Technology

分離工学

【Code】30770 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31480

Geoinformatics

空間情報学

【Code】31480 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】Techniques to collect, manage and analyze the spatial data and information related to the terrain and environment are introduced. Especially, Geographic Information System (GIS), satellite remote sensing and digital photogrammetry are focused on.

【Grading】Evaluate considering the scores of intermediate examination (GIS) and final examination (remote sensing and photogrammetry), and the submitted reports.

【Course Goals】The student will understand the techniques to obtain the spatial data, e.g. remote sensing and photogrammetry, and the system to effectively show and analyze such data, e.g. GIS. In addition, the student will understand the relationship between the techuniques and the system.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	The purpose and role of geoinformatics, and the techniques related to geoinformatics are introduced.
GIS	7	The student will understand how to represent geographic information and the geographic information system.
Digital photogrammetry	4	The student will understand (1) interior orientation, (2) exterior orientation, (3) colinearity condition, and (4) coplanarity condition, and (5) epipolar line.
Remote sensing	3	The student will understand (1) visible and reflective infrared remote sensing, (2) thermal remote sensing, (3) microwave remote sensing, and (4) LiDAR (Light Detection and Ranging).

【Textbook】Handout will be provided if necessary.

【Textbook(supplemental)】Japan Association on Remote Sensing, "Remote Sensing Note" ,
Kohei Cho , "Spatial Data Analysis using GIS"

【Prerequisite(s)】It is expected that the student has completed the courses,
(1) Statistics (first semester in the second year), and
(2) Surveying and practice (first semester in the third year).

【Web Sites】

【Additional Information】

30250

Concrete Engineering

コンクリート工学

【Code】30250 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】The basic theory and the design technique of reinforced concrete (RC) and prestressed concrete (PC) structure are explained with the mechanical behavior of the materials introduced in ‘Construction Materials’.

Be sure and attend the lecture with your text book. Some homework are assigned to enlarge your knowledge.

【Grading】Grading is based on the result of a term-end examination with the homework and attendance.

【Course Goals】Students of this class learn to understand the basic theory and the design technique of reinforced concrete (RC) and prestressed concrete (PC) structure, and calculate the resistance and the response of simple RC/PC member.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	Concrete structure and its characteristic are introduced.
Fundamental of design	2	The design method, the safety factor and etc. are explained.
Structural materials	1	The mechanical behavior of concrete, reinforcing steel and polymer material is explained.
Bond behavior and anchorage	2	The mechanism of bond and anchorage is explained.
Flexural and compression behavior	2	The mechanical behavior and the capacity of RC section subjected to the flexural moment and/or the normal force are explained.
Shear and torsion behavior	2	The mechanical behavior and the capacity of RC section subjected to the shear force and/or the torsional moment are explained.
Crack and deflection	2	The cracks and deflection of RC member are explained.
Verification method of performance over time	1	The verification method of performance over time including the corrosion of the reinforcing steel is explained.
Others	1	The latest research and technique relating to concrete engineering are introduced.
Confirmation of understanding of lecture	1	A confirmation of understanding of lecture is examined.

【Textbook】K. Kobayashi: Concrete Engineering, Morikita Publishing Co., Ltd., 3,150JPY

【Textbook(supplemental)】

【Prerequisite(s)】Students of this class had better take ‘Structural Mechanics I and Exercises (30080)’ in 2nd year and ‘Construction Materials (30240)’ in 3rd year.

【Web Sites】

【Additional Information】

31560

Heat Transfer

熱流体工学

【Code】31560 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	2	
	1	
	3-4	
	1	
	2	
	2	
	1	
	1-2	
	1-2	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31500

Earthquake and Wind Resistance of Structures, and Related Structural Design Principles

耐震・耐風・設計論

【Code】31500 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】To understand fundamentals of design theory for civil infrastructures. To explain various design loads, including dead load, live load, temperature load, seismic load, and wind load, limit states of structures and their evaluation, demand performance. To design structures considering reliability, optimal design, serviceability, aesthetics, and environment.

【Grading】Based on the performance during the course (including homework) and the results of a final examination.

【Course Goals】To understand fundamentals of design for civil infrastructures.
To understand fundamentals of load, limit state of structures, reliability design and optimal design.
To understand fundamentals of characteristics of natural wind, aerodynamics of structures, design wind and wind resistant design.
To understand fundamentals of earthquake mechanism and seismic response of structures, seismic load, and seismic design.

【Course Topics】

Theme	Class number of times	Description
Introduction of design theory of civil infrastructure	2	Design theory of civil infrastructures is introduced. The concept and significance of design, objective of design, characteristics of civil infrastructures, flow of design process, mechanical design, multi-level decision making are discussed. Engineering ethics are also explained.
Introduction of load	3	Design loads for civil infrastructures are introduced. The characteristics and classification of design loads are explained and their quantitative expression is discussed. Especially statistic characteristics of random loads, i.e. seismic load and wind load, are explained.
Prediction of earthquake ground motion and earthquake response of structure	2	Methods for predicting earthquake ground motion are introduced based on the theories of earthquake mechanism and ground vibration. Equation of motion for the single degree of freedom system and its solution are also explained in order to estimate earthquake response of structure. Design methods for infrastructures are interpreted on the basis of theories of elasticity and plasticity.
Characteristics of natural wind and aerodynamics of structures	2	The characteristics of natural wind and strong wind are explained and process of design wind for structures is discussed. And various aerodynamics (vortex-induced vibration, galloping, flutter, buffeting, and etc.) acting on structural section with various geometric shape and their generation mechanism are explained.
Limit state of structure and reliability analysis	3	The outline of structural safety analysis is introduced for serviceability, ultimate and fatigue limit of structures. As for uncertainties in various actions to structures and the resistance of structures, the design methods such as allowable stress method, limit states method with partial safety factors will be discussed in conjunction with reliability analysis.
Seismic design, wind resistant design, optimal design, and landscape design	3	Seismic design, wind resistant design, optimal design and landscape design for various structures, including long span bridge

【Textbook】Hand-outs are distributed when necessary.

【Textbook(supplemental)】

【Prerequisite(s)】Probabilistic and Statistical Analysis and Exercises(30030), Dynamics of Soil and Structures(31110), Structural Mechanics I and Exercises(30080), Structural Mechanics II and Exercises(31640), and Fluid Mechanics(31650)

【Web Sites】

【Additional Information】Office hour (contact information and consultation hours) of the individual lecturer will be given in his/her first lecture.

31490

Computer Programming and Experiment on Structural Mechanics

構造実験・解析演習

【Code】31490 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】Practical understanding and application of the theory that have been learned in “Structure mechanics Ⅰ and Exercises ”and “Structure mechanics Ⅱ and Exercises ”.
To learn the measurment technique on strain, deflection and vibration in experiment, and the fundamentals/application on computer programming for matrix methods for structural analysis in computational exercise which are needed for understanding of the mechanical properties of member and/or structure.

【Grading】Grade is given based on attendance and reports.

【Course Goals】To understand the fundamentals of measurement of strain, deflection and vibration
To deeply understand theory of structure mechanics by beam experiment
To understand numerical analysis approach of structures by use of matrix methods
To deeply and synthetically understand mechanical behaviors and validation methods of structures by comparing the experimental results with those resulted from matrix methods

【Course Topics】

Theme	Class number of times	Description
Introduction	2	Explanation of the significance and the role of structural experiment and computer analysis Introduction of relationship among structural mechanics, structural experiment and computer analysis, and examples of practical failure structures
Experiment	12	Introducing fundamentals of experiment method and measurement technique for structure model Experiment of cantilever beam under static load and vibration, and its results and discussion Some practical application cases on techniques of experiment and analyses
Analysis	12	Structural analysis for truss, beam and frame by matrix Calculation of stiffness matrix, steps of formation of stiffness equations and the solution Explanation on a few of attention points of practical numerical approaches and analyses Exercises of computer programming
Analysis on experiment	4	To compare the experimental results with those resulted from computer programming To deeply and synthetically understand mechanical behaviors and validation methods of structures
Confirmation of the attainment level of learning	2	Confirm the attainment level of learning

【Textbook】To be distributed in lectures

【Textbook(supplemental)】

【Prerequisite(s)】CompuTer Programming in Global Engineering, Structure mechanics Ⅰ and Exercises, Structure mechanics Ⅱ and Exercises

【Web Sites】

【Additional Information】Office hour (contact information and consultation hours) of the individual lecturer will be given in his/her first lecture.

31550

Wave Motions for Engineering

波動工学

【Code】31550 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】Toshifumi Matsuoka
【Course Description】All the attendance students understand correctly vibration and the wave motion phenomenon which are seen by the nature, and put on the practical skills which are needed by resource engineering. Learn about the wave motion in the elastic body and electromagnetic waves which spreads the underground. This knowledge becomes important for engineers in resource engineering field. Furthermore, in order to understand the micro phenomenon which is needed by oil engineering, the first step about the wave motion of quantum mechanics is described. Although the lesson is based on a lecture, an understanding is deepened by studying an exercise problem according to circumstances.
【Grading】Although experimental mark is based on fundamental score, attendance to a lesson and report results may be taken into consideration.
【Course Goals】Students will be able to manipulate vibrations and wave motion phenomena freely using mathematical formula. Moreover, the ability to explain vibration and wave motion phenomena is mastered during this class.
【Course Topics】

Theme	Class number of times	Description
Simple harmonic motion and its superposition	1	The oscillating phenomenon and the wave motion phenomena of appearing in the resource engineering are described focusing on using examples. Furthermore, simple harmonic motion and its superposition are described.
Damping oscillation, forced oscillation, and coupled vibration	3	An attenuation coefficient is defined about the damping oscillation of one degree of freedom, and it finds for an oscillatory wave form. Furthermore, after finding for the resonance curve and phase curve to harmony wave external force and clarifying a frequency response characteristic, vibration is described when two or more vibration systems are interacting mutually.
The traverse wave which spreads the string	1	A one-dimensional wave equation is drawn taking the case of a string, and the character of a wave is stated.
The solution by the computer of wave motion propagation	1	A required matter is described when performing the simulation of a wave motion phenomenon using a computer.
Analytic Mechinics	2	The analytic mechanics which is needed when you understand the mathematical principle of a wave motion phenomena is described, and the solution by the Lagrange equation of an oscillating phenomenon is described.
Elastic Waves	2	About the wave motion which spreads an elastic body, from the equation of motion of an elastic body, a wave equation is drawn and existence of a longitudinal wave and a traverse wave is described. Furthermore, the distributed phenomenon is described about a surface wave.
Electromagnetic Waves	1	From Maxwell's equation, the wave equation with which an electromagnetism phenomenon follows is drawn, and the solution is described.
Diffraction Phnonenon	2	The diffraction phenomena of a wave are described using Kirchhoff's integration theorem.
Schrodinger Equation	1	Introduction of Quantum Mechanics and Schrdinger Equation
Check of Progress	1	Furthermore, the degree of study achievement is checked about whether an understanding of the wave phenomenon progressed through this whole lecture.

【Textbook】
【Textbook(supplemental)】有山正孝「振動・波動」裳華房
Pain, The Physics of Vibrations and Waves, Wiley
Nettel, Wave Physics, Springer
King, Vibrations and Waves, Wiley
【Prerequisite(s)】Vectol Analysis, Classical Dynamics, Electromagnetism
【Web Sites】
【Additional Information】

31470

Spot Training
学外実習

【Code】31470 【Course Year】3rd year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Exercise 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30880

Global Engineering for Disaster Reduction

地球防災工学

【Code】30880 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】Civil Engineering manages basic built environments in our society, which maintains quality of civic life, and save life and properties. This lecture discusses the role of civil engineering as the basic elements based on Business Continuity Management and Critical Infrastructure Protection concept.

【Grading】Mini reports after each lectures, and the end of semester reports examination

【Course Goals】Acquiring basic the understanding about CIP（Critical Infrastructure Protection）and BCP (Business Continuity Planning)

【Course Topics】

Theme	Class number of times	Description
Definition of Critical Infrastructure	3	Definition and history of Critical Infrastructure will be discussed.
What is resiliency?	2	Definition of resiliency and possible future of society with high resiliency will be explained.
Business Continuity Planning	3	Concept of BCP, Risk and Crisis, BCP and countermeasures for BCP will be explained.
Business continuity of Critical Infrastructures	6	Countermeasures for business continuity of Water supply system, communication network, energy, transportation, finance, logistics, and public administration will be explained.
Achievement test	1	

【Textbook】none

【Textbook(supplemental)】Kyoto University, NTT resilience research group, Creating resilient society, Nikkei BP, 2009 (in Japanese)

【Prerequisite(s)】Both natural and social science interests required.

【Web Sites】

【Additional Information】

Construction Materials, Laboratory

材料実験

【Code】30860 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2 【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】Experiments on the materials for concrete and concrete member are carried out in the main. Properties of concrete materials and member are discussed by using those experimental results.

Be sure and attend the laboratory with your experimental text book. The schedule and details of the experiment are announced at the initial lecture. Students of this laboratory class have to attend an initial lecture because they are to be divided into some groups.

【Grading】A report with the experimental results and discussion is assigned in each time. The grading is based on the total point of reports and attendance.

【Course Goals】Students of this class practically learn to understand the properties of concrete material and member introduced in 'Construction Materials' and 'Concrete Engineering', and its measurement technique.

【Course Topics】

Theme	Class number of times	Description
Introduction	1	The objective and contents of this laboratory are introduced. The fundamentals of the measuring and testing method are also introduced.
Cement	1	The density, the fineness and the setting time of cement, and the flow of mortar are tested.
Aggregate	1	The density, the water absorption ratio, the grading, unit mass and surface water ratio of fine and coarse aggregate are tested.
Mix proportion design of concrete and fresh concrete	1	Mix proportion of concrete is designed using the results of ‘cement’ and ‘aggregate’. The condition of fresh concrete made by using the designed mix proportion is examined. The test specimens for ‘hardened concrete’ are also cast.
Hardened concrete	2	Some destructive and non-destructive tests are performed in the test specimens cast in ‘fresh concrete’.
Reinforcing steel bar	1	The yield strength, the tensile strength and the elongation are obtained in the reinforcing steel bar for concrete.
Design of reinforced concrete (RC) and prestressed concrete (PC) beam	3	The reinforced concrete (RC) and prestressed concrete (PC) beam are designed.
Casting of RC and PC beam	1	The designed RC and PC beam specimens are cast.
Prestressing	1	The prestress is introduced in PC beam by post tensioning system.
Loading test of RC and PC beam	2	Loading test for RC and PC beam specimens is carried out. The flexural behavior of RC and PC beam is investigated, comparing the experimental loading capacity with the designed one.
Topics	1	The latest research and/or technique of concrete are introduced.
A term-end examination	0	A term-end examination is not done.

【Textbook】The Society of Materials Science, Japan: Construction Materials Laboratory, 1,600JPY

【Textbook(supplemental)】

【Prerequisite(s)】Members of this class had better take ‘Construction Materials (30240)’ and ‘Concrete Engineering (30250)’ in 3rd year.

【Web Sites】

【Additional Information】

31610

Time Series Analysis

時系列解析

【Code】31610 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31770

Design Exercise for Global Engineering A

地球工学デザイン A

【Code】31770 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2
【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese
【Instructor】M. Kawasaki, Y. Kubota, (Pacific Consultants) Y. Ito, (ditto) K. Nishiyama, (ditto) R. Nishigami
【Course Description】"Design" is an act of synthesis, so it is an opposite act of analysis in general (however in the process, multiple analyses are contained). Synthesis is not mere summation of elements. In this class, we approach to the synthesis of design from "understanding of basic knowledge", "skill of thinking, informing and expression", "acquiring of process knowledge" and "case studies". Then, with the general concept of design, we learn concrete discipline of "civil engineering design" which should be treated with a creation of aesthetic environment in our public spaces.
【Grading】Total points will be scored in attendance (40%) and results of design practice and reports (60%). Teamwork is important in the competition, so the members in the same team will be given the same points.
【Course Goals】To understand the basic knowledge and skills of civil engineering design. To acquire the process knowledge by team design. At last, students are expected to get design-mindsets as civil engineers.
【Course Topics】

Theme	Class number of times	Description
Guidance	1	Guidance
Space unit and functional space	2	Understanding of "unit space" and "functional space" is firstly important when we design spaces. In this class, the concept and cases are shown. Then the rule and affordance of space which exist in the relationship between man and environment. As an application of affordance, we learn universal design and think what is the "function" of spaces. Moreover, the general concept of "design" which is important for both engineers and designers, we discuss what is civil engineering design with the reflection of general concept of design.
Fundamental practice of design	2	Through design practices, students learn basic knowledge and skills of design for public spaces. Though there is no exclusive and absolute solution for design, students are required to learn how to make a quality of public spaces more excellent through the practices.
Civil engineering design competition	5	"Team design" is a characteristic of civil engineering design. In big civil engineering projects, a person can hardly design everything. So the team design is needed. Moreover, in real process of decision making of design, the best proposal is chosen among multiple alternatives. In this class, students will be separated into some teams to challenge the design competition. Each team will execute the collection of information, observation, analysis, making concept, conceive ideas, integration of ideas, evaluation and presentation. The best team will be given a prize.
Front line of civil engineering design	5	Through the lectures and design practices by professionals who are working on the front line of civil engineering design, we learn how engineering and design are combined, how they are integrated into public spaces and how they are managed in the process. As themes, for example, "creativity of structural design", "design of green and environment" and "city planning and landscape" are planned to deepen our understanding.

【Textbook】
【Textbook(supplemental)】
【Prerequisite(s)】It is desirable to have taken the class of “ Urban and Landscape Design ”
【Web Sites】
【Additional Information】Office hours are not especially set. Ask any questions by mailing or visiting professors (Kawasaki, rm.202; Kubota, rm.201, C1-1 at Katsura Campus). The theme of design practice could be changed partially.

31790

Design Exercise for Global Engineering C

地球工学デザイン C

【Code】31790 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Seminar 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	2	
	5	
	1	
	2	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31590

Earth Resources and Ocean Energy

地殻海洋資源論

【Code】31590 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30840

Administration of Public Works

土木法規

【Code】30840 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】This course will outline the overview of the existing laws on administration of public works and explain their implication to nation building, community development, and civil engineering facilities as well as practice in planning, construction, management, and operation.

【Grading】The final grade will be determined based on a comprehensive assessment of the final examination, papers, and other assignments.

【Course Goals】The objective of this course is to gain an understanding of the existing laws on administration of public works, their implications to nation building, community development, and civil engineering facilities, and practice in planning, construction, management, and operation.

【Course Topics】

Theme	Class number of times	Description
	1	
	2	
	2	
	5	
	2	
	1	
	1	
	1	

【Textbook】Handouts to be distributed.

【Textbook(supplemental)】・ Oka, Shohei. " " Gihodo Shuppan (1989)
・ Oka, Shohei. " " Sankaido (1995)

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31200

Underground Development Engineering

地殻開発工学

【Code】31200 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	3	
	4	
	5	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

31780

Design Exercise for Global Engineering B

地球工学デザイン B

【Code】31780 【Course Year】4th year 【Term】1st term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】Japanese 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	3	
	6	
	1	
	4	
	1	
	4 〜 6	
	4 〜 6	
	3 〜 5	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

30890

Introduction to Architectural Engineering

建築工学概論（建築）

【Code】30890 【Course Year】4th year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	4	
	3	
	3	
	4	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

21050

Engineering Ethics

工学倫理

【Code】21050 【Course Year】4th year 【Term】2nd term 【Class day & Period】 【Location】 【Credits】2

【Restriction】No Restriction 【Lecture Form(s)】Lecture 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	
	1	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

21080

Introduction to Engineering

工学序論

【Code】21080 【Course Year】1st year 【Term】 【Class day & Period】 【Location】 【Credits】1

【Restriction】No Restriction 【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22020

Exercise in English of Science and Technology

科学技術英語演習

【Code】22020 【Course Year】2nd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22110

Engineering and Ecology

工学とエコロジー (英語)

【Code】22110 【Course Year】【Term】1st term 【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】 【Language】English 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1	
	2	
	3	
	4~5	
	6~7	
	8~11	
	12~13	
	14~15	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

22210

Engineering and Economy

工学と経済（英語）

【Code】22210 【Course Year】【Term】2nd term 【Class day & Period】【Location】【Credits】2 【Restriction】

【Lecture Form(s)】 【Language】English 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description
	1~2	
	3~4	
	5~6	
	7~8	
	9~10	
	11~13	
	14~15	

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

24010

Global Leadership Seminar I

ＧＬセミナーＩ

【Code】24010 【Course Year】3rd year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

25010

Global Leadership Seminar II

ＧＬセミナーⅡ

【Code】25010 【Course Year】4th year 【Term】【Class day & Period】【Location】【Credits】1 【Restriction】

【Lecture Form(s)】 【Language】 【Instructor】

【Course Description】

【Grading】

【Course Goals】

【Course Topics】

Theme	Class number of times	Description

【Textbook】

【Textbook(supplemental)】

【Prerequisite(s)】

【Web Sites】

【Additional Information】

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