Course number	U-ENG23 22051 LJ55				
Course title (and course title in English)	工業数学B1（T1・T2） Engineering Mathematics B1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HARADA EIJI		
Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.5	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The course introduces theory of complex functions and its applications.

[Course objectives]

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

[Course schedule and contents]

Introduction[2times]:
Definition of complex numbers, complex plane and review of vector analysis

Basic theory of complex functions[8times]:
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[4times]:
Application of residue theorem to calculation of definite integrals, Multivalued functions.

Learning achievement test[1time]:
Learning achievement test.

Feedback

[Course requirements]

Basic Calculus (From the university curriculum: Calculus A and B, Advanced Calculus A).

Continue to 工業数学B1（T1・T2）(2)↓↓↓

工業数学B1（T1・T2）(2)

[Evaluation methods and policy]

Evaluation Method
Final examination (80%) and report (20%).

Evaluation Policy
Evaluation will be conducted in accordance with the grading policy of the School of Engineering.

[Textbooks]

None.

[References, etc.]

（Reference books）

Useful material is introduded during the lecture.

[Study outside of class (preparation and review)]

Basic Calculus

（Other information (office hours, etc.)）

KULASIS system will be used to contact with registered students.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 22051 LJ55		
Course title (and course title in English)	工業数学B1（T3・T4） Engineering Mathematics B1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAITOU JIYUN

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The course introduces theory of complex functions and its applications.

[Course objectives]

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

[Course schedule and contents]

Preperation, 2 times
definition of complex number, complex plane, vector analysis

Basic of complex function, 8 times
differential of complex function, Cauchy　Riemann equations, regular function and its property, Cauchy's integral theorem, Cauchy's integral formula, Taylor expansion, Laurent expansion, types of isolated singularities, residue theorem

Application of complex function, 4 times
application of residue theorem to integral calculation, multivalued function

Confirmation of achievement,1 time
The achievement assessment is intended to measure students' knowledge,
skill and aptitude on the subject using quiz and viva-voce.

[Course requirements]

Basic Calculus (From the university curriculum: Calculus A and B, Advanced Calculus A).

[Evaluation methods and policy]

Evaluation will be based on assignments (13 or 14 times, 20~30 points), and an examination (70~80 points).

Students will submit all assignments.

[Textbooks]

Instructed during class
None.

Continue to 工業数学B1（T3・T4）(2)↓↓↓

工業数学B1（T3・T4）(2)

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

A Report is assigned for every class for review.

（Other information (office hours, etc.)）

Only T1 and T2 class students can take the class.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG20 42105 LJ77		
Course title (and course title in English)	工学倫理 Engineering Ethics	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Informatics Professor,NIITSU KIICHI Graduate School of Engineering Professor,Shu Seki Graduate School of Engineering Senior Lecturer,HIGASHIGUCHI KENJI Graduate School of Letters Professor,ISEDA TETSUJI Center for the Promotion of Interdisciplinary Education and Research Program-Specific Assistant Professor,SHIMIZU YUYA Graduate School of Engineering Professor,SUGIYASU KAZUNORI Graduate School of Engineering Professor,IMAHORI HIROSHI Graduate School of Informatics Professor,UMENO KEN Office of Society-Academia Collaboration for Innovation NAKAGAWA MASAYUKI Graduate School of Engineering Professor,OOSAKI MAKOTO Graduate School of Engineering Professor,TAKAGI IKUJI Graduate School of Engineering Professor,NISHIWAKI SHINJI Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Engineering Professor,OOWADA TAKU Graduate School of Engineering Professor,SUSAKI JUNICHI Graduate School of Engineering Senior Lecturer,Kanako Shojiki

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Modern ethics based on engineering aspect are becoming essential to present engineers and scientists. Instructors from various faculties give lectures about ethics in their research fields.

Continue to 工学倫理(2)↓↓↓

工学倫理(2)

[Course objectives]

The goal of this class is to understand engineering ethics, and to develop the ability to judge by yourself when you encounter ethical issues.

[Course schedule and contents]

Lectures on ethics in various fields of engineering will be given by faculty members of the Graduate School of Engineering or other graduate schools. (Details will be provided after they are determined.)
This course is a media course in which all lectures will be given online via Zoom.

[Course requirements]

None

[Evaluation methods and policy]

Class participation and reports.

[Textbooks]

Lecture materials will be distributed.

[References, etc.]

（Reference books）

『Omnibus Engineering Ethics 』（Kyoritsu Shuppan Co., Ltd.）ISBN:978-4320071964
『Practical Engineering Ethics - A Short Course, New Edition』（Kagaku-Dojin Publishing Company,INC）ISBN:9784759811551
『Engineering Ethics (Revised Edition)』（CORONA PUBLISHING CO.,LTD.）ISBN:978-4-339-07798-8
『World of Engineering Ethics (3rd Edition)』（Morikita Publishing Co., Ltd.）ISBN:978-4-627-97303-9

[Study outside of class (preparation and review)]

The assignment of the report will be given for each lesson.

（Other information (office hours, etc.)）

The class order is subject to change.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

Continue to 工学倫理(3)↓↓↓

工学倫理(3)

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG20 12108 LJ77		
Course title (and course title in English)	工学序論 Introduction to Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,Shu Seki Graduate School of Informatics Professor,KASHIMA HISASHI Graduate School of Engineering Professor,KANKI KIYOKO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Office of Society-Academia Collaboration for Innovation Program-Specific Professor,KITANI TETSUO Graduate School of Engineering Professor,SUZUKI MOTOFUMI Graduate School of Energy Science Professor,NAKAMURA YUUJI Graduate School of Engineering Senior Lecturer,ISHITSUKA KAZUYA Graduate School of Engineering Senior Lecturer,KOWHAKUL, Wasana

Target year	1st year students or above	Number of credits	1	Year/semesters	2024/Intensive, First semester
Days and periods	Intensive	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Engineering is to inquire after truth, to develop useful technologies, and to establish ways how to give back development results of technology to the society.
First, we offer special lectures regarding the basic knowledge that students in faculty of engineering are expected to have.
Then, we offer a series of intensive lectures about how engineering can suggest solutions of current and future problems of our society, the value of technology, and the responsibilities that researchers and engineers are expected to fulfill.

[Course objectives]

Students learn basic matters such as attitudes and responsibilities they are expected to take as a member of social community. They find value in studying engineering and become to consider what they do in future by understanding technology can suggest solutions of problems our society is facing, especially problems about safety and security.

[Course schedule and contents]

Special lectures,1time, About basic knowledge and attitude as students who start to learn engineering, and the role of engineering in society.
Intensive lectures,6times, A series of lectures offered by special lecturers playing on global stages of science and technology. Lectures are for understanding the role that technology is playing in modern society, for reconfirming importance to study engineering and to work as a researcher and engineer in society, and are to be opportunities to consider own future path. Essays are assigned in every lecture to summarize the lecture content and opinions of other students.
Schedule of the lectures are announced later.

Continue to 工学序論(2)↓↓↓

工学序論(2)

[Course requirements]

None

[Evaluation methods and policy]

Evaluation will be based on participation and essays assigned in every intensive lecture.

[Textbooks]

Specify if necessary.

[References, etc.]

（Reference books）

Specify if necessary.

[Study outside of class (preparation and review)]

Specify if necessary.

（Other information (office hours, etc.)）

Information about lecturers and contents of lectures are announced on electric bulletin boards.
Please confirm to your department office that the credit of this course is admitted to graduation requirements.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG20 32402 SE77		
Course title (and course title in English)	工学部国際インターンシップ１ Faculty of Engineering International Internship 1	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KOWHAKUL, Wasana Graduate School of Engineering Professor,HONDA MITSURU

Target year	3rd year students or above	Number of credits	1	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese and English

[Overview and purpose of the course]

Acquisition of international skills with the training of foreign language through the internship programs hosted by the University, the Faculty of Engineering, or the undergraduate school the applicant belongs to.

[Course objectives]

The acquisition of international skills with the training of foreign language through the to internship programs hosted by the University is the major expectation to the students.

[Course schedule and contents]

Overseas Internship,1time,The contents to be acquired should be described in the brochure of each internship program.
Final Presentation,1time,A presentation by the student is required followed by discussion among participants.

[Course requirements]

Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.

[Evaluation methods and policy]

Marit rating is done based on the presentation or reports after each internship program. Each Department responsible to identify if the credit earned by this subject to be included as mandatory ones or not. If the credit is not included in the undergraduate school in which the participant belongs to, the credit is granted by the Global Leadership Education Center as a optional credit. The number of credits, either 1 or 2, will be determined depending on the contents and the duration of the program that the participant has participated in.

[Textbooks]

Continue to 工学部国際インターンシップ１(2)↓↓↓

工学部国際インターンシップ１(2)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

It is required for students to check if the internship program to participate in could be evaluated as part of mandatory credits or not and could earn how many credits before the participation to the undergraduate school or educational program the student in enrolled. If the credit could not be treated as mandatory ones, get in touch with the Global Leadership Engineering Education Center.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course that includes off-campus training classes.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG20 22403 SJ77		
Course title (and course title in English)	グローバル・リーダーシップセミナーI(企業調査研究) Global Leadership Seminar I (Study for methodology in a company)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,hirai yoshikazu

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The purpose of this course is to study about how worldwide leading company, institute, etc. make proposals and find solutions for expanding their own technologies to the international market. Throughout hands-on training on their laboratory, students investigate the methodology of team organization, proposal, market prediction and conception ability by group works. After the investigation, students are expected to improve their comprehension and explanation capability. As extended exersice subject of this course, the Global Leadership Seminar II is opened in the second semester.

[Course objectives]

The goal of this course is to improve student's comprehension and explanation capability for processes of proposal and expansion on the international market invesitigating worldwide leading companies by group work.

[Course schedule and contents]

Week 1, Guidance
Week 2-13, Hands-on training
Week 14, Pre-presentation
Week 15, Final presentation

[Course requirements]

How to register will be announced later. Students who want to join this course is requested to attend the first class.

[Evaluation methods and policy]

Students are prohibited to skip hands-on training. Evaluation will be based on presentation.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Continue to グローバル・リーダーシップセミナーI(企業調査研究)(2)↓↓↓

（Related URLs）

http://www.glc.t.kyoto-u.ac.jp/ugrad

[Study outside of class (preparation and review)]

Investigating companies in advance. Analyzing the result from hands-on training. Preparing presentation.

（Other information (office hours, etc.)）

How to register will be announced later. Students who want to join this course is requested to attend the first class. Students are prohibited to skip hands-on training. Evaluation will be based on presentation.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG20 32502 SE77				
Course title (and course title in English)	工学部国際インターンシップ２ Faculty of Engineering International Internship 2		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Senior Lecturer,KOWHAKUL, Wasana Graduate School of Engineering Professor,HONDA MITSURU	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese and English

[Overview and purpose of the course]

Acqusition of international skills with wth the training of foreign language through the participation to the international internship programs held by the Faculty of Engineering or its subsidiary bodies.

[Course objectives]

The acquisition of international and foreign language skills through the participation to international programs is expected. Detailed objectives of the participation should be identified by each program.

[Course schedule and contents]

Overseas Internship,1time,The contents to be acquired should be described in the brochure of each internship program.
Final Presentation,1time,A presentation by the student is required followed by discussion among participants.

[Course requirements]

Described in the application booklet for each internship program. The registrant is requested to have enough language skills for the participation.

[Evaluation methods and policy]

Marit rating is done based on the presentation or reports after each internship program. Each Department responsible to identify if the credit earned by this subject to be included as mandatory ones or not. If the credit is not included in the undergraduate school in which the participant belongs to, the credit is granted by the Global Leadership Education Center as a optional credit. The number of credits, either 1 or 2, will be determined depending on the contents and the duration of the program that the participant has participated in.

[Textbooks]

Continue to 工学部国際インターンシップ２(2)↓↓↓

工学部国際インターンシップ２(2)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

It is required for students to check if the internship program to participate in could be evaluated as part of mandatory credits or not and could earn how many credits before the participation to the undergraduate school or educational program the student in enrolled. If the credit could not be treated as mandatory ones, get in touch with the Global Leadership Engineering Education Center.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course that includes off-campus training classes.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG20 22503 SJ77				
Course title (and course title in English)	グローバル・リーダーシップセミナーII(イノベーションとその事業化) Global Leadership Seminar II (Innovation and its commercialization)	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HONDA MITSURU Graduate School of Engineering Senior Lecturer,hirai yoshikazu		
Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Intensive, Second semester
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The capabilities that society expects from Kyoto University students primarily include "deep knowledge in their respective fields of specialization" and the "ability to identify issues on their own and present a path to resolution." In this course, you will develop the latter capability, which is difficult to acquire through regular lectures and university life, by creating new business plans through group work. While individual activities are allowed, group activities are encouraged.

[Features of this Course]
1. Distinguished Instructors: Under the mentoring of renowned innovators active in the business world, students will engage in setting challenges and planning solutions.
2. Activity Budget: A budget will be provided for market research, prototype production, and software development necessary for developing project proposals.
3. Presentation Opportunities: Outstanding proposals may be displayed at the Katsura Library, among other opportunities for commercialization.

[Mentors]
- Mitsuaki Oshima, Special Appointment Professor (Honorary Technical Supervisor at Panasonic HD, Director of ESL Research Institute): A leading Japanese innovator, known for inventions like image stabilization for cameras and 5G communication technologies. Recipient of the Purple Ribbon Medal and the Order of the Rising Sun, Gold Rays with Rosette.
https://hillslife.jp/learning/2018/05/06/new-perspective6/
- Seiichi Nishimoto, Honorary Professor (Chairman of the Kyoto Advanced Technology Research Institute): Supports the development of science and technology in the Kyoto area and the growth of ventures and SMEs.
https://www.astem.or.jp/about/researcher/nishimoto
- Kentaro Kaneko, Professor (Ritsumeikan University, Research Organization of
Science and Technology): Co-founder of FLOSFIA, continuously innovating new semiconductor materials.
https://kaneko-lab.ritsumei.ac.jp/
- Teppei Tsushima, Chief Section Manager, Sony Corporation, Mobile Communications Business Division, wena Business Room: Founder of Sony's smartwatch business, wena.
https://www.sony.com/ja/SonyInfo/Jobs/recruit/business/sap/tsushima.html
- Hideki Aoyama, Principal Engineer, Panasonic HD: Developer of the visible light communication technology LinkRay(TM) and vice-chairman for the international standardization of the IEEE802.15.7 communication standard.
https://hidekia.github.io/
- Tsutomu Mukai, Senior Manager, Panasonic HD: Promotes open innovation with venture companies in Israel.

Continue to グローバル・リーダーシップセミナーII(イノベーションとその事業化)(2)↓↓↓

Professor Mitsuaki Oshima is one of Japan's "Top 10 Representative Inventors," known for inventing and developing fundamental patents in technologies such as camera image stabilization in iPhones and high-speed and ultra-low latency communication for 5G mobile phones. Additionally, he invented multi-disciplinary technologies like anti-piracy measures for Nintendo Wii software, digital TV broadcasting standards in Japan, the US, and Europe, and IoT home appliances. He is famous as a serial innovator. Professor Oshima will introduce how groundbreaking inventions that change society originate.

More information can be found on the following page:
http://www.erc.t.kyoto-u.ac.jp/news/gl_seminar2_2023

[Notes]
This seminar is intended for students in their second year of the Engineering Department or higher. The seminar is worth one credit, but whether it is recognized as a required credit for graduation depends on the undergraduate school. Please confirm with your undergraduate school office. Also, a camp is planned for November 30th and December 1st, so it is necessary to be enrolled in the Personal Accident Insurance for Students Pursuing Education and Research(“ Gakkensai ”). Participation in the camp is recommended.

[Course objectives]

Through group work, you can acquire the ability to plan and propose solutions, starting from identifying and setting challenges to envisioning the creation of social value.

[Course schedule and contents]

The course will be conducted in person.
- [Orientation] (1 session): The overview and schedule of the course will be explained.
- [Lectures] (3 sessions): Special lectures by experts will be conducted.
- [Team Building (1 session): An exercise in team building, essential for group work, will be carried out.
- [Group Work] (8 sessions): Students will engage in setting challenges, problem identification, data collection, and group work. Through intensive group work discussions, they will plan and propose solutions to the identified issues, create a draft report, and conduct 2-3 presentations. Holding mini-lectures by special instructors will also be planned.
- [Camp] (1 session): An intensive session dedicated to project work in an environment exclusive to participants and mentors through overnight training camp.
- [Preliminary Review Session] (1 session): A class to practice presentations in preparation for the final presentation event.
- [Final Presentation Event] (1 session): The final presentations will take place, followed by submission of presentation materials.

[Course requirements]

The enrollment limit for this course might be set at approximately 20 students.

[Evaluation methods and policy]

[Evaluation Method]
Grades will be based on regular participation (20%) and the presentation and submission of presentation

Continue to グローバル・リーダーシップセミナーII(イノベーションとその事業化)(3)↓↓↓

materials at the final presentation event held during the last lecture session (80%). Regular participation evaluation will focus on the student's active participation in the lectures.

[Evaluation Policy]
We will comprehensively evaluate the ability to identify and set challenges through group discussions, as well as the ability to propose solutions towards achieving goals. Students are required to develop individual or group business plans through the challenges and group work, and to present them at the final presentation event.

Attendance in lectures per se is not a criterion for grade evaluation; however, as the course involves group work, regular attendance is strongly recommended.

[Textbooks]

We will let you know if necessary.

[References, etc.]

（Reference books）

We will let you know if necessary.

[Study outside of class (preparation and review)]

Please prepare and develop your own ideas in advance that you would like to work on throughout the course.

（Other information (office hours, etc.)）

[Schedule for the 2024 Academic Year]
The classes will be conducted in person on Fridays during the 5th period in Lecture Room W3, Research Building 9.
*Note: The 3rd lecture will be held in Lecture Room N5, Research Building 9 (subject to change in lecture room).
- Orientation: October 4
- Fundamentals of Group Work: October 18
- Special Lectures, In-Person Group Work: October 11, 25; November 1, 8, 15, 29; December 6, 13, 20, 27; January 10
- Camp: November 30 (Sat) 13:00 - December 1 (Sun) 13:00 @ AWL Keihoku (tentative)
- Preliminary Review Session: January 17
- Final Presentation: January 18 (Sat)

*Please note that whether the credits earned are recognized as necessary for graduation depends on your undergraduate school. Refer to your undergraduate school course guide for more information.
*Registration for the course is not through KULASIS but via the following page. It is scheduled to open around September 2024:
https://www.t.kyoto-u.ac.jp/fs/erc/2024Fall_GL_seminar2

For details on office hours, please check KULASIS.

*Please visit KULASIS to find out about office hours.

Continue to グローバル・リーダーシップセミナーII(イノベーションとその事業化)(4)↓↓↓

グローバル・リーダーシップセミナーⅡ(イノベーションとその事業化)(4)

[Courses delivered by instructors with practical work experience]

(1) Category

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 23003 LJ55		
Course title (and course title in English)	確率統計解析及び演習(T1) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,TAKAYUKI KAMEDA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding the theory and method of probability statistical analysis as a basic method to cope with the uncertainty of natural and social phenomena subject to geotechnology. In particular, the goal is to understand the concept of probability and its basic theorem, master basic probability distribution and its usage, master thinking on statistical estimation tests, and understanding the basic methods of multivariate analysis. The lecture is a parallel lecture divided into four classes.

[Course objectives]

Getting familiar with the concept of probability and the basic theorem, and understanding various distributions that are widely used in the field of geotechnology and its properties and usage for design, and so forth. Additionally, being able to understand the basic nature of populations and specimens and the principles of estimation and verification and using them for concrete inferential statistics.

[Course schedule and contents]

The 1st Class: Significance of probability statistical method
A lecture will be given on the significance, in terms of engineering, of probability statistics, and the necessity in general engineering will be outlined.

The 2nd - 5th Classes: Probabilistic grasp of uncertain phenomena
The concept of probability and its basic theorem will be explained. In particular, conditional probability, random variables, the probability distribution function, the probability density function, the moment generating function, and the characteristic function will be explained. Multidimensional probability distribution and the transformation of random variables will also be discussed.

The 6th - 9th Classes: Probability distribution model
The characteristics and properties of various probability distributions effective for expressing real phenomena such as binomial distribution, Poisson distribution, normal distribution, and so forth will be described.

The 10th - 12th Classes: Sample distribution and statistical estimation/test
Sample distribution, such as X^2 distribution, t distribution, F distribution, and how to calculate them will be explained. In addition, regarding statistical estimations to derive probabilistic properties of a population from sample values, a lecture will be given on the concept and method of point and interval estimation, and the statistical test method to verify the significance of engineering phenomena.

The 13th - 14th Classes: Multivariate statistical analysis/regression analysis

Continue to 確率統計解析及び演習(T1)(2)↓↓↓

確率統計解析及び演習(T1)(2)

Based on the theory of probability statistics, multivariate analysis and the method of analysis of variance that are mainly used to analyze survey data will be described. In particular, the probabilistic model and the confidence limits by taking the first order regression analysis as an example will be outlined.

<<Semester final examination>>

The 15th Class: Feedback

[Course requirements]

It is desirable that students have taken calculus and linear algebra.

[Evaluation methods and policy]

Grades will be evaluated by including the degree of active participation in lectures and exercises, the results of quizzes and intermediate tests, and so forth in the scores of regular tests. The details will be communicated by the professors at the beginning of the class. A passing score is 60 or more out of 100 points.

[Textbooks]

Kitamura,S and Hori,T(eds.): 『An Introduction to Probability and Statistics for Engineering』（Asakura Publishing Co., Ltd.,）ISBN:9784254111132

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

It is divided into 4 classes and conducted as parallel lectures. Partial abbreviations or additions may be done depending on the number of classes in the year. Office hours are not set in particular, but questions are accepted during class/practice or at the professor’s room (an appointment should be made in advance. The contact method will be communicated by the professors during the first lecture for each class).

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23003 LJ55		
Course title (and course title in English)	確率統計解析及び演習(T2) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding the theory and method of probability statistical analysis as a basic method to cope with the uncertainty of natural and social phenomena subject to geotechnology. In particular, the goal is to understand the concept of probability and its basic theorem, master basic probability distribution and its usage, master thinking on statistical estimation tests, and understanding the basic methods of multivariate analysis. The lecture is a parallel lecture divided into four classes.

[Course objectives]

Getting familiar with the concept of probability and the basic theorem, and understanding various distributions that are widely used in the field of geotechnology and its properties and usage for design, and so forth. Additionally, being able to understand the basic nature of populations and specimens and the principles of estimation and verification and using them for concrete inferential statistics.

[Course schedule and contents]

The 1st Class: Significance of probability statistical method
A lecture will be given on the significance, in terms of engineering, of probability statistics, and the necessity in general engineering will be outlined.

The 2nd - 5th Classes: Probabilistic grasp of uncertain phenomena
The concept of probability and its basic theorem will be explained. In particular, conditional probability, random variables, the probability distribution function, the probability density function, the moment generating function, and the characteristic function will be explained. Multidimensional probability distribution and the transformation of random variables will also be discussed.

The 6th - 9th Classes: Probability distribution model
The characteristics and properties of various probability distributions effective for expressing real phenomena such as binomial distribution, Poisson distribution, normal distribution, and so forth will be described.

The 10th - 12th Classes: Sample distribution and statistical estimation/test
Sample distribution, such as X^2 distribution, t distribution, F distribution, and how to calculate them will be explained. In addition, regarding statistical estimations to derive probabilistic properties of a population from sample values, a lecture will be given on the concept and method of point and interval estimation, and the statistical test method to verify the significance of engineering phenomena.

The 13th - 14th Classes: Multivariate statistical analysis/regression analysis

Continue to 確率統計解析及び演習(T2)(2)↓↓↓

確率統計解析及び演習(T2)(2)

Based on the theory of probability statistics, multivariate analysis and the method of analysis of variance that are mainly used to analyze survey data will be described. In particular, the probabilistic model and the confidence limits by taking the first order regression analysis as an example will be outlined.

<<Semester final examination>>

The 15th Class: Feedback

[Course requirements]

It is desirable that students have taken calculus and linear algebra.

[Evaluation methods and policy]

Grades will be evaluated by including the degree of active participation in lectures and exercises, the results of quizzes and intermediate tests, and so forth in the scores of regular tests. The details will be communicated by the professors at the beginning of the class. A passing score is 60 or more out of 100 points.

[Textbooks]

Kitamura,S and Hori,T(eds.): 『An Introduction to Probability and Statistics for Engineering』（Asakura Publishing Co., Ltd.,）ISBN:9784254111132

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

It is divided into 4 classes and conducted as parallel lectures. Partial abbreviations or additions may be done depending on the number of classes in the year. Office hours are not set in particular, but questions are accepted during class/practice or at the professor’s room (an appointment should be made in advance. The contact method will be communicated by the professors during the first lecture for each class).

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23003 LJ55		
Course title (and course title in English)	確率統計解析及び演習(T3) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Associate Professor,KOBAYASHI SOHEI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding the theory and method of probability statistical analysis as a basic method to cope with the uncertainty of natural and social phenomena subject to geotechnology. In particular, the goal is to understand the concept of probability and its basic theorem, master basic probability distribution and its usage, master thinking on statistical estimation tests, and understanding the basic methods of multivariate analysis. The lecture is a parallel lecture divided into four classes.

[Course objectives]

Getting familiar with the concept of probability and the basic theorem, and understanding various distributions that are widely used in the field of geotechnology and its properties and usage for design, and so forth. Additionally, being able to understand the basic nature of populations and specimens and the principles of estimation and verification and using them for concrete inferential statistics.

[Course schedule and contents]

The 1st Class: Significance of probability statistical method
A lecture will be given on the significance, in terms of engineering, of probability statistics, and the necessity in general engineering will be outlined.

The 2nd - 5th Classes: Probabilistic grasp of uncertain phenomena
The concept of probability and its basic theorem will be explained. In particular, conditional probability, random variables, the probability distribution function, the probability density function, the moment generating function, and the characteristic function will be explained. Multidimensional probability distribution and the transformation of random variables will also be discussed.

The 6th - 9th Classes: Probability distribution model
The characteristics and properties of various probability distributions effective for expressing real phenomena such as binomial distribution, Poisson distribution, normal distribution, and so forth will be described.

The 10th - 12th Classes: Sample distribution and statistical estimation/test
Sample distribution, such as X^2 distribution, t distribution, F distribution, and how to calculate them will be explained. In addition, regarding statistical estimations to derive probabilistic properties of a population from sample values, a lecture will be given on the concept and method of point and interval estimation, and the statistical test method to verify the significance of engineering phenomena.

The 13th - 14th Classes: Multivariate statistical analysis/regression analysis

Continue to 確率統計解析及び演習(T3)(2)↓↓↓

確率統計解析及び演習(T3)(2)

Based on the theory of probability statistics, multivariate analysis and the method of analysis of variance that are mainly used to analyze survey data will be described. In particular, the probabilistic model and the confidence limits by taking the first order regression analysis as an example will be outlined.

<<Semester final examination>>

The 15th Class: Feedback

[Course requirements]

It is desirable that students have taken calculus and linear algebra.

[Evaluation methods and policy]

Grades will be evaluated by including the degree of active participation in lectures and exercises, the results of quizzes and intermediate tests, and so forth in the scores of regular tests. The details will be communicated by the professors at the beginning of the class. A passing score is 60 or more out of 100 points.

[Textbooks]

Kitamura,S and Hori,T(eds.): 『An Introduction to Probability and Statistics for Engineering』（Asakura Publishing Co., Ltd.,）ISBN:9784254111132

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

It is divided into 4 classes and conducted as parallel lectures. Partial abbreviations or additions may be done depending on the number of classes in the year. Office hours are not set in particular, but questions are accepted during class/practice or at the professor’s room (an appointment should be made in advance. The contact method will be communicated by the professors during the first lecture for each class).

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23003 LJ55		
Course title (and course title in English)	確率統計解析及び演習(T4) Probabilistic and Statistical Analysis and Exercise	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Associate Professor,HIROI KEI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding the theory and method of probability statistical analysis as a basic method to cope with the uncertainty of natural and social phenomena subject to geotechnology. In particular, the goal is to understand the concept of probability and its basic theorem, master basic probability distribution and its usage, master thinking on statistical estimation tests, and understanding the basic methods of multivariate analysis. The lecture is a parallel lecture divided into four classes.

[Course objectives]

Getting familiar with the concept of probability and the basic theorem, and understanding various distributions that are widely used in the field of geotechnology and its properties and usage for design, and so forth. Additionally, being able to understand the basic nature of populations and specimens and the principles of estimation and verification and using them for concrete inferential statistics.

[Course schedule and contents]

The 1st Class: Significance of probability statistical method
A lecture will be given on the significance, in terms of engineering, of probability statistics, and the necessity in general engineering will be outlined.

The 2nd - 5th Classes: Probabilistic grasp of uncertain phenomena
The concept of probability and its basic theorem will be explained. In particular, conditional probability, random variables, the probability distribution function, the probability density function, the moment generating function, and the characteristic function will be explained. Multidimensional probability distribution and the transformation of random variables will also be discussed.

The 6th - 9th Classes: Probability distribution model
The characteristics and properties of various probability distributions effective for expressing real phenomena such as binomial distribution, Poisson distribution, normal distribution, and so forth will be described.

The 10th - 12th Classes: Sample distribution and statistical estimation/test
Sample distribution, such as X^2 distribution, t distribution, F distribution, and how to calculate them will be explained. In addition, regarding statistical estimations to derive probabilistic properties of a population from sample values, a lecture will be given on the concept and method of point and interval estimation, and the statistical test method to verify the significance of engineering phenomena.

The 13th - 14th Classes: Multivariate statistical analysis/regression analysis

Continue to 確率統計解析及び演習(T4)(2)↓↓↓

確率統計解析及び演習(T4)(2)

Based on the theory of probability statistics, multivariate analysis and the method of analysis of variance that are mainly used to analyze survey data will be described. In particular, the probabilistic model and the confidence limits by taking the first order regression analysis as an example will be outlined.

<<Semester final examination>>

The 15th Class: Feedback

[Course requirements]

It is desirable that students have taken calculus and linear algebra.

[Evaluation methods and policy]

Grades will be evaluated by including the degree of active participation in lectures and exercises, the results of quizzes and intermediate tests, and so forth in the scores of regular tests. The details will be communicated by the professors at the beginning of the class. A passing score is 60 or more out of 100 points.

[Textbooks]

Kitamura,S and Hori,T(eds.): 『An Introduction to Probability and Statistics for Engineering』（Asakura Publishing Co., Ltd.,）ISBN:9784254111132

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

It is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

It is divided into 4 classes and conducted as parallel lectures. Partial abbreviations or additions may be done depending on the number of classes in the year. Office hours are not set in particular, but questions are accepted during class/practice or at the professor’s room (an appointment should be made in advance. The contact method will be communicated by the professors during the first lecture for each class).

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		
Course title (and course title in English)	構造力学 I 及び演習 Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KITANE YASUO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, Properties of forces, Equilibrium of forces
Week 2: Statically determinate and indeterminate structures, Support conditions of structures and reaction forces
Week 3: Member forces of statically determinate trusses
Week 4: Shear force and bending moment diagrams of statically determinate beams
Week 5: Influence lines
Week 6: Stress-strain relationships
Week 7: Section forces and stresses, Section properties
<<Learning level check>>
Week 8: Combination of stresses and Mohr's circle
Week 9: Deformation of cross-section, Stress and strain distribution
Week 10: Deflection of beam (2nd-order differential equation)
Week 11: Deflection of beam (4th-order differential equation)
Week 12: Conjugate beam method
Week 13: Compatibility equations for statically indeterminate structures
Week 14: Buckling of columns
<<Final exam>>
Week 15: Feedback

[Course requirements]

Calculus A and B

Continue to 構造力学 I 及び演習(2)↓↓↓

構造力学Ⅰ及び演習(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

To be announced by individual lecturer in his/her first lecture

[Study outside of class (preparation and review)]

To be announced by individual lecturer in his/her first lecture.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		
Course title (and course title in English)	構造力学 I 及び演習 Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, Properties of forces, Equilibrium of forces
Week 2: Statically determinate and indeterminate structures, Support
conditions of structures and reaction forces
Week 3: Member forces of statically determinate trusses
Week 4: Shear force and bending moment diagrams of statically determinate beams
Week 5: Influence lines
Week 6: Stress-strain relationships
Week 7: Section forces and stresses, Section properties
<<Learning level check>>
Week 8: Combination of stresses and Mohr's circle
Week 9: Deformation of cross-section, Stress and strain distribution
Week 10: Deflection of beam (2nd-order differential equation)
Week 11: Deflection of beam (4th-order differential equation)
Week 12: Conjugate beam method
Week 13: Compatibility equations for statically indeterminate structures
Week 14: Buckling of columns
<<Final exam>>
Week 15: Feedback

[Course requirements]

Calculus A and B

Continue to 構造力学Ⅰ及び演習(2)↓↓↓

構造力学Ⅰ及び演習(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

To be announced by individual lecturer in his/her first lecture

[Study outside of class (preparation and review)]

To be announced by individual lecturer in his/her first lecture.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		
Course title (and course title in English)	構造力学 I 及び演習 Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAGI TOMOMI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, Properties of forces, Equilibrium of forces
Week 2: Statically determinate and indeterminate structures, Support conditions of structures and reaction forces
Week 3: Member forces of statically determinate trusses
Week 4: Shear force and bending moment diagrams of statically determinate beams
Week 5: Influence lines
Week 6: Stress-strain relationships
Week 7: Section forces and stresses, Section properties
<<Learning level check>>
Week 8: Combination of stresses and Mohr's circle
Week 9: Deformation of cross-section, Stress and strain distribution
Week 10: Deflection of beam (2nd-order differential equation)
Week 11: Deflection of beam (4th-order differential equation)
Week 12: Conjugate beam method
Week 13: Compatibility equations for statically indeterminate structures
Week 14: Buckling of columns
<<Final exam>>
Week 15: Feedback

[Course requirements]

Calculus A and B

Continue to 構造力学 I 及び演習(2)↓↓↓

構造力学Ｉ及び演習(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

To be announced by individual lecturer in his/her first lecture

[Study outside of class (preparation and review)]

To be announced by individual lecturer in his/her first lecture.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		
Course title (and course title in English)	構造力学 I 及び演習 Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUMIYA HISATO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, Properties of forces, Equilibrium of forces
Week 2: Statically determinate and indeterminate structures, Support conditions of structures and reaction forces
Week 3: Member forces of statically determinate trusses
Week 4: Shear force and bending moment diagrams of statically determinate beams
Week 5: Influence lines
Week 6: Stress-strain relationships
Week 7: Section forces and stresses, Section properties
<<Learning level check>>
Week 8: Combination of stresses and Mohr's circle
Week 9: Deformation of cross-section, Stress and strain distribution
Week 10: Deflection of beam (2nd-order differential equation)
Week 11: Deflection of beam (4th-order differential equation)
Week 12: Conjugate beam method
Week 13: Compatibility equations for statically indeterminate structures
Week 14: Buckling of columns
<<Final exam>>
Week 15: Feedback

[Course requirements]

Calculus A and B

Continue to 構造力学 I 及び演習 (2)↓↓↓

構造力学Ⅰ及び演習 (2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

To be announced by individual lecturer in his/her first lecture

[Study outside of class (preparation and review)]

To be announced by individual lecturer in his/her first lecture.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23008 LJ73		
Course title (and course title in English)	構造力学 I 及び演習 Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, Properties of forces, Equilibrium of forces
Week 2: Statically determinate and indeterminate structures, Support conditions of structures and reaction forces
Week 3: Member forces of statically determinate trusses
Week 4: Shear force and bending moment diagrams of statically determinate beams
Week 5: Influence lines
Week 6: Stress-strain relationships
Week 7: Section forces and stresses, Section properties
<<Learning level check>>
Week 8: Combination of stresses and Mohr's circle
Week 9: Deformation of cross-section, Stress and strain distribution
Week 10: Deflection of beam (2nd-order differential equation)
Week 11: Deflection of beam (4th-order differential equation)
Week 12: Conjugate beam method
Week 13: Compatibility equations for statically indeterminate structures
Week 14: Buckling of columns
<<Final exam>>
Week 15: Feedback

[Course requirements]

Calculus A and B

Continue to 構造力学Ⅰ及び演習(2)↓↓↓

構造力学Ⅰ及び演習(2)

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

To be announced by individual lecturer in his/her first lecture

[Study outside of class (preparation and review)]

To be announced by individual lecturer in his/her first lecture.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23010 LJ57		
Course title (and course title in English)	一般力学(T1・T2) Fundamental Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUMIYA HISATO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This class introduces foundations of Newtonian mechanics and its application to engineering. The motion of a particle, multi-particle systems and rigid bodies are mainly introduced, and Related mechanics studied in specialized subjects are explained.

[Course objectives]

The goal is to acquire a systematic knowledge of mechanics of a particle, multi-particle systems, and rigid body to solve basic mechanical problems.

[Course schedule and contents]

Fundamental mathmatics, 1 time,
Vector calculus.

Laws of motion, 4 times,
Equation of motion, velocity and acceleration vector in polar coordinates, linear momentum and angular momentum, conservation laws, damped harmonic oscillator, driven harmonic oscillator, resonance, coupled oscillations and their mode.

Work and energy, 2 times,
Work, conservative force and potential, conservation of mechanical energy.

Non-inertial systems, 1 time,
Galilean transformation, motion in a rotating coordinate system (coriolis force and centrifugal force).

Multi-particle systems, 1 time,
Center of mass, conservation of momentum.

Motion of rigid bodies, 3 times,
Degree of freedom, statics of rigid bodies, moment of inertia, rotation of a rigid body about a fixed axis, motion of a rigid body.

Foundation of analytical mechanics, 2 times,
Constraint condition, constraint force, generalized coordinate, generalized force, Lagrange's equations.

Confirmation of achievement,

Continue to 一般力学(T1・T2)(2)↓↓↓

一般力学(T1・T2)(2)

The achievement assessment is intended to measure students' knowledge, skill and aptitude on the subject using quiz and viva-voce.

Feedback, 1 time.

[Course requirements]

It is desirable that students complete Calculus A, B and linear algebra A, B.

[Evaluation methods and policy]

Evaluation will be based on usual performance score(class attendance, attitude in class, and assignments) (30~40 points), and examinations (60~70 points).

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

（Related URLs）

https://panda.ecs.kyoto-u.ac.jp/

[Study outside of class (preparation and review)]

Preparation for the next class is announced at the class. Reports are assigned for review.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23010 LJ57						
Course title (and course title in English)	一般力学(T3・T4) Fundamental Mechanics			Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Senior Lecturer,ISHITSUKA KAZUYA		
Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester		
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese		

[Overview and purpose of the course]

This class introduces foundations of Newtonian mechanics and its
application to engineering. The motion of a particle, multi-particle systems, and rigid body are mainly introduced and related mechanics studied in specialized subjects are explained.

[Course objectives]

The goal is to acquire a systematic knowledge of mechanics of a
particle, multi-particle systems, and rigid body to solve basic
mechanical problems.

[Course schedule and contents]

Fundamental mathmatics, 1 times,
Vector calculus

Laws of motion, 4 times,
Equation of motion, Velocity and acceleration vector in polar
coordinates, linear momentum and angular momentum, conservation laws, damped harmonic oscillator, driven harmonic oscillator, resonance, coupled oscillations and their modes

Work and Energy, 2 times,
Work, conservative force and potential, conservation of mechanical energy

Non-inertial systems, 1 time,
Galilean Transformation, motion in a rotating coordinate system
(Coriolis force and centrifugal force)

Multi-particle systems, 1 time,
Center of Mass, conservation of Momentum

Motion of rigid bodies, 3 times,
Degree of freedom, statics of rigid bodies, Moment of inertia,
Rotation of a rigid body about a fixed axis, Motion of a rigid body

Foundation of analytical mechanics, 2 times,

Continue to 一般力学(T3・T4)(2)↓↓↓

一般力学(T3・T4)(2)

Constraint condition, constraint force, generalized coordinate,
generalized force, Lagrange's equations.

Confirmation of achievement, 1 time
Examination

Feedback, 1 time

[Course requirements]

Elementary Calculus A, B and Linear Algebra A, B

[Evaluation methods and policy]

Examination: 60-70%, Weekly assignment: 30-40%.

[Textbooks]

Worksheet (in Japanese) is provided via web.

[References, etc.]

（Reference books）

小出昭一郎 『物理テキストシリーズ１　力学』（岩波書店, 1980）ISBN:4-00-007741-4

（Related URLs）

https://panda.ecs.kyoto-u.ac.jp/

[Study outside of class (preparation and review)]

Preparation and reviewing are recommended, although the details are arbitrary.

（Other information (office hours, etc.)）

No particular office-hour is set.
Contact information of instructors whose offices are in the Katsura Campus.

hayashi.tameto.6s@kyoto-u.ac.jp
ishitsuka.kazuya.4w@kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23015 LJ15		
Course title (and course title in English)	環境生物・化学 Biology and Chemistry for Environmental Engineers	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Associate Professor,ASADA YASUHIRO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This course aims to learn basic chemistry and biology essential for environmental science and technology. This course is divided into two parts. The first half is basic water chemistry and analytical chemistry. The second half is biology including structure of major biomolecules, central dogma and respiratory system and energy metabolism.

[Course objectives]

To learn basic chemistry and biology essential for environmental science and technology.

[Course schedule and contents]

Chemical parameters in the aquatic environment,1time,pH, concentration,activity and activity coefficient,acid and bases in the aquatic environment
Acid and base reaction in the aquatic environment,3times,Principle of acid base equilibrium. Logarithmic diagram and proton condition. carbonates in both closed and open systems.
Methods to control the aquatic environment,2times,Alkalinity and Acidity. Coagulation, flocculation and sedimentation with logarithmic diagram.
Midterm examination,1time,Midterm examination is on 7th time around.
Cell and biomolecules,2times,Structure and function of cellar organelles and biomolecules such as lipids, protein, nucleic acids.
The central dogma,3times,DNA replication, transcription and translation.
respiratory system and energy metabolism,2times,Aerobic respiration and other type of respiratory systems of environmental microorganisms.
confirmation of achievement,1time,confirmation of achievement

[Course requirements]

None

[Evaluation methods and policy]

The grading is based on the score of a midterm examination and a regular examination.

[Textbooks]

Bruce Alberts 『Essential細胞生物学(原書第4版)』（南江堂）ISBN:978-4524261994（It will be used for latter half of this class (biology part).）

Continue to 環境生物・化学(2)↓↓↓

環境生物・化学(2)

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Several reports will be given for preparation and review.

（Other information (office hours, etc.)）

We appreciate active discussions and questions.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33024 LJ73				
Course title (and course title in English)	材料学 Construction Materials		Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 schedule and contents]

1. Introduction
Classification of materials, history of construction materials, ethics for civil engineers and current topics are introduced
2. Basic structure
Bond between atoms, ideal strength, dislocation, yield, and mechanical properties are introduced.
3. Metallic materials & steel
Metallic material, iron, blast furnace, refine, steel, transformation, heat treatment and metallic new materials are introduced.
4. Matellic corrosion & protection
Corrosion and corrosion protection of metals are explained.
5. Polymer materials
Resin, rubber, fiber, polymer concrete and organic new materials are explained.
6. Cement
Types of cements, chemical composition, chemical compound, hydration, hydration heat and blended cement are introduced.
7. Admixture for concrete
Chemical admixture, water-reducing admixture, air-entraining admixture, mineral admixture, pozzolanic reaction, latent hydraulic property and high-range admixture are introduced.
8. Aggregate & mixing water, fresh concrete
Aggregate, mixing water and fresh concrete (workability, rheology, consistency, segregation) are explained.
9. Mechanical properties of concrete
The water cement ratio, compressive strength, flexural strength, tensile strength and toughness of concrete are introduced.
10. Durability of concrete
Durability, alkali-silica-reaction, shrinkage are introduced.
11. Corrosion of reinforcing steel in concrete

Continue to 材料学(2)↓↓↓

材料学(2)

Corrosion of reinforcing steel, carbonation, chloride induced corrosion are introduced.
12. Mix design of concrete
Mix desig of concrete is explained.
13. High performance concrete and reinforcement
High performance concrete and special reinforcement are introduced.
14. Inspection & investigation methods for concrete structures
Surface hardness, ultrasonic pulse, elastic wave, thermography, half cell potential and polarization resistance are explained.
15. Feedback
Achievement of learning is confirmed and the result is fed back with regard to questions.

[Course requirements]

"Basic Physical Chemistry" in Liberal Arts and General Education Courses.

[Evaluation methods and policy]

Evaluate considering the scores of final examination and the submitted reports.

[Textbooks]

Toyoaki Miyagawa and Keitetsu Rokugo 『Construction materials』 （Asakura ltd）ISBN:9784254261622 （in Japanese）

[References, etc.]

（Reference books）

Introduced during class

（Related URLs）

http://csd.kuciv.kyoto-u.ac.jp/(Department of Urban Manatement, Structures Management Engineering (Atsushi Hattori))
http://sme.kuciv.kyoto-u.ac.jp/(Department of Civil & Earth Resources Engineering, Structural Materials Engineering (Takashi Yamamoto))
http://sme.kuciv.kyoto-u.ac.jp/(Department of Civil & Earth Resources Engineering, Structural Materials Engineering (Satoshi Takaya))

[Study outside of class (preparation and review)]

1. Preview of today's chapter.
2. Review of each mini-quiz based on explanation.

（Other information (office hours, etc.)）

Visiting: Takashi Yamamoto at rm C1-455, Katsura and/or Satoshi Takaya at rm C1-454, Katsura are welcome.

Continue to 材料学(3)↓↓↓

材料学(3)

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33025 LJ73		
Course title (and course title in English)	コンクリート工学 Concrete Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 schedule and contents]

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

[Course requirements]

Students of this class had better take 'Structural Mechanics I and Exercises' in 2nd year and 'Construction Materials' in 3rd year.

Continue to コンクリート工学(2)↓↓↓

コンクリート工学(2)

[Evaluation methods and policy]

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

[Textbooks]

K. Kobayashi: Concrete Engineering, Morikita Publishing Co., Ltd., 3,240JPY ISBN:9784627425651

[References, etc.]

（Reference books）

S.Inoue, et al.: Zusetu Concrete structures, Gakugei Publishing Co., Ltd., 3,024JPY ISBN:9784761525958

[Study outside of class (preparation and review)]

1. Preview of today's chapter.
2. Review of each mini-quiz based on explanation.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33030 LJ73		
Course title (and course title in English)	**水文学基礎** Fundamentals of Hydrology	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Associate Professor,YOROZU KAZUAKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.5	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The fundamental concept of hydrology is the hydrological cycle, which is various scale physical processes of water movements in the atmosphere, land surfaces, 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 land surfaces, and transport of vapor in the atmosphere. The vapor changes to liquid and fall on the land surfaces as precipitation, then the flow of water on and under the land surfaces are driven by gravity. Hydrology is the study of the movement of water on and under the land surface and its applications to mitigate water-related disasters, develop water resources and preserve the environment. In the class, basic hydrological processes such as solar radiation, precipitation, evapotranspiration, infiltration, surface and subsurface flow, and river flow are described.

[Course objectives]

The aim of the course is to understand the basic hydrological processes to obtain the knowledge for analyzing hydrological phenomenon and the engineering background for water resources development.

[Course schedule and contents]

1. The hydrologic cycle: 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.
2-4. Precipitation processes: Precipitation, the flow of water from the atmosphere to the surface, will be explained from the perspective of atmospheric thermodynamics and how rain clouds are formed. First, we will show the principles of dry adiabatic process and moist adiabatic process (how a "baby" cumulonimbus cloud is formed), which also lead to the understanding of hydrological land surface processes. Next, we will explain the potential instability of the atmosphere (why cumulonimbus clouds develop rapidly).
5. Interception and infiltration: The process of precipitation interception by trees is introduced. Then the governing equation of unsaturated flow and the basic equations of potential infiltration are explained.
6. Groundwater flow: The mechanism of rainfall-runoff in mountainous slope The mechanism of groundwater is explained. The physical equation to represent groundwater flow is derived from the continuity and momentum equations of water flow.
7-9. Surface runoff: The mechanism of rainfall-runoff in mountainous slope is explained. The kinematic wave

Continue to 水文学基礎(2)↓↓↓

水文学基礎(2)

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.
10. Solar radiation and energy balance: Energy and water cycle driven by solar radiation is described. Basic mechanism of global warming ant its influence on hydrologic cycle is introduced.
11-13. Evaporaion and transpiration: 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.
14. Flood routing: The mechanism of flood routing is explained. Numerical representation method to represent channel network structure is introduced, then typical flow routing methods are described.
<< Examination >>: Final examination is conducted.
15. Feedback: Questions from students are accepted.

[Course requirements]

It is desiarable to study Hydraulics (2nd year) and probability and statistical analysis (2nd year).

[Evaluation methods and policy]

The score is evaluated comprehensively with quiz, report, and the final examination.

[Textbooks]

池淵周一・椎葉充晴・宝 馨・立川康人 『エース水文学』（朝倉書店, 2006）ISBN:9784254264784

[References, etc.]

（Reference books）
椎葉充晴・立川康人・市川 温 『例題で学ぶ水文学』（森北出版,2010）

[Study outside of class (preparation and review)]

Read the handouts to understand contents to be given in lectures and to gain deep understanding of unclear points of the lectures.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33032 LJ73		
Course title (and course title in English)	水資源工学 Water Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,HORI TOMOHARU Graduate School of Engineering Associate Professor,KIM SUNMIN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Water resources systems planning,1time,
Target of water resources engineering. Temporal and spatial distribution of water resources on the earth.

Development of water resources,2times,
Concept and measures of water resources develeopment. Efficiency and limit of water resources development.

Design of water resources systems,1time,
Estimation of water demand and design of water resources systems.

Operation and management of water resources systems,2times,
Planning and management, off-line and real time operation, optimization of reservoir control.

Social and legislation system for water resources,1time,
Social and legislation system for water resources, water right, public and private water, management and defect.

Water resources evaluation (1): Hydrologic predictions,1time,
Hydrologic predictions play an important role for water resources evaluation. The basic role of hydrologic predictions for a river planning and river management are explained.

Water resources evaluation (2): Hydrologic frequency analysis,4times,
The basis of the hydrologic frequency analysis is explained. Hydrologic variables used for the river planning and water resources planning are introduces as probabilistic variables; the concept of non-exceedance and exceedance probability and T-year probabilistic hydrologic variables are explained. Then, the procedure of

Continue to 水資源工学(2)↓↓↓

水資源工学(2)

hydrologic frequency analysis, distribution functions used for the frequency analysis, and estimation methods of parameters of a distribution function is described.

Water resources evaluation (3): Real-time hydrologic forecasting,2times,
Methods for real-time rainfall forecasting and river discharge forecasting are focused.

Achievement confirmation,1time,
Achievement assement is intended to measure students knowledge, skill and aptitude on the subject.

[Course requirements]

It is desirable that students have already learned fundamental hydrology and systems analysis for planning and management.

[Evaluation methods and policy]

Grading is done based on the mark on regular examination with reference to the degree of positive participation to classes and assignments. Minimum passing grade is sixty percent.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

t is necessary to review based on lecture materials and to complete the report assignments given during the lecture.

（Other information (office hours, etc.)）

Active participation is expected in the lectures through questions and so forth. The content and number of lectures may change depending on circumstances. In addition, some lecture items may be replaced with special lectures given by researchers and others outside the university on current topics.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33044 LJ24　U-ENG23 33044 LJ55　U-ENG23 33044 LJ73

Course title (and course title in English)	社会システム計画論 Planning and Management of Social Systems	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester

Days and periods	Thu.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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. The second half provides cutting-edge issues including participatory approach in social decision-makings and risk governance.

[Course objectives]

The target of this lecture is to understand roles of infrastructure planning and management, typical models for systems analysis, cutting-edge issues in infrastructure planning.

[Course schedule and contents]

1. Guidance/Social System and Systems Analysis: Tatano
2. Methods for problem structuring and significance of infrastructure planning: Tatano
3. Multivariate analysis (1): Onishi
Significance of multivariate analysis, review of linear regression model
4. Multivariate analysis (2): Onishi
Multiple regression model
5. Multivariate analysis (3): Onishi
Various methods of multivariate analysis and application
6. Multivariate analysis (4): Onishi
Principal component analysis
7. Queuing theory: Onishi
8. Application of queuing theory in port facility planning: Onishi
9. Game theory: Onishi
10. Institutional design: Onishi
11. Decision-making under uncertainty (1): Tatano
Markov decision process model
12. Decision-making under uncertainty (2): Tatano
Exercise of applying Markov decision process model in planning problem
13. Cutting-edge of infrastructure planning (1): Tatano
Participatory approach
14. Cutting-edge of infrastructure planning (2): Tatano
Risk governance
<<Final examination>>
15. Feedback

Continue to 社会システム計画論(2)↓↓↓

社会システム計画論(2)

[Course requirements]

Fundamental understanding of probability

[Evaluation methods and policy]

Evaluation is based on attendance (30%) and the score of final exam (70%).

[Textbooks]

Systems analysis for Infrastructure planning: phenomenal analysis, Morikita pub. (in Japanese) ISBN: 4627427301

[References, etc.]

（Reference books）

Introduced during class

（Related URLs）

(None)

[Study outside of class (preparation and review)]

Students are requested to review probabilistic models by using textbook such as the one used in the class of ‘Probabilistic and Statistical Analysis and Exercise’. Because the time for review is limited, students are requested to review by themselves as needed basis.

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33045 LJ73		
Course title (and course title in English)	**都市・地域計画** Urban and Regional Planning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Engineering Assistant Professor,Tomoki Nishigaki

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The process of urban planning will be outlined and key topics, including urban facilities planning, land use policy, and transportation policy will be discussed in detail. In addition, lectures will also be given on basic theory and models relating to land use, transportation, environmental conservation, and urban economy.

[Course objectives]

To master basic knowledge of urban planning and to understand the structure of urban problems.

[Course schedule and contents]

Introduction to Urban and Regional Planning (1 time)
The principal problems of cities and regions will be presented, and the social background and necessity for planning will be described. In particular, important viewpoints to consider for the future of cities, such as internationalization, aging, and responding to environmental problems will be explained.

Basic Policy of Urban Planning (2 times)
The basic ideas and key measures of urban planning, such as urban planning areas, urbanization areas, urbanization adjustment areas, and application areas will be explained while covering case examples from Kyoto.

Land Use Planning/District Planning (2 times)
The significance and contents of land use planning and planning restrictions will be outlined. In addition, using case examples from Kyoto we will explain the basic measures relating to urban developments, including land reallocation, urban redevelopment, and district planning among others that are key to historic and natural preservation.

Urban Models and Theory (2 times)
Urban models, such as the population forecast/migration model, economic cycle/base model, land use model, and so forth will be explained.

Environmental Problems and Urban Systems (3 times)
Current issues related to environmental problems, the global environment, the urban environment, and requirements for planning from the viewpoint of environmental economics will be described. In particular, as the foundation of these issues, the theory of external diseconomies will be described in detail.

System and Financial Resources of Urban Planning (2 times)

Continue to 都市・地域計画(2)↓↓↓

都市・地域計画(2)

The social benefits achieved through urban planning will be explained, while focusing on the relationship between benefits and burdens. Basic theories of urban planning systems and financial resources will also be described.

Urban Transportation Measures (2 times)
Urban transportation measures will be explained from the viewpoint of urban development. In particular, we will discuss the direction of transportation measures that should be taken into consideration in order for cities to maintain a level of sustainability based on environmental and energy issues.

Summary of all Lectures (1 time)
All lectures will be summarized and relevant tasks will be organized. Finally, achievement levels will be confirmed.

[Course requirements]

None

[Evaluation methods and policy]

Attendance, reports, and the final examination will be taken into consideration.

[Textbooks]

Not used
None used.

[References, etc.]

（Reference books）
Yoshitsugu Kanemoto 『Urban Economics』（TOYO KEIZAI INC.）ISBN:9784492813034（The content is somewhat advanced, but it is recommended as a book that is useful for understanding urban problems.）

[Study outside of class (preparation and review)]

Review of each lecture is essential.

（Other information (office hours, etc.)）

Questions and comments should be saved for lectures so that other students can benefit. In the event that you want to ask questions individually, please ask them after the lecture has finished.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33053 LJ73　U-ENG23 33053 LJ14		
Course title (and course title in English)	水質学 Water Quality	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,Fujiwara Taku Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Graduate School of Engineering Professor,NISHIMURA FUMITAKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,4times,
,4times,
,3times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33054 LJ73　U-ENG23 33054 LJ16		
Course title (and course title in English)	上水道工学 Water Supply Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Water supply is introduced as one of the urban supplies, from the point of technologies of protection of life. Role of water supply system and risk management of water quality as well as water purification technologies are targeted in class. Class is conducted through thinking together.

[Course objectives]

To understand basics of water purification technologies, role of water supply system in water cycles in the basin, and management of health risk through risk management of water supply.

[Course schedule and contents]

Overview (1 time)
Concept of sanitary engineering, a study on protection of life, and water supply engineering as an example of the sanitary engineering are introduced. Goal of the class is also stated.

Watershed management and water supply system (1 time)
Role of water supply system in water cycle of watershed is introduced. Concept of protection of water source, and integrated river basin management and its significance are discussed.

Over view of water supply system (1 time)
Total water supply system from catchment to consumer taps and outline of topics covered in the class are introduced.

Water purification process (4 times)
Basics of water purification processes are turbidity removal and disinfection. Mechanisms of slow and rapid sand filtration systems, disinfection and pathogens in water are introduced. Formation of disinfection byproducts, harmful compounds such as carcinogenicity, after disinfection is also stated in details.

Advanced water purification process (2 times)
Water qualities of source water are widely varied. It is difficult to meet many types of needs of consumers for drinking water by conventional water purification processes. Advanced water purification processes such as ozonation, activated carbon treatment, membrane treatment and their significance are introduced.

Water quality management (4 times)
There are microbial and chemical risks in drinking water. Safe levels should be maintained as drinking water are discussed. Concepts and methodologies to set drinking water quality standards are shown. In addition,

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上水道工学(2)

quantitative microbial risk assessment is discussed.

Achievement confirmation (1 time)
Achievement of learning is confirmed.

[Course requirements]

It is preferable to have knowledge of the courses of Biology and Chemistry for Environmental Engineers, and Water Quality.

[Evaluation methods and policy]

Grade is evaluated by reports, a paper test, and attendance.
Breakdown: sum of the results of the reports and the paper test (60%), attendance (40%).

[Textbooks]

Not used

[References, etc.]

（Reference books）

Itoh S., Ohtani S., Kozuki Y., Nishimura F., Hashimoto O., Higuchi T., Fujiwara T., Yamazaki S., Yamanaka R., Yamamoto H. 『Intelligible Environmental Engineering』（Rikoh Tosho）ISBN:9784844608318
Itoh S. and Echigo S 『Disinfection byproducts in water.』（Gihodo）ISBN:9784765534284

（Related URLs）

http://www.urban.env.kyoto-u.ac.jp

[Study outside of class (preparation and review)]

Instruction will be given by the professors.

（Other information (office hours, etc.)）

Office hours are not set. But, please visit a C-1 232 room if there are any questions.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33055 LJ16　U-ENG23 33055 LJ73		
Course title (and course title in English)	下水道工学 Sewerage System Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,Fujiwara Taku Graduate School of Engineering Professor,NISHIMURA FUMITAKE Graduate School of Engineering Associate Professor,HIDAKA TAIRA Graduate School of Engineering Assistant Professor,TAKEUCHI HARUKA Graduate School of Global Environmental Studies Assistant Professor,NOMURA YOUHEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Sewerage system is one of the imperative infrastructures in order to create fine and healthy life, which drains sewage and storm water, and treats domestic wastewater. This course explains the basic knowledge of sewerage system, such as roles, objectives, and significance of sewerage system, water quality management, and design & operation of the facilities from the point of construction engineering.

[Course objectives]

・To acquire the fundamental knowledge about sewerage system.
・To understand the role and function of each facility in sewerage system and to be able to explain and design the facility.

[Course schedule and contents]

(1) Master plan of sewerage system[2 weeks]:
Introduction on sewerage system and course guidance. Roles and significance of sewerage system for creation of desirable water environment and management. Type of sewerage system, comprehensive basin-wide planning of sewerage systems, relationship among the sewerage-like facilities such as Jokaso and drainage facilities for agricultural communities. Engineering ethics.

(2) Sewage collection system[2 weeks]:
Lecture on the planning and design of sewage pipe, settling basin, and pumping station.

(3) Treatment technology[5 weeks]:
Lecture on the treatment type(primary treatment, secondary treatment, and complete treatment), their selection process, and basic flow of treatment. Solid-liquid separation and biological process(activated sludge process, rotating biological contactor: RBC), their treatment mechanisms and design & operational parameters.

(4) Advanced treatment[2 weeks]:
Lecture on the advanced treatment such as nutrient removal, removal of trace harmful organic compounds by ozone. Background, treatment principle, design & operation, and system configuration.

Continue to 下水道工学(2)↓↓↓

下水道工学(2)

(5) Treatment and disposal of sewage sludge[1 week]:
Lecture on the final disposal of the sludge and fundamental component of the process. Direction of future treatment of sewage sludge from the view point of energy saving.

(6)New perspective of sewerage system[2 weeks]:
Special lecture by a specialist such as a public official from Ministry of Land, Infrastructure, Transport and Tourism.
Future perspective, technological trends and expansion, attitudes of governments

(7) Final examination/ Learning achievement evaluation

(8) Feedback

[Course requirements]

Water quality engineering, hydraulics

[Evaluation methods and policy]

Evaluation will be based on the written examination.

[Textbooks]

津野洋・西田薫 『環境衛生工学』（共立出版）ISBN:4320073878

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Review with related literature is strongly recommended in order to understand broadly based knowledge and to obtain useful information.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33057 LJ15　U-ENG23 33057 LJ77		
Course title (and course title in English)	放射線衛生工学 Radiological Health Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Lectures will be given on properties of radiation, the interaction between radiation and matter, the effects of radiation on human beings and organisms, the exposure dose limit, radiation shielding, radiation sources, treatment, radiation protection methods, radiation environment monitoring, engineering problems related to environmental radioactivity, and its impact assessment method.

[Course objectives]

Based on the basic knowledge on radiation and radioactivity, understanding the radiation sources in the living environment, the characteristics of radiation exposure, the characteristics of biological influences, and the way of thinking about setting radiation exposure limits. Based on this basic knowledge, understanding the framework of exposure control, environmental monitoring, and environmental radiation risk assessment according to the characteristics of radiation and radioactivity.

[Course schedule and contents]

Radiation and radioactivity (3 times): The purpose and system of radiological health engineering, its definition, the composition of lecture contents, and current radiation related issues will be outlined. In addition, the mechanism of nuclear collapse and the emission of radiation, the stability of atomic nuclei, types and energies of radiation, collapsed series, and so forth will be covered.

Interaction of radiation and matter (3 times): Mechanism and characteristics of interaction between α rays, β rays, and γ rays, characteristics of radiometers, nuclear reactions, collapse diagrams, principles of activation analysis, and so forth will be discussed. Additionally, lectures will be given on the shielding of gamma rays, the kind and thickness of shielding material, the method of external radiation dose assessment by ionizing radiation, and so forth.

Biological/human body effect of radiation (2 times): The mechanism of the influence of radiation on living beings from DNA, cells, and the solid level will be explained. Radiation effects on the human body will be classified, and the concept of radiation protection, exposure limit value and risk, the method of setting exposure limit values, the regulated values by law, methods to avoid radiation exposure, and so forth will be covered.

Method of radiation management (3 time): Radiation effects on the human body will be classified and a lecture will be given on the unit of exposure doses and management methods of radiation exposure.

Measurement method of radioactivity and radiation (1 time): A lecture will be given on the principle and

Continue to 放射線衛生工学(2)↓↓↓

放射線衛生工学(2)

usage of various radiation measuring devices.

Regulation value of radiation (1 time): The concept of radiation protection, exposure limit value and risk, the method of setting an exposure limit value, the regulated value by law, methods to avoid radiation exposure, and so forth will be covered.

Movement of radioactivity in the environment (1 time): A lecture will be given on the method of estimating the movement of radioactivity in the environment and exposure assessment.

[Final exam]

Feedback (1 time): Questions on the lectures or exams will be accepted and answered by E-mail.

[Course requirements]

None

[Evaluation methods and policy]

Evaluated by the scores of the final examination (80%) and small tests after each lecture (20%).

[Textbooks]

Handout will be given at each lecture.

[References, etc.]

（Reference books）

柴田徳思編 『放射線概論』（通商産業研究社）ISBN:9784860451530
(**社**)**日本アイソトープ協会 『アイソトープ手帳』（丸善出版）**ISBN:9784890732777

[Study outside of class (preparation and review)]

Completely understand the contents of each handout.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33058 LJ77　U-ENG23 33058 LJ17　U-ENG23 33058 LJ16		
Course title (and course title in English)	廃棄物工学 Solid Waste Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Agency for Health, Safety and Environment Professor,HIRAI YASUHIRO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This course will study measures used to manage waste generated by household and industrial activities in cities and towns. Students will learn the hierarchical measures used in solid waste management, including waste prevention, reuse, recycling, bioconversion, thermal conversion, and final disposal. We will explain the concept of the 3Cs (Clean, Cycle, and Control) as they relate to hazardous waste and international management systems. We will also introduce strategic case examples for controlling mercury and asbestos waste. The course also covers (1) legal systems used for the definition and classification of municipal solid waste (MSW), (2) basic properties of MSW, (3) management plans and collection/transportation methods for MSW, and (4) basic waste management techniques and systems such as MSW treatment, recycling, and final disposal.

[Course objectives]

The major objectives of the course are:
(1) to learn about the waste management hierarchy and the processes of waste prevention, reuse, recycling, bioconversion, thermal conversion, and final disposal;
(2) to gain an understanding of hazardous waste definitions and international legal systems on hazardous waste, as well as the 3Cs concept; and
(3) to acquire basic knowledge about MSW management plans and the techniques and systems used for MSW collection, transportation, treatment, recycling, and disposal.

[Course schedule and contents]

1. Resource Consumption and Waste Generation (1) Material Flow, Material Industry (Hirai)
2. Resource consumption and waste generation (2) Flow, stock, and life span of durable consumer goods (Hirai)
3. Definition and classification of waste and legal systems on waste management (Hirai)
4. Collection and transportation of waste (Hirai)
5. Hierarchical waste management (1) Reduce, Reuse and Recycle (Hirai)
6. Hierarchical waste management (2) Composting and biogas production (Hirai)
7. Hierarchical waste management (3) Incineration and energy recovery (Takaoka)
8. Hierarchical waste management (4) Landfill (Hirai)
9. Hazardous waste management (1) Definition and basics of hazardous waste (Hirai)
10. Hazardous waste management (2) Mercury (Takaoka)
11. Hazardous waste management (3) Asbestos (Hirai)
12. Waste disposal costs and waste charging (Hirai)

Continue to 廃棄物工学(2)↓↓↓

廃棄物工学(2)

13. Evaluation and management of environmental impact associated with waste treatment (1) Characterization of waste (Hirai)
14. Evaluation and management of environmental impact associated with waste treatment (2) LCA (Hirai)

<<Final examination>>

15. Feedback

[Course requirements]

None

[Evaluation methods and policy]

Evaluating method: examination scores, 60%; report and quizzes, 40%.

[Textbooks]

Not specified. Materials and references will be given in class when needed.

[References, etc.]

（Reference books）

To be announced in class.

[Study outside of class (preparation and review)]

Review on the materials and references distributed. Specified points will be announced in class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33059 LJ76　U-ENG23 33059 LJ16　U-ENG23 33059 LJ73		
Course title (and course title in English)	環境装置工学 Environmental Plant Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Program-Specific Associate Professor,HARADA　HIROKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This lecture is aimed at learning principle of environmental plants to conserve the environment. Unit operations such as fluid transportation, separation, thermodynamics, mass transfer, heat transfer and reaction are explained. Also, the principle and design for treatment devices of liquid, gas and solid are shown.

[Course objectives]

Understand the role of environmental plant to conserve the environment and common engineering techniques for the plants

[Course schedule and contents]

Class 1: Introduction to Environmental plant engineering
The engineering ethics are introduced based on accidents in the past.
Lecture on unit operations and system in environmental plants, and units and important parameters used in environmental plant.

Class 2-3: Separation
Lecture ons property of particles such as dust and sludge and separation processes such as thickening, filtration, dust collectors.

Class 4-5: Chemical reaction
Lecture on Reaction pattern and Reactor types such as batch, continuous stirred-tank and plug flow reactors

Class 6-7: Heat transfer
Lecture on heat transfer such as thermal conduction, convection and radiation and the applications

Class 8: Midterm examination

Class 9-10: Fluid flow processes
Lecture on fluid flow processes and the applications such as measurement of air velocity

Class 11-12: Air conditioning and thermodynamics of vapor
Lecture on air conditioning and thermodynamics of vapor and usage of steam table and humidity chart

Class 13-14: Mass transfer
Lecture on mass transfer such as gas ‐ liquid equilibrium and the the applications such as gas absorber tower

Continue to 環境装置工学(2)↓↓↓

環境装置工学(2)

Class 15: Checking the degree of learning achievement and making the answers for quizzes, Feed back

Class 16: Final examination

[Course requirements]

It is desirable that students have already learned Hydraulics and Exercises

[Evaluation methods and policy]

Evaluated by the final examination (60 points) and the participation including attendance, midterm examination and quizzes (40 points)

[Textbooks]

Not used

[References, etc.]

（Reference books）
平岡正勝、田中幹也著 『新版　移動現象論』（朝倉書店）ISBN:9784254250237
水科篤郎、桐栄良三編 『化学工学概論』（産業図書）ISBN:4782825102

[Study outside of class (preparation and review)]

Lecture materials are delivered in class. Review the class and the materials.

（Other information (office hours, etc.)）

The order of lecture content can be changed.
This lecture does not have a specific office hour
Questions about each class should be given to Masaki TAKAOKA using E-mail takaoka.masaki.4w@kyoto-u.ac.jp or phone: 075-383-3335.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33077 LJ77		
Course title (and course title in English)	分離工学 Separation Technology	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Energy Science Assistant Professor,KUSAKA EISHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,3times,
,2times,
,3times,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 分離工学(2)↓↓↓

分離工学(2)

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33085 LJ73		
Course title (and course title in English)	公共経済学 Public Economics	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Graduate School of Engineering Professor,OONISHI MASAMITSU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

"The aim is to learn basic concepts of microeconomics and understand concepts related to the theory of evaluation of social infrastructure projects. For this purpose, a relatively detailed lecture will be conducted on the basic concepts of microeconomics, as well as the concepts concerning market functions, the behavior of economic agents, and the evaluation of social welfare. Next, market failure and how to deal with it will be explained. At that time, the economic characteristics of infrastructure and general cost benefit analysis as a method of evaluation will be explained.
"

[Course objectives]

Mastering the basic concepts of microeconomics and understanding concepts related to the theory of the evaluation of infrastructure projects

[Course schedule and contents]

"Outline and public role (1 time): The outline of this lecture and the public role will be explained.
Consumer behavior model (2 times): The consumer behavior model will be described in detail. In particular, after describing the preference, utility, utility maximizing behavior of households, the nature of the demand function, the compensation function, the Slutsky equation, and the aggregate demand function will be described. Furthermore, the type and nature of households' welfare measures will be explained. Text 2
Practice on consumer behavior (1 time): A practice of the above two lectures will be conducted.
Corporate behavior model (2 times): The behavioral model of a company will be explained. First, technology, production function, profit maximization behavior, and cost minimization behavior will be explained as basic knowledge. Next, the nature and points of cost and supply functions will be described in detail, and the market structure and corporate behavior will be explained. Text 3
Practice of company behavior (1 time): A practice of the above two lectures will be conducted.
Market of perfect competition (1 time): The markets of perfect competition will be explained. Additionally, differences between general equilibrium analysis and partial equilibrium analysis, and the concept of Pareto efficiency will be described in detail. Text 4
Market of imperfect competition (1 time): The characteristics of markets of imperfect competition, such as monopolistic markets and oligopolistic markets, and factors that cause monopolies and regulations as countermeasures will be explained. Text 5
Indicator of economic valuation (1 time): Various indicators necessary for measuring benefits, such as consumer surplus, producer surplus, social surplus, compensation variance, and equivalent variance will be described. Text 7

Continue to 公共経済学(2)↓↓↓

公共経済学(2)

Externality (1 time): The generation mechanism of externality and its types, and the internalization policy of externality will be explained. Text 14.1
Public goods (1 time): The nature of public goods and Samuelson conditions will be explained. Text 6
Practice of market and externality (1 time): A practice of the above five lectures will be conducted.
Cost-benefit analysis (1 time): Regarding the concept of cost-benefit analysis, the concepts of cost and benefit, as well as the social discount rate and evaluation index will be explained, and the difference with financial analysis and methods for quantifying benefits will be described in detail. Additionally, from the viewpoint of engineer ethics, the state of project evaluation will be discussed. Texts 8 and 9
Feedback (1 time): Confirming the degree of achievement regarding the contents of this lecture"

[Course requirements]

It is desirable that students have taken the course of planning system analysis and practice.

[Evaluation methods and policy]

Periodical tests, reports, and attendance are comprehensively taken into consideration. (Periodic tests: 70 to 80%; reports and attendance: 20 to 30%)

[Textbooks]

石倉智樹・横松宗太 『公共事業評価のための経済学』（コロナ社）ISBN:9784339056402
Hal R. Varian: Intermediate Microeconomics: A Modern Approach, Nineth Edition, W. W. Norton amp Company, 2014 isbn{}{9780393919677}

[References, etc.]

（Reference books）
小林潔司 『知識社会と都市の発展』（森北出版）ISBN:4627494610

[Study outside of class (preparation and review)]

It is advisable to read the corresponding parts of the textbook in advance.

（Other information (office hours, etc.)）

Questions and so forth will be accepted after the class. Questions can also be asked via e-mail to pub@psa2.kuciv.kyoto-u.ac.jp.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43086 EJ73		
Course title (and course title in English)	材料実験 Construction Materials, Laboratory	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Engineering Assistant Professor,UEMURA KEITA Graduate School of Engineering Assistant Professor,TAKAYA SATOSHI

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.3,4	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Introduction,1time,The objective and contents of this laboratory are introduced. The fundamentals of the measuring and testing method are also introduced.
Cement,1time,The density, the fineness and the setting time of cement, and the flow of mortar are tested.
Aggregate,1time,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,1time,Mix proportion of concrete is designed using the results of lsquocementrsquo and lsquoaggregatersquo. The condition of fresh concrete made by using the designed mix proportion is examined. The test specimens for lsquohardened concretersquo are also cast.
Hardened concrete,2times,Some destructive and non-destructive tests are performed in the test specimens cast in lsquofresh concretersquo.
Reinforcing steel bar,1time,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,3times,The reinforced concrete (RC) and prestressed concrete (PC) beam are designed.
Casting of RC and PC beam,1time,The designed RC and PC beam specimens are cast.
Prestressing,1time,The prestress is introduced in PC beam by post tensioning system.
Loading test of RC and PC beam,2times,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.
Achievement confirmation,1time,Achievement of learning is confirmed.

Continue to 材料実験(2)↓↓↓

材料実験(2)

[Course requirements]

Members of this class had better take 'Construction Materials' and 'Concrete Engineering' in 3rd year.

[Evaluation methods and policy]

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.

[Textbooks]

The Society of Materials Science, Japan: Construction Materials Laboratory, 2,200JPY ISBN:9784901381406

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

'Construction Materials' and 'Concrete Engineering' should be reviewed.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33087 EJ73		
Course title (and course title in English)	**水理実験**(R1**以前入学者**) Experiments on Hydraulics(Enrolled before 2019)	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,HARADA EIJI Disaster Prevention Research Institute Professor,KAWAIKE KENJI Graduate School of Engineering Professor,SANJIYOU MICHIO Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Associate Professor,YOROZU KAZUAKI Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Engineering Assistant Professor,TANAKA TOMOHIRO Graduate School of Engineering Assistant Professor,Takumi Tazaki Disaster Prevention Research Institute Assistant Professor,Takahiro Koshiba Disaster Prevention Research Institute Assistant Professor,MIYASHITA TAKUYA Disaster Prevention Research Institute Assistant Professor,Yamanoi Kazuki Disaster Prevention Research Institute Assistant Professor,YAMADA MASAFUMI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.3,4	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

Continue to 水理実験(R1以前入学者)(2)↓↓↓

水理実験(R1以前入学者)(2)

[Overview and purpose of the course]

The current status of hydraulic experiments, including hydraulic measurement methods and the latest experimental equipments, will be outlined. Experiments on pipe flow and open-channel flow and water surface waves will be conducted for basic phenomena in hydraulics. Programming practice will be conducted for basic problems in the fields of river, coast, and hydrology.

[Course objectives]

Through basic measurement, observation of hydraulic phenomena and computational experience using numerical models for fluid flow, students will obtain a fundamental understanding for investigating physical phenomena of fluids.

[Course schedule and contents]

Introduction to hydraulic experiments [Lec: 1time]: The purpose and contents of hydraulic experiments are outlined and the cases related to the ethics of engineers are explained. Overview of the current status of hydraulic experiments, including measurement devices used in hydraulic experiments and the latest experimental facilities, are outlined.

The following four experiments (A through D) are conducted in small groups on a rotation basis. Students are required to write a report on each experiment and are instructed on the submitted reports.

A) Transition from lamiar to turbulent flows, friction law in pipe flows [1time]: The patterns of laminar and turbulent flows in a pipe are confirmed by the dye injection method. In addition, the Hagen-Poiseuille flow in laminar flow and the Prandtl-Karman flow in turbulent flow are examined in terms of the resistance law.
B) Velocity and free-surface profiles in open-channel flows [1time]: Water surface profile and velocity distribution in open channel flow are measured and compared with theories on the resistance law and velocity distribution in uniform flow. In addition, water surface profile in a channel with varying channel gradient is measured and the theory by one-dimensional analysis method is verified.
C) Hydraulic jump in horizontal bed [1time]: The most basic hydraulic jump on horizontal roadbed is targeted, and the phenomenon itself should be grasped and the experimental values are compared with theoretical ones by one-dimensional analysis.
D) Transmission and deformation behaviors of waves [1time]: Wave profile, celerity, trajectory of water particles, and amplitude of waves propagating in uniform depth are measured. Then, we compare these quantities with the calculated values based on the small amplitude wave theory. In addition, the wave breaking height/depth on the slope are measured and compared with the conventional experimental formula for wave breaking.

For the following four experimental items (1 to 4), the basic properties of the phenomena, mathematical expressions and their discretization are explained. Students are required to create a program, perform the calculations, and write a report. Students are instructed on the submitted reports.
1) Numerical solution of the advection-diffusion equation
2) Tracking of open channel water surface profile
3) Refraction of water surface waves
4) Runoff analysis
Basic properties of phenomena, mathematical expressions and their discretization are explained in the lecture [Lec: 2times].

Achievement confirmation: [1time],
15 lessons (3 lectures, 11 experiments/practices (including report guidance), 1 Achievement confirmation)

Continue to 水理実験(R1以前入学者)(3)↓↓↓

水理実験(R1以前入学者)(3)

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B]).

[Evaluation methods and policy]

Grades will be based on the experiment and programming practice reports (60 points for the four experiment reports and 40 points for the four programming practice reports, for a total of 100 points). Reports submitted without participating in the experiments will not be evaluated.

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

（Reference books）

後藤仁志 『**『流れの方程式』 (森北出版**, 2022)』（ISBN:978-4-627-67671-8）

[Study outside of class (preparation and review)]

Students must read carefully the hydraulic experiment instruction manual previous to the experiment and review the related items in the hydraulics and hydraulic-related lectures. Also, when writing the report, review the related items again.

（Other information (office hours, etc.)）

Some experiments are conducted at Katsura campus (Nishikyo-ku, Kyoto City). How to get in touch with instructors is announced during experiment. Information will be announced via PandA or KULASIS, etc.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43089 LJ74		
Course title (and course title in English)	建築工学概論<地球> Introduction to Architectural Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ARAKI YOSHIKAZU Graduate School of Engineering Professor,NISHIYAMA MINEHIRO Graduate School of Engineering Professor,KOETAKA YUUJI Disaster Prevention Research Institute Professor,MATSUSHIMA SHINICHI

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This course will provide an overview of various building structures (wooden structures, steel structures, reinforced concrete structures, composite structures, etc.), and discuss the characteristics of structural materials that comprise architecture, as well as the structural principles of architecture. These explanations will focus on the relationship between the characteristics of various types of disturbance affecting buildings (in the natural and artificial environment), on the one hand, and the response of building structures, on the other, as well as between the target performances of architectural spaces and the combined principles of structures.

[Course objectives]

At the initial phase of the study of architectural structures, acquire the necessary fundamental knowledge and basic concepts and learn about the organization of academic systems.

[Course schedule and contents]

Building structural mechanics and structural design, 4 classes: Building structures are deformed by the effects of various loads, and internal forces arise. We will discuss the mechanics laws governing such behavior of structures and the basic concepts of building structural mechanics that predict it, without use of mathematical formulas whenever possible. We will discuss displacement and deformation, force and equilibrium, force and deformation, mechanical characteristics of structural elements such as joists, beams and columns, and various structures such as framed structures and shell construction.

Steel structure, 3 classes: These classes will explain the following: a) raw materials of steel, ironmaking techniques and their history, properties of steel material, b) examples of buildings constructed of steel material and their detailed structures, c) process from design to construction and examples of construction. We will explain the principles of earthquake-resistant structures and base isolation in a manner that is easy to understand, and present various dampers to damper building vibration.

Structural materials in buildings, concrete structures, 4 classes: These classes will discuss basic information about main structural materials such as iron, steel, concrete, and wood. With respect to concrete and steel composite structures such as RC, SRC, and CFT, we will explain foundational structural principles, principles of resistance to dead load, live load, and earthquake load, and structural detailings of buildings in practice.

Seismic design, Soil and foundations, Wooden houses, 3 classes : Our country is a leading earthquake-prone

Continue to 建築工学概論<地球>(2)↓↓↓

建築工学概論<地球>(2)

country in the world. It is a very important issue how to design safer buildings anainst earthquakes. The generating mechanism of earthquakes, the seismic ground motion propagation in the soil, and the response of a building are explained. Then, the foundamental concept of seismic design is explained. Moreover, basic knowledge of the soil and foundations, and wooden structure are also outlined.

Confirmation of learning attainment, 1 class: This class will summarize the course and confirm learning attainment.

[Course requirements]

None

[Evaluation methods and policy]

In addition to the final examination(80 points), an evaluation of normal points(20 points) is also performed.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

None

（Other information (office hours, etc.)）

[Office hours] Will be detailed during class.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course
None

(3) Details of practical classes delivered based on instructors’ practical work experience
None

未更新

Course number	U-ENG23 33107 LJ73				
Course title (and course title in English)	土質力学II及び演習 Soil Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,HIGO YOUSUKE Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO		

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Wed.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Consolidaton, 2 times, 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 time, Understand stresses in the ground due to loading, soil strength and pressure distribution below foundation.

Shear deformation and shear strength, 2 times, 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 times, 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 times,

Bearing capasity of foundation, 1.5 times, 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

Continue to 土質力学II及び演習(2)↓↓↓

problems associated with it.

Slope stability, 2 times, Understand the failure mechanisms of both infinite and finite slopes and methods of slope stability analysis.

Soil dynamics, 2 times, Understand the nature of dynamic loads, mechanism of liquefaction and liquefaction parameters, and stress conditions on soil element under earthquake loading.

Infrastructure and ground, 1 time, Understand the recent geoengineering projects and ethical responsibility for geoengineers.

Feedback, 1 time, Understand the intentions and correct answers of the questions given in the examination.

[Course requirements]

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

[Evaluation methods and policy]

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

[Textbooks]

Text book:Fusao Oka,quotSoil Mechanicsquot,Asakura publishing Co., Ltd isbn{}{9784254261448}.

[References, etc.]

（Reference books）

Fusao Oka,quotSoil Mechanics Exercisesquot,Morikita publishing Co., Ltd isbn{}{4627426607}.

（Related URLs）

(http://geomechanics.kuciv.kyoto-u.ac.jp/lecture.html)

[Study outside of class (preparation and review)]

Review of Soil Mechanics I and Exercises is recommended.

（Other information (office hours, etc.)）

Contact Information will be delivered in their first lecture.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

Continue to 土質力学II及び演習(3)↓↓↓

土質力学II及び演習(3)

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG23 33111 LJ73				
Course title (and course title in English)	波動・振動学 Dynamics of Soil and Structures		Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,IGARASHI AKIRA Disaster Prevention Research Institute Professor,GOTOU HIROYUKI	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 formulation 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 schedule and contents]

Vibration of structures and equation of motion (1 week)
Vibration phenomena encountered in civil engineering structures. Impotance and engineering issues of vibration. Derivation of equation of motion.

Free vibration (1 week)
Definition of the natural period and damping ratio for single degree-of-freedom systems. Derivation of free vibration response.

Force vibration (1 week)
Resonance curves and phase response curves for forced harmonic vibration. Frequency response characteristics.

Principle of vibration measurement (1 week)
Background theory of vibration measurement. Accelerometers and seismometers.

Response to arbitrary input (2 weeks)
Evaluation of dynamic response to arbitrary forcing and earthquake excitation. Response spectra.

Nonlinear vibration (1 week)
Fundamental properties of nonlinear dynamic response of structures associated with elasto-plastic behavior.

Vibration of 2-DOF systems (1 week)
Solution of equations of motions for 2-degree-of-freedom systems representing free vibration. Concept of

Continue to 波動・振動学(2)↓↓↓

normal vibration modes.

Natural frequencies and natural modes of vibration (1 week)
Relationship between the natural frequencies, normal vibration modes of multi-degree-of-freedom systems and eigenvalue analysis.

Damped free vibration of MDOF systems (1 week)
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 week)
Modal analysis to evaluate the dyanmic response of multi-degree-of-freedom systems for harmonic and arbitrary excitation.

Vibration of continuum (1 week)
Vibration of shear beams. Flexural vibration. Wave equation. Solution of shear vibration problem.

Elastic wave (2 weeks)
Properties of elastic waves travelling in elastic media and elastic layers. Fundamental concept in deriving solutions of elastic wave propagation problems.

Examination (1 week)
Students' achievements in understanding of the course material are evaluated.

Feedback (1 week)
A feedback session on the class material and examination problems is carried out.

[Course requirements]

Calculus, Linear algebra, Structural Mechanics I and Exercises, Structural Mechanics II and Exercises

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

There may be a couple of homework assignments throughout the course.

Continue to 波動・振動学(3)↓↓↓

波動・振動学(3)

（Other information (office hours, etc.)）

Office hours are not specified; Questions to instructors are accepted by appointment

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33117 LJ73		
Course title (and course title in English)	連続体の力学 Continuum Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Continuum Mechanics is a branch of the physical sciences dealing with the deformation and motion of continuous media under the influence of external effects.
The following basic items are explained with exercises: Fundamentals of tensor analysis, Mathematical formulation of deformation, motion and stress, Conservation laws of continuous media (mass, momentum, angular momentum, energy conservation laws), Constitutive laws of elastic body and Newtonian fluids, Principle of virtual work and minimum potential energy based on the calculus of variations, Finite Element Method, Applications in Elasticity and Fluid Dynamics.

[Course objectives]

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 schedule and contents]

Elementary knowledge on tensor analysis,2times,Definition of tensors, Integral theorem, Material derivative over a material volume, Transformation of components of tensors, etc.
Stress, strain and strain rate tensors,2times,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,2times,Mathematical expression of conservation laws of continuous media (mass, momentum, angular momentum, energy)
Constitutive law of solids and fluids,2times,Constitutive laws of elastic amp visco elastic body and Newton fluids
Principles based on the calculus of variations and FEM,2times,Principle of vurtual work and minimum potential energy based on the calculus of variations, Finite Element Method, etc.
Applications in elasticity and fluid dynamics,4times,Applications in Elasticity and Fluid Dynamics. Wave propagation in elastic body, Thermal convection and Lorentz Chaos, etc.
Achievement confirmation,1time,Achievement of learning is confirmed.

Continue to 連続体の力学(2)↓↓↓

連続体の力学(2)

[Course requirements]

Basic understanding on differential and integral calculus and linear algebra

[Evaluation methods and policy]

Mainly regular examination. Reports and attendance are also considered for grading.

[Textbooks]

Printed materials on the contents of this subjetc are distributed in class.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Students can contact with Prof. Hosoda by sending e-mail to hosoda.takashi.4w@kyoto-u.ac.jp (Katsura C1-3-265).

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23134 LJ73		
Course title (and course title in English)	計画システム分析及び演習 Systems Analysis and Exercise for Planning and Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJII SATOSHI Graduate School of Engineering Associate Professor,KAWABATA YUICHIRO Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO Graduate School of Management Associate Professor,OOBA TETSUHARU Graduate School of Engineering Assistant Professor,NAKAO SATOSHI Graduate School of Engineering Assistant Professor,Tomoki Nishigaki

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

Basic concept for planning and management,6times,
Linear Programming,5times,
Non linear programming,5times,
Dynamic programming, PERT,6times,
Confirmation of progress,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Continue to 計画システム分析及び演習(2)↓↓↓

計画システム分析及び演習(2)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33138 EJ73		
Course title (and course title in English)	土質実験及び演習 Experiments on Soil Mechanics and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Associate Professor,IWAI HIROMASA Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HASHIMOTO RYOTA Disaster Prevention Research Institute Associate Professor,UEDA KYOHEI Graduate School of Global Environmental Studies Assistant Professor,KATO TOMOHIRO Graduate School of Engineering Program-Specific Assistant Professor,MIYOSHI TAKAKO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Introduction and Orientation, 1 time,

Physical properties of soils, 1 time, Structure of soil, Engineering classification of soils, Consistency Limits, Grain size distribution

Compaction Test, 1 time, Laboratory compaction tests, Factors affecting compaction

Hydraulic Conductivity Test & Particle size distribution test, 1 time, Permeability and seepage, Darcy's law, Hydraulic gradient, Determination of hydraulic conductivity, Particle size distribution of soils

Continue to 土質実験及び演習(2)↓↓↓

土質実験及び演習(2)

Model test on seepage flow in soil, 1 time, Model test on seepage flow in soil, Flow net analysis

Consolidation Test, 1 time, Fundamentals of consolidation, Laboratory tests, Settlement-time relationship

Unconfined compression test, 1 time, Stress-strain and strength behavior of clays

Direct Shear Test, 1 time, Mohr-Coulomb failure criterion, Laboratory tests for shear strength determination

Sounding methods, 0.5 times, N-values of standard penetration test and elastic wave exploration

Centrifuge model test, 0.5 times, Experiments using the similarity law of centrifuge test

Shaking table test, 1 time, Experiments using the shaking table test on dynamic behaviours of soils and foundations

Computer Exercise and numerical analysis, 2 times, Fundamentals of math and physics for geotechnical engineering

Special Lecture, 1 time, Special lecture on soil mechanics

Exercise, 1 time, Practical application of laboratory testing data

Feedback, 1 time, Summary of experiments on soil mechanics

[Course requirements]

Soil mechanics I and exercises(31620)
It is recommended to take soil mechanics II and exercises in parallel.

[Evaluation methods and policy]

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.

[Textbooks]

To be announced in the class.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

It is recommended to read testing procedure beforehand.

Continue to 土質実験及び演習(3)↓↓↓

土質実験及び演習(3)

（Other information (office hours, etc.)）

Contact information will be announced in the orientation.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33140 LJ14　U-ENG23 33140 LJ15		
Course title (and course title in English)	大気・地球環境工学 Atmospheric and Global Environmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Assistant Professor,OSHIRO KEN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

The history of global environmental issues are lectured with a special focus on climate change,地球環境問 ozone depletion and acid rain. Moreover, the energy consumption and its environmental relationship would be discussed. The governmental and international organization roles are also presented. Finally the air pollution, its mechanism, health impact and abatement technologies are lectured.

[Course objectives]

To understand the systematic knowledge about global environment and air pollution problem

[Course schedule and contents]

Global environmental change,1time,Structural change in society and environmental problem changes are discussed. History of global environment and current situation are explained. The sustainable development and environmental efficiency, environmental capacities follow.
Climate change,4times,Why climate change happens, greenhouse gas emissions, their reaction in the environment, climate change perspective and impacts are explained. Finally, climate change mitigations are presented.
Ozone layer protection and acd rain,1time,Ozone depletion history, the source substance, ozone layer distribution, ultraviolet effect on health, international ozone layer protection, Montreal protocol effectiveness and Japanese countermeasures are explained. Acid rain mechanism, its ecosystem effect, and the mitigation measures for acid rains are presented.
Energy and environment,2times,Environmental load associated with energy consumption, indoor pollution, urban air pollutions caused by energy consumption and intervention to the material cycle induced by energy consumptions are lectured.
Global environmental protection,1time,International activities for global environmental issues, and Japanese policy as well as private sectorrsquos role are explained.
Air pollution,1time,Global and Japanese air pollution history is introduced. Then, industrial development and its relationship with air pollutions are discussed.
Air pollutants and health impact,1time,Individual air pollution species and its chemical characteristics, as well as health impacts are lectured.
Air pollution law and abatement technology,1time,Environmental standard and emissions regulations for air pollutions are explained. Also, abatement technologies are presented
Air pollution mechanism,1time,Diffusion of pollution, reaction, and deposition are discussed with from the physical chemistry phenomena. Stability of air and air quality model is also explained
Air pollution simulation,1time,Emissions source data, meteorological data, and air chemical transport model simulations are lectured.

Continue to 大気・地球環境工学(2)↓↓↓

大気・地球環境工学(2)

Confirmation of understanding,1time,Confirm the understanding

[Course requirements]

none

[Evaluation methods and policy]

There to be writing test every class and final exam are evaluated as well.

[Textbooks]

Distribute handout copy

[References, etc.]

（Reference books）
3R・低炭素社会検定実行委員会編:3R・低炭素社会検定公式テキスト（ミネルバ書房） 公害防止の技術と法規編集委員会：新・公害防止の技術と法規（大気編）（産業環境管理協会）

[Study outside of class (preparation and review)]

non

（Other information (office hours, etc.)）

Explain in the first lecture

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33141 EJ73　U-ENG23 33141 EJ14		
Course title (and course title in English)	環境工学実験1 Environmental Engineering, Laboratory I	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,Fujiwara Taku Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Graduate School of Engineering Professor,NISHIMURA FUMITAKE Graduate School of Engineering Associate Professor,HIDAKA TAIRA Graduate School of Engineering Assistant Professor,TAKEUCHI HARUKA Graduate School of Global Environmental Studies Assistant Professor,NOMURA YOUHEI

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Mon.3,4,5	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,5times,
,6times,
,2times,
,2times,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 環境工学実験1(2)↓↓↓

環境工学実験1(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33144 LJ77		
Course title (and course title in English)	先端資源エネルギー工学 Advanced Resources and Energy Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Professor,MURATA SUMIHIKO Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Associate Professor,NARA YOSHITAKA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[#039#039, #039#039]

[Course schedule and contents]

,1time,
,1-2times,
,1-2times,
,1-2times,
,1-2times,
,1-2times,
,1-2times,
,1-2times,
,1-2times,

[Course requirements]

None

Continue to 先端資源エネルギー工学(2)↓↓↓

先端資源エネルギー工学(2)

[Evaluation methods and policy]

[Textbooks]

[#039#039, #039#039]

[References, etc.]

（Reference books）

[#039#039, #039#039]

（Related URLs）

([#039#039, #039#039])

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33147 PJ17　U-ENG23 33147 PJ16　U-ENG23 33147 PJ73		
Course title (and course title in English)	学外実習(土木工学コース) Spot Training	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

Continue to 学外実習(土木工学コース)(2)↓↓↓

学外実習(土木工学コース)(2)

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course that includes off-campus training classes.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33147 PJ17　U-ENG23 33147 PJ16　U-ENG23 33147 PJ73		
Course title (and course title in English)	学外実習(環境工学コース) Spot Trainning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

To acquire methodologies of Global Engineering (e.g., structural engineering, hydraulic engineering, geotechnical engineering, planning, and environmental engineering) through their experiences at institutions (e.g., national and local governments, public corporations, and private companies).

[Course objectives]

To improve job consciousness and working knowledge through business experiences related to Global Engineering (Civil Engineering and Environmental Engineering).
To share experiences of internship among the students at debrief meeting and improve their presentation skills.

[Course schedule and contents]

Internship related to Global Engineering (e.g., structural engineering, hydraulic engineering, geotechnical engineering, planning, and environmental engineering):
To acquire methodologies of Global Engineering (e.g., mechanical characteristics of structures and methodologies of structural engineering to achieve rational structure design, hydraulics and hydrology for basics of hydraulic structure design, characteristics of soil and rock and basic methodologies of ground structure design, methodologies of rational infrastructure development, and roles of environmental engineering) through actual applications.

[Course requirements]

A required prerequisite is knowledge of basic subjects (e.g., structural mechanics, hydraulics, soil mechanics, systems analysis for planning and management, and fundamental environmental engineering).

[Evaluation methods and policy]

Grade is given based on a report about outcome of the internship, and presentation after the internship.

Continue to 学外実習(環境工学コース)(2)↓↓↓

学外実習(環境工学コース)(2)

[Textbooks]

Not used
No textbook.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

To follow guide of the staffs.

（Other information (office hours, etc.)）

The contents of internship are dependent on accepting organizations.
*Periods of internship is over 2 weeks from the middle of August to the end of September during summer holidays.
*Briefing attendance at the beginning of fiscal year is necessary.
To confirm information on details of office hours via KULASIS.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33148 LJ73		
Course title (and course title in English)	空間情報学 Geoinformatics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUSAKI JUNICHI Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Introduction,1time,The purpose and role of geoinformatics, and the techniques related to geoinformatics are introduced. In addition, the student will understand the concept of CIM (Construction Information Modeling) to share 3D data among different stages, e.g. design, construction and management. The student will also understand the future trend about CIM.
GIS,6times,The student will understand how to represent geographic information and the geographic information system.
Digital photogrammetry,2times,The student will understand (1) interior orientation, (2) exterior orientation, and (3) colinearity condition.
Remote sensing,4times,The student will understand (1) visible and reflective infrared remote sensing, (2) thermal remote sensing, (3) microwave remote sensing.
3D point cloud data processing,1time,The concept and techniques to process point cloud data measured by light detection and ranging (LiDAR) will be introduced.
Evaluation of understanding,1time,The student will be evaluated for their understanding of the contents offered by the course.
,,

[Course requirements]

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).

Continue to 空間情報学(2)↓↓↓

空間情報学(2)

[Evaluation methods and policy]

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

[Textbooks]

Susaki, J. and Hatayama M., quotGeoinformaticsquot Corona Publishing Co., Ltd., isbn{}{9784339056389}

[References, etc.]

（Reference books）

Japan Association on Remote Sensing, quotRemote Sensing Notequot ibid{}{BB01990469},
Kohei Cho , quotSpatial Data Analysis using GISquot isbn{}{9784772231244}

[Study outside of class (preparation and review)]

Nothing

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33149 EJ73		
Course title (and course title in English)	構造実験・解析演習 Computer Programming and Experiment on Structural Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO Disaster Prevention Research Institute Professor,IGARASHI AKIRA Graduate School of Engineering Professor,KITANE YASUO Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Associate Professor,SAITOU JIYUN Graduate School of Engineering Associate Professor,FURUKAWA AIKO Graduate School of Engineering Associate Professor,MATSUMIYA HISATO Graduate School of Engineering Assistant Professor,UEMURA KEITA Graduate School of Engineering Assistant Professor,GOI YOSHINAO Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI Graduate School of Engineering Assistant Professor,MATSUMOTO RISA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Practical understanding and application of the theory that have been learned in Structure mechanicsIand Exercises and Structure mechanicsIIand Exercises.
To learn the measurement 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 the mechanical properties of member and/or structure.

[Course objectives]

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 schedule and contents]

Introduction, 1 time
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

Continue to 構造実験・解析演習(2)↓↓↓

構造実験・解析演習(2)

Structural Experiment, 6 times
Introducing fundamentals of experiment method and measurement technique for structure model, 5 experiments (cantilver, frame, metal, vibraition test, concrete)

Computer Analysis, 7 times
Computation of the global stiffness matrix, boundary condition, solution procedure, calculation of strain, Visualization, Numerical analysis of a simple beam, Numerical analysis of the test cases (flexural deflection of and a frame)

Feeback lecture, 1 time
Review structural experiments and computer analysis. Confirm the attainment level of learning

[Course requirements]

Computer Programming in Global Engineering, Structure mechanics Ⅰ and Exercises, Structure mechanicsⅡ and Exercises

[Evaluation methods and policy]

Grade is given based on attendance and reports.
Experiment: 50 points (each experiments 10 points), Computer programming:50 points
Evaluation of experiment and computer programming must be over 30 points.

[Textbooks]

Instructed during class
To be distributed in lectures

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Students will review frame analysis.

（Other information (office hours, etc.)）

Office hour (contact information and consultation hours) of the individual lecturer will be given in his/her first lecture.
It is desirable to bring your own laptop.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33150 LJ73				
Course title (and course title in English)	耐震・耐風・設計論 Earthquake and Wind Resistance of Structures, and Related Structural Design Principles		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI Graduate School of Engineering Assistant Professor,MATSUMOTO RISA	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Introduction of design theory of civil infrastructure,2times,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,3times,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,2times,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,2times,The characteristics of natural wind and strong wind are explained and process of design wind for structures is discussed. And various aerodynamics

Continue to 耐震・耐風・設計論(2)↓↓↓

(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,3times,The outline of structural safety analysis is introduced for serviceability, ultimate and fatigue limit of structures. As for uncertanities 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,3times,Seismic design, wind resistant design, optimal design and landscape design for various structures, including long span bridge

[Course requirements]

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)

[Evaluation methods and policy]

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

[Textbooks]

Hand-outs are distributed when necessary.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33151 LJ73

Course title (and course title in English)	地盤環境工学 Geoenvironmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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

[Course schedule and contents]

Soft ground improvement,4times,(1) Foundations of structures, (2) countermeasures against soft ground, (3) principle of ground improvement, (4) innovative materials including geosynthetics, and (5) road and pavement engineering, are introduced.
Environmental Geotechnics,5times,(1) Remediation of contaminated soils and groundwaters, (2) waste containment, and (3) reuse of waste materials in geotechnical applications, are introduced.
Geo-disaster,5times,(1) Rainfall-induced geo-disaster, (2) earthquake-induced geo-disaster, (3) mechanism of liquefaction, and (4) prediction and countermeasure of liquefaction, are introduced.
Achievement confirmation,1time,Achievement of learning is confirmed.

[Course requirements]

quotSoil mechanics I and Exercises (31620)quot would be helpful as a prerequisite.

[Evaluation methods and policy]

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

[Textbooks]

Handouts will be provided.

Continue to 地盤環境工学(2)↓↓↓

地盤環境工学(2)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

Contact Information: Professor T. Katsumi at katsumi.takeshi.6v@kyoto-u.ac.jp.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33152 LJ73		
Course title (and course title in English)	交通マネジメント工学 Transportation Systems Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUJII SATOSHI Graduate School of Management Professor,YAMADA TADASHI Graduate School of Engineering Associate Professor,KAWABATA YUICHIRO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Outlines of Traffic and Transportation Engineering,1time,
Road Transportation Planning,2times,
Survey and Analysis of Travel Behavior,2times,
Approaches for Travel Management,2times,
Survey and Analysis of Road Network,3times,
Traffic Flow Theory,1time,
Plannig and Design of Road,1time,
Traffic Operation,2times,
Feedback,1time,

[Course requirements]

The students are recommended to take #039Probabilistic and Statistical Analysis and Exercises#039 and #039Systems Analysis and Exercises for Planning and Management#039 in advance.

[Evaluation methods and policy]

Students will be graded considering both assingnments and term paper.

[Textbooks]

Y. Iida and R. Kitamura: Traffic Engineering (written in Japanese), Ohmsha, 2008 isbn{}{9784274206382}.

[References, etc.]

（Reference books）

Continue to 交通マネジメント工学(2)↓↓↓

交通マネジメント工学(2)

[Study outside of class (preparation and review)]

The exercises related to the class are assigned to the students in order to encourage them to review the contents of class.

（Other information (office hours, etc.)）

The way to contact with the professors for Q amp A is provided at the first class of this course.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33154 EJ76　U-ENG23 33154 EJ16　U-ENG23 33154 EJ15		
Course title (and course title in English)	環境工学実験2 Environmental Engineering , LaboratoryII	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,TAKAYUKI KAMEDA Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Associate Professor,YOKO SHIMADA Graduate School of Engineering Program-Specific Associate Professor,HARADA　HIROKI Graduate School of Engineering Senior Lecturer,YAMAMOTO KOUHEI Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Engineering Assistant Professor,YASUI MIDORI Institute for Integrated Radiation and Nuclear Science Assistant Professor,IKEGAMI MAIKO

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/Second semester
Days and periods	Tue.3,4,5	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This class is aimed at learning fundamental knowledge, principles and methods on monitoring of atmospheric environment, noise measurement and radiation measurement through various experiments. Also, basic experiments on physical and chemical unit operations in environmental engineering are conducted.

[Course objectives]

Learning experimental methods to measure various factors in the environment and physical and chemical unit operations in environmental engineering.

[Course schedule and contents]

1st and 2nd Class: Introduction to the laboratory and monitoring of atmospheric environment
The outline of 12 experiments in this course and general information for attending students are presented on the first day of class.
These classes cover the following contents to learn the methodology for monitoring atmospheric environment and analyzing air quality.
・Lecture on the measurement techniques of air pollutants, such as nitrogen oxides (NOx) and particulate matter (PM).
・Practice of the measurements of air quality, meteorological observation, and estimation of the amount of emission in the field.

3rd and 4th Class:Noise measurement
To understand physical and subjective measurement of the sound levels in the environment

5th Class: Report writing

Continue to 環境工学実験2(2)↓↓↓

環境工学実験2(2)

To write the reports on these experiments

6th to 11th Class: Environmental process experiments
(1) Air flow condition
Experiment on measurement of air velocity and volumetric airflow to understand the flow condition in a duct.
(2) Flow characteristics of reactors
To evaluate the degree of mixing in reactors by impulse response tracer experiments
(3) The overall heat transfer coefficient of turbulent flow
Obtaining the overall heat transfer coefficient of turbulent flow by heat exchange experiments between hot and cold water.
(4) Coagulation
To decide optimal dosage of a coagulant to turbid samples by conducting jar-test
(5) Settling Characteristics
To understand the settling behavior of suspended particle in water and the design of the horizontal sedimentation tank.
(6) Rapid sand filtration
To evaluate the relationship between turbidity removal and water head loss and to observe filter washing process

12th and 13th Class: Radiation measurement
(1) Basic principles of radiation measurement:
To understand basic principles of radiation measurement applying interaction
between radiation and substances.
To analyze counting rate performance and statistical characteristics of
radioactive decay using GM counter.
(2)Measurement of environmental radioactivity
To measure some radiation dose in living spaces using a personal dosemeter.
To measure concentrations of natural radioactive nuclides in soils.
To master how to investigate pollution points using survey meters.

14th Treatment of Wastewater and Waste
Treat the wastewater and waste generated from experiments

15th Report writing and feed back
To write the reports on these experiment

[Course requirements]

None

[Evaluation methods and policy]

Evaluated by the reports from each experiment and the active participation in each experiment

[Textbooks]

Textbook for the experiments is delivered in class.

Continue to 環境工学実験2(3)↓↓↓

環境工学実験2(3)

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

Read thoroughly the textbook and understand procedures of the experiments.

（Other information (office hours, etc.)）

The date on report writing can be changed. Questions about each class should be given to each faculty member. Questions about overall class should be given to Professor Takaoka.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG23 33155 LJ77　U-ENG23 33155 LJ71　U-ENG23 33155 LJ58		
Course title (and course title in English)	波動工学 Wave Motions for Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU　Shibo

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Simple harmonic motion and its superposition,1time,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,3times,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,1time,A one-dimensional wave equation is drawn taking the case of a string, and the character of a wave is stated.
Analytic Mechinics,2times,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,2times,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,2times,From Maxwell#039s equation, the wave equation with which an electromagnetism phenomenon follows is drawn, and the solution is described.
Diffraction Phnonena,2times,The diffraction phenomena of a wave are described using Kirchhoff#039s integration theorem.
Numerical Simulation of Wave Phenomena,1time,The fundamentals of numerical methods are introduced to

Continue to 波動工学(2)↓↓↓

波動工学(2)

simulate wave phenomena.
Check of Progress , 1 times,Furthermore, the degree of study achievement is checked about whether an understanding of the wave phenomenon progressed through this whole lecture.

[Course requirements]

Vector Analysis, Classical Dynamics, Electromagnetics

[Evaluation methods and policy]

Although experimental mark is based on fundamental score, attendance to a lesson and report results may be taken into consideration.

[Textbooks]

Not used

[References, etc.]

（Reference books）
有山正孝「振動・波動」裳華房 isbn{}{9784785321093}
Walter Fox Smith, Waves and Oscillations, Oxford University Press isbn{}{9780195393491}

[Study outside of class (preparation and review)]

Since the lecture will follow what are written in the Syllabus unless otherwise specified, students are requested to prepare for the class beforehand.

（Other information (office hours, etc.)）

A part of the lecture could be given in English.
Depending on the annual schedule in the academic calendar and of the lecturer, there could be cancellation and supplementary lectures in the semester. Modeled answers will be distributed as a feedback material within the best delay after the final exam.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG23 33156 LJ71		
Course title (and course title in English)	熱流体工学 Thermo-Fluid Engineeering	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,FUJIMOTO HITOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3-4times,
,4times,
,4times,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33159 LJ77　U-ENG23 33159 LJ28				
Course title (and course title in English)	**地殻海洋資源論** Earth Resources and Ocean Energy		Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Energy Science Associate Professor,KUSUDA HIROMU	
Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,2times,
,1time,
,3times,
,1time,
,2times,
,1time,
,1time,
,1time,
,1time,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

Continue to 地殻海洋資源論(2)↓↓↓

地殻海洋資源論(2)

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23162 LJ73		
Course title (and course title in English)	土質力学 I 及び演習 Soil Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Management Professor,HIGO YOUSUKE Graduate School of Engineering Professor,YASUHARA HIDEAKI Graduate School of Engineering Associate Professor,IWAI HIROMASA Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HASHIMOTO RYOTA Disaster Prevention Research Institute Associate Professor,UEDA KYOHEI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Introduction, 0.5 times, Introductory concepts:Understand the principles of soil behavior and the fundamentals of geotechnical practices in soils.

Soil classification and compaction, 3.5 times, Understand the geology of soils, soil classification system, fundamental properties, effective stress, compaction, unsaturated soil and frozen soil

Water flow through soil, 3 times, Understand the permeability and Darcy's law, quick sand condition, seepage and flow nets.

Midterm exam, 0.5 times,

Consolidation and settlement, 3.5 times, Understand Terzaghi's one dimensional consolidation theory, the total and effective stress distribution in soil.

Shear Strength of soil, 3 times, Understand shear strength of cohesive and cohesionless soil, Mohr-coulomb

Continue to 土質力学Ⅰ及び演習(2)↓↓↓

土質力学Ｉ及び演習(2)

failure theory, drained and undrained behavior of clay and sand.

Feedback, 1 time, Understand the intentions and correct answers of the questions given in the examination.

[Course requirements]

The course is designed for students in any major;an earth science background is not required.

[Evaluation methods and policy]

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

[Textbooks]

Text book: Fusao Oka, quotSoil Mechanicsquot, Asakura publishing Co., Ltd isbn{}{9784254261448}.

[References, etc.]

（Reference books）

Fusao Oka, quotSoil Mechanics Exercisesquot, Morikita publishing Co., Ltd isbn{}{4627426607}.

（Related URLs）

(http://geomechanics.kuciv.kyoto-u.ac.jp/lecture.html)

[Study outside of class (preparation and review)]

It is recommended to read the textbook beforehand.

（Other information (office hours, etc.)）

Mimura, Kishida, Higo and Kimoto: Contact Information will be delivered in their first lecture
Katsumi and Takai: Visit their office in Yoshida Campus directly

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33163 LJ73		
Course title (and course title in English)	都市景観デザイン Urban and Landscape Design	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KAWASAKI MASASHI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA Graduate School of Engineering Assistant Professor,TANIGAWA RIKU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

To design the urban facilities, open spaces, landscapes of streets and districts, is to create the place for the people and their activities. It enables to make places in harmony with the environment by making connections of each space of the city, region, and nature. The course aims to consider vision of urban landscape and learn practical skills of design and representation.

[Course objectives]

To understand the ways of design of the urban facilities, open spaces, landscapes of streets and districts. To acquire basic skills of landscape design. Students are expected to get design-mindsets as civil engineers in the end.

[Course schedule and contents]

Guidance:What is urban landscape?,1 time, Definition of landscape, recognition of landscape, visual perception, climate and landscape, living landscape, social system of landscape
What is design?,1 time,Landscape Architecture of Urban structures, roads, streets, waterfront, parks, Design methods, spaces and scales, landscape prediction
Basic practice,5 times,Techniques of drawings: lines and elements, plans(Paley Park), Perspective drawings, sketches
Design practice,5 times,Site survey, Group work (task arrangement and planning), concept making, space design, presentation
Landscape History,1 time,Formation of urban and rural villages in Japan and history of civil engineering, urban planning and urbanization in modern times
Landscape Planning,1 time,Landscape Conservation, town planning methodology, examples of urban / region revitalization by public space design
Feedback,1 time,Achievement of learning is confirmed.

[Course requirements]

None

[Evaluation methods and policy]

Total points will be scored in attitude of attendance (30%) and results of design practice and reports (70%).

Continue to 都市景観デザイン(2)↓↓↓

都市景観デザイン(2)

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

To be announced

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33164 LJ73				
Course title (and course title in English)	構造力学II及び演習(A班) Structural Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU		
Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Mon.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 schedule and contents]

Work, energy and virtual work,13times,IntroductionWork, virtual work and energyCastiglianorsquos theorems and principle of minimum potential energyVirtual work and complementary virtual workPrinciple of virtual work (virtual displacement)Principle of complementary virtual work(virtual force)Reciprocal theorems
Static determinate and indeterminate,1time,Degree of freedom and degree of indeterminacy
Solutions to statically indeterminate structures,6times,Introduction of force method and displacement methodBy equations of elasticityBy displacement method
Structural stability,3times,Stability criteriaDeformation of rigid body-elastic spring systemDeformation of elastic beam- column system
Basis of matrix method of structural analysis,4 times,Matrix adapted to equilibrium equations/displacement conditionsAnalysis of plane truss
Structral analysis engineer#039s ethics,1time,Examples on structral analysis engineer#039s 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,2times,Confirm the attainment level of learning

Continue to 構造力学II及び演習(A班)(2)↓↓↓

構造力学II及び演習(A班)(2)

[Course requirements]

calculus A and B, Linear Algebra A and B, Structure mechanics Ⅰ and Exercises

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

M. Matsumoto, E. Watanabe, H. Shirato, K. Sugiura, A. Igarashi, T. Utsunomiya, Y. Takahashi: Structure mechanicsⅡ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

Since the class will be based on the content of the previous class, students should review the content of the previous class and check their understanding. Other instructions, including preparation, will be given in class as necessary.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33164 LJ73		
Course title (and course title in English)	構造力学II及び演習(B班) Structural Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAITOU JIYUN

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Mon.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 schedule and contents]

Guidance,2times,Guidance on how this class is operated, and how to use computing facility for this class. Basic knowledge on the role of IDS in network security and how machine learning can help the intrusion detection.
Intrusion Detection by Signature-Based IDS,5times,Learn the mechanism of intrusion detection by signature-based IDS by studying open source signature-based IDS and attacks, such as correspondence between alarms issued from IDS and communications, and adding signatures to detect attacks.
Intrusion Detection by Machine Learning,7times,Learn the method of classifying normal and malicious traffic by machine learning algorithms and public dataset for benchmarking intrusion detection performance.
Presentation,1time,Based on the exercise, students presents their methods of intrusion detection using machine learning, and discuss it with other students and instructors.

[Course requirements]

calculus A and B, Linear Algebra A and B, Structure mechanics I and Exercises

[Evaluation methods and policy]

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

[Textbooks]

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

Continue to 構造力学II及び演習(B班)(2)↓↓↓

構造力学II及び演習(B班)(2)

[References, etc.]

（Reference books）

M. Matsumoto, E. Watanabe, H. Shirato, K. Sugiura, A. Igarashi, T. Utsunomiya, Y. Takahashi: Structure mechanicsⅡ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

Since the class will be based on the content of the previous class, students should review the content of the previous class and check their understanding. Other instructions, including preparation, will be given in class as necessary.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33164 LJ73				
Course title (and course title in English)	構造力学II及び演習(C班) Structural Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,IGARASHI AKIRA		
Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Mon.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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

[Course objectives]

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 schedule and contents]

Guidance,2times,Guidance on how this class is operated, and how to use computing facility for this class. Basic knowledge on the role of IDS in network security and how machine learning can help the intrusion detection.
Intrusion Detection by Signature-Based IDS,5times,Learn the mechanism of intrusion detection by signature-based IDS by studying open source signature-based IDS and attacks, such as correspondence between alarms issued from IDS and communications, and adding signatures to detect attacks.
Intrusion Detection by Machine Learning,7times,Learn the method of classifying normal and malicious traffic by machine learning algorithms and public dataset for benchmarking intrusion detection performance.
Presentation,1time,Based on the exercise, students presents their methods of intrusion detection using machine learning, and discuss it with other students and instructors.

[Course requirements]

calculus A and B, Linear Algebra A and B, Structure mechanics Ⅰ and Exercises

[Evaluation methods and policy]

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

[Textbooks]

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

Continue to 構造力学II及び演習(C班)(2)↓↓↓

構造力学II及び演習(C班)(2)

[References, etc.]

（Reference books）

M. Matsumoto, E. Watanabe, H. Shirato, K. Sugiura, A. Igarashi, T. Utsunomiya, Y. Takahashi: Structure mechanicsⅡ, Maruzen Ltd. isbn{}{4621046403}

[Study outside of class (preparation and review)]

Since the class will be based on the content of the previous class, students should review the content of the previous class and check their understanding. Other instructions, including preparation, will be given in class as necessary.

（Other information (office hours, etc.)）

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.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33165 LJ71		
Course title (and course title in English)	流体力学 Fluid Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,FUJIMOTO HITOSHI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,3times,
,2times,
,1time,
,1time,
,7times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33166 LJ77		
Course title (and course title in English)	物理化学 Physical Chemistry	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,MABUCHI MAMORU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,2times,
,4times,
,4times,
,2times,
,2times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33173 LJ55 U-ENG23 33173 LJ73

Course title (and course title in English)	工業数学B2(土木工学コース) Engineering Mathematics B2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This course lectures Fourier analysis and solution of the partial differential equations as its application. Students learn definitions and characteristics of Fourier series for periodic functions and Fourier transform for integrable non-periodic functions. The course aims to develop the ability to apply the Fourier analysis to various engineering problems. In addition, the course introduces discrete Fourier transform and its application to engineering problems.

[Course objectives]

Students understand Fourier series and Fourier transform together with the mathematical and physical background. Students analyze various problems on the Fourier series and the Fourier transform, and solve the partial differential equations.

[Course schedule and contents]

+Day 1: Introduction
What is Fourier Analysis? How to apply it? Clarify the necessary background knowledge.

+Day 2-3: Fourier series
A periodic function which is expanded into an infinite series of trigonometric functions is called a Fourier series.

+Day 4-5: Partial differential equation I
Second order partial differential equations (Laplace equation, wave equation, thermal equation, etc.) are discussed. The applications of Fourier series to initial-boundary problems are discussed.

+Day 6-8: Convergence of Fourier series and Functional space
Convergence behavior of Fourier series are discussed. Functional space (L2) is introduced as an application of the Fourier series.

+Day 9-10: Fourier transform
Fourier analysis of non-periodic function leads to the Fourier transform. The various properties of the Fourier transform is derived.

+Day 11-12: Partial differential equation II

Continue to 工業数学B2(土木工学コース)(2)↓↓↓

工業数学B2(土木工学コース)(2)

Second order partial differential equations with infinite domain
are discussed as the applications of Fourier transform.

+Day 13: Supplement of Fourier transform
Supplement contents of Fourier transform are lectured, i.e. uncertainty principle, etc.

+Day 14: Discrete Fourier transform
Discrete Fourier transform for digital signals is explained.

+Day 15: Exercise
Exercise the typical problems about Fourier analysis and partial differential equations.

[Course requirements]

Calculus, Linear Algebra, Engineering Mathematics B1.

[Evaluation methods and policy]

Attendance, homeworks, midterm exam, and term-end exam. The details are introduced in the first class.

[Textbooks]

None.

[References, etc.]

（Reference books）

Useful material is introduded during the lecture.

[Study outside of class (preparation and review)]

Students need to review the lecture for preparation to quiz.

（Other information (office hours, etc.)）

KULASIS

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33174 LJ55　U-ENG23 33174 LJ77				
Course title (and course title in English)	工業数学B2(資源工学コース) Engineering Mathematics B2		**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,FUKUYAMA EIICHI	
Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2024/First semester
Days and periods	Tue.2	**Class style**	Lecture (Face-to-face course)	**Language of instruction**	Japanese

[Overview and purpose of the course]

Fourier transform amp Laplace transform and their application to the solution of differential equations,

[Course objectives]

[Course schedule and contents]

Fourier Series and Fouier Transform,1time,
Fourier Transform Appllied to Boundary Value Problem of Differential Equation,3times,
Interporation and Approximation,3times,
Laplace Transform,3times,
Solution of Differential Equations by Laplace Transform,4times,
Liniar System and Laplace Transform,2times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33175 LJ77　U-ENG23 33175 LJ73		
Course title (and course title in English)	岩盤工学(土木工学コース) Rock Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Professor,YASUHARA HIDEAKI Graduate School of Engineering Associate Professor,HASHIMOTO RYOTA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

Understanding of mechanical properties of rock, distributions of rock discontinuities and fractures, mechanical and hydra-mechanical properties of rock discontinuities and fractures. Also basic knowledge of design and construction method of rock structures will be studied.

[Course schedule and contents]

Introduction of Rock Engineering and Underground Space Techonology,1time,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. In addtion, the basic knowledge of geology required to study rock engineering will be explained.
Mechanical propeties of rock and rock joint,3times,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 identification of discontinuity (rock fracture),2times,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,2times,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,4times,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,3times,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

Continue to 岩盤工学(土木工学コース)(2)↓↓↓

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,1time,Students are examined on the understanding of this subjet through a paper test.

[Course requirements]

None

[Evaluation methods and policy]

Evaluation is decided overall as 35% first examination, 45% final examination and 20% of reports and subjects.

[Textbooks]

Not used

[References, etc.]

（Reference books）

Society of Materials Science, Japan: Rock Mechanics isbn{}{4765516288}

[Study outside of class (preparation and review)]

Quizzes are handed out through PandA.

（Other information (office hours, etc.)）

Office hour will be explained at the guidence.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23176 LJ77		
Course title (and course title in English)	岩盤工学(資源工学コース) Rock Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,NARA YOSHITAKA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

A material experiment for observing the mechanical properties and microscopic characteristics of rocks and metal materials and an observation of the structure of materials will be carried out. By completing this experiment, students will learn how to measure the mechanical properties of rocks and metal materials, how to observe structures, and how to use equipment related to measurement and observation.

[Course objectives]

In this experiment, the aim is to be able to evaluate the Young's modulus, Poisson's ratio, uniaxial compressive strength, and the tensile strength of rocks and to determine the destruction condition of rocks, as well as the ability to observe the structure of rocks and metals using a microscope, and to be able to evaluate mechanical properties, such as yield stress, tensile strength, and the strain-hardening coefficient of metallic materials.

[Course schedule and contents]

Overall description (1 time): An overall explanation will be given about the purpose of the class, the program, safety notes, and division into groups.

Rock material testing and destruction conditions (4.5 times): An outline of rock material tests, Young's modulus, how to obtain Poisson's ratio, uniaxial compressive strength, and the tensile strength calculation method will be explained. Additionally, starting with preparing rock specimens for each group, the uniaxial compression test of rocks and the strain measurement by strain gauge, the tensile test of rocks (compression test), the evaluation of Young's modulus and Poisson's ratio, and destructive condition determination will be carried out.

Tensile test and mechanical properties of metallic materials (4.5 times): The outline of the test method for metallic materials will be explained. Additionally, a uniaxial tensile test of steel material/aluminum alloy material will be conducted, and a calculation of the stress-strain curve as well as the evaluation and analysis of mechanical properties will be carried out.

Tissue observation of metal and rock (4.5 times): The method of observing the structure of metals and rocks and the usage microscopes will be explained. Regarding the observation of metallic structures, grinding and corrosion of the specimen is performed by each group, and the structure observation of crystal grains and so forth is conducted. As for the observation of the structure of rocks, the principle and usage of polarizing microscopes will be studied and the observation of rocks and minerals by means of polarized microscopes

Continue to 岩盤工学(資源工学コース)(2)↓↓↓

岩盤工学(資源工学コース)(2)

will be conducted; in addition, discussions on the observation results will be carried out.

[Course requirements]

It is desirable that students have taken “Basic Experiment on Resource Engineering.” It is also desirable to take “Field Practice of Resource Engineering,” “Rock Engineering,” and “Material and Plasticity” of the Resource Engineering course, which are open at the same time.

[Evaluation methods and policy]

Experiments are conducted for each group, and experiment reports are assigned for each topic. Grading will be based on 50% for efforts towards experiments and 50% for the experiment report.

[Textbooks]

Others; prints will be distributed as necessary.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

It is required to attend every class, work on the tasks handed out to each person in charge, and submit reports.

（Other information (office hours, etc.)）

Attendance is recommended for all third-year students of the Resource Engineering course. Contact details and important issues will be presented during the overall explanation of the first class.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

未更新

Course number	U-ENG23 33180 LJ75　U-ENG23 33180 LJ71		
Course title (and course title in English)	材料と塑性 Materials and Plasticity	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Energy Science Professor,MABUCHI MAMORU

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Understanding the fundamentals of mechanics and dislocation theory related to plastic materials, and learning the basic knowledge indispensable for understanding the forming and deformation of metals.

[Course objectives]

Ability to explain the basic aspects of plastic constitutive equations and dislocation theory, which are the basis of analyzing the deformation behavior of materials in various plastic forming processes.

[Course schedule and contents]

[1st Class]
Introduction (summary of plasticity and plastic forming, concept of plasticity, history of plastic forming), definitions of stress and strain.

[2nd class]
Stress-strain curves (work-hardening curves) in metals, modeling of work-hardening curves, plastic deformation behavior in tensile deformation of sheet metals, and condition of onset of necking.

[3rd - 4th class]
・Yield functions: Plastic deformation in multiaxial stress condition, equivalent stress, equivalent plastic strain, von Mises yield criterion, Tresca yield criterion, comparison with experiments.
・Plastic constitutive equations (strain increment theory): Levy-Mises equations, Prandtl-Reuss equations, mathematical properties of yield functions.

[5th - 7th class]
Elementary analysis of plastic deformations: Plane strain compressive deformation of blocks, uniform bending of sheets, etc.
Reports, quizzes, exercises, etc. are assigned for each item in order to verify attainment of learning.

Fundamentals of Dislocation Theory (1); 4 classes; edge dislocations; screw dislocations; mixed dislocations; dislocation density; dislocation lines; Burgers vectors; Peierls potential; kinks; jogs; dislocations and lattice defects; interaction of dislocations

Fundamentals of Dislocation Theory (2); 3 classes; dislocation behavior such as crossing, combination, decomposition, reaction and generation; work hardening from dislocation theory; strengthening mechanism

Continue to 材料と塑性(2)↓↓↓

材料と塑性(2)

(solid solution strengthening, precipitation strengthening, grain refinement strengthening); thermal activation process and non-thermal activation process of dislocation motion.
Reports etc. shall be assigned for each item to verify attainment of learning.

Verification of attainment, 1 class, verify understanding of lecture contents by showing answers, etc. after regular testing (feedback class).

[Course requirements]

Nothing in particular

[Evaluation methods and policy]

Evaluation based on the results of grades, reports, and final exams.

[Textbooks]

Additional handouts will be distributed as necessary.

[References, etc.]

（Reference books）

Fusahito Yoshida, **『弾塑性力学の基礎』** (Kyoritsu Publishing, 1997), The Japan Society for Technology of Plasticity, ed., **『例題で学ぶはじめての塑性力学** (Morikita Publishing, 2009), Professor Moriya Oyane, **『新編　塑性加工学』** (Yokendo) ISBN:4842501138

[Study outside of class (preparation and review)]

Instructions are given in class.

（Other information (office hours, etc.)）

No office hours shall be provided but questions shall be answered as necessary.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23181 LJ73				
Course title (and course title in English)	社会基盤デザインⅠ Design for Infrastructure I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI		
Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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 quotconvenient and comfortable citiesquot, quotsafe countries to live inquot, quoteco-friendly global societyquot and quotsustainable civilization based on resources and energyquot. 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.

[Course objectives]

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 schedule and contents]

Introduction to Civil Engineering,2times,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,3times,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.

Hydraulic Engineering,3times,There will be three lectures corresponding to Hydraulic Engineering. These three lectures provide the student with basic knowledge of hydraulics from an engineering perspective corresponding to mitigation/prevention of flood induced disasters in river and coastal areas, towards establishment of safe and sustainable water environments. The fundamentals of hydraulic structure design related to hydrostatic analysis will be explained along with examples related to dams, weirs and floating bodies.

Geotechnical Engineering,3times,Civil Engineering is introduced in the view point of geotechnical Engineering, which includes soil mechanics, geo-hazard mitigation, geo-environment, international cooperation, etc.

Continue to 社会基盤デザインⅠ(2)↓↓↓

社会基盤デザインⅠ(2)

Planning and Management,3times,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,1time,Achievement of learning is confirmed.

[Course requirements]

No specific prior knowledge is required

[Evaluation methods and policy]

The score is evaluated comprehensively from reports for each lecture (including performance scores in the class) and the final examination. The full score is 100 marks which consists of 50 marks from reports and 50 marks from the final examination.

[Textbooks]

Handouts will be distributed as appropriate.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

To be notified by instructor during his/her lecture.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

Course number	U-ENG23 33182 LJ73				
Course title (and course title in English)	社会基盤デザインＩＩ Design for Infrastructure II		Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.5	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Expected roles of civil engineers,2times,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,9times,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,3times,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,1time,Confirm the achievements of learning

[Course requirements]

None

Continue to 社会基盤デザインＩＩ(2)↓↓↓

社会基盤デザインＩＩ(2)

[Evaluation methods and policy]

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

[Textbooks]

Distribute printed materials as needed

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Instructions will be given during the class.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33184 PJ73		
Course title (and course title in English)	測量学及び実習(H27以降入学者) Surveying and Field Practice	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUSAKI JUNICHI Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Graduate School of Management Associate Professor,OOBA TETSUHARU Disaster Prevention Research Institute Associate Professor,HIROI KEI Graduate School of Engineering Assistant Professor,NAKAO SATOSHI Graduate School of Engineering Assistant Professor,TANAKA KOSUKE Graduate School of Engineering Assistant Professor,TANIGAWA RIKU Graduate School of Engineering Assistant Professor,ISHII YOSHIE

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Fri.2,3,4	Class style	Practical training (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

測量学に関する講義と実習を行う。講義では様々な測量技術、測量機器の仕組み、観測データにおける誤差の扱いと調整方法について講述する。実習では、測量機器を用いて野外で測量を行い、測量機器の扱いや測量の方法を学ぶ。さらに、得られたデータを整理して調整計算を行うことで、観測情報についての理解を深める。

[Course objectives]

・誤差が含まれるデータから最確値や標準誤差などを推定する背景と論理を理解する。
・観測値へ最小二乗法や誤差伝播の法則を適用して、最確値やその不偏標準偏差を求められるようになる。
・様々な測量の内容を理解する。
・測量実習では、事前に計画を立てる計画性と、班員と協力しながら所期の目標を達成できる協調性を身につける。

[Course schedule and contents]

測量学概説,1回,測量学の目的、歴史、内容について概説するとともに、測量技術の適用事例や最新の測量技術動向を紹介する。
距離測量と角測量,3回,測量技術の基本である距離測量と角測量の方法を学ぶ。また、実習を通して測量機器の設置方法(整準、求心)とセオドライトを用いた角測量技術を体得する。
基準点測量,8回,基準点測量のための測量計画について概説するとともに、代表的な基準点測量法である三角測量、トラバース測量について詳説し、野外における実習を実施する。
水準測量,3回,測点の標高を定めるための水準測量の方法とデータの調整法について説明し、野外における実習を行う。
平板測量と地形測量,4回,測量区域の細部を明らかにするための平板測量、地形測量の方法について述べるとともに、その成果物である地形図の特性、測量と空間の認識との関連性について解説する。

Continue to 測量学及び実習(H27以降入学者)(2)↓↓↓

測量学及び実習(H27以降入学者)(2)

あわせて実習を行う。
誤差論,2回,誤差に関する基本的な概念を説明するとともに、誤差伝播の法則、一般算術平均値の考え方を説明する。
最小二乗法,3回,測量データの処理の基本となる最小二乗法の考え方とその計算方法について演習を交えながら習熟させる。
調整計算,4回,三角測量、トラバース測量データの調整法を解説し、実習で得られたデータを用いた計算演習を行う。
写真測量,2回,写真測量の概要を説明するとともに、実体視、反射実体鏡による航空写真の判読に関する実習を行う。
GPS測量,3回,GPSの原理ならびにGPSを使った測量技術について講義し、演習を行う。さらに、受講生の学習到達度を確認する。
三次元都市モデルと都市計画,1回,国土交通省が主導する三次元都市モデルの概要と都市計画への応用事例について学習する。
測量学とBIM/CIM,1回,建設業界で進められている調査、測量、設計、施工、維持管理における三次元データの取得と活用について学習する。
学習到達度の確認,1回,本講義の内容に関する到達度を確認（講評）する。

[Course requirements]

線型代数学、数理統計学

[Evaluation methods and policy]

中間・期末試験の成績を全体の80%、実習での評価（レポート＋出席状況等）を全体の20%として換算し、評価する。但し、実習での評価点が所定の点数未満の場合、中間・期末試験の成績が良くても不可とする。

[Textbooks]

田村正行・須﨑純一 『新版 測量学』（丸善）ISBN:9784621087480

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

実習では6～7名の学生から構成される班単位で行動することなり、全員が最低一回は班長を務める。班長は計画書や報告書の作成が求められるため、十分な学習が必要である。

（Other information (office hours, etc.)）

This course is provided in Japanese.

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	科学英語（地球）（T1） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/First semester
Days and periods	Wed.4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
,,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	科学英語（地球）（T1） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/First semester
Days and periods	Wed.5	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	科学英語（地球）（T2） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/First semester
Days and periods	Thu.4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48				
Course title (and course title in English)	科学英語（地球）（T2） Scientific English		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Karin L. Swanson	
Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/First semester
Days and periods	Thu.3	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

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,14times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	**科学英語（地球）**（T3） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Second semester
Days and periods	Mon.4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	科学英語（地球）（T3） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Second semester
Days and periods	Mon.5	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
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[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	**科学英語（地球）**（T4） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Karin L. Swanson

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Second semester
Days and periods	Thu.4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
,,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 23185 SJ48		
Course title (and course title in English)	**科学英語（地球）**（T4） Scientific English	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,FURUKAWA AIKO Part-time Lecturer,Stephen Gill

Target year	2nd year students or above	Number of credits	1	Year/semesters	2024/Second semester
Days and periods	Thu.3	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,14times,
,1time,
,,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33187 LJ77　U-ENG23 33187 LJ10　U-ENG23 33187 LJ58

Course title (and course title in English)	資源情報解析学 Resource information analysis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Associate Professor,KASHIWAYA KOKI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Senior Lecturer,ISHITSUKA KAZUYA Graduate School of Engineering Assistant Professor,Noguchi NaNa

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

In the process of geological survey and exploration related to mineral and energy resources, various information, such as lithofacies and minerals, rock physical properties and chemical composition, mechanical properties, and so forth are obtained in large quantities. Lectures will be given on modeling the spatial distribution of resources from this information and accurately evaluating ore reserves. In addition, the information analysis method necessary for designing and planning resource development by land mining, underground digging, and underwater drilling will be covered. Additionally, the geological properties, such as chemical component concentration and groundwater level in the fluid, and the response from underground regarding the input electromagnetic waves in the electromagnetic wave survey change with time. Lectures will be given on analysis methods for such data that change according to time and space, and understand the application to underground structure and the Earth ’ s crust environment evaluation. The contents are composed of four items: geological information analysis, time series data analysis, spatio-temporal data analysis, and integrated analysis of mechanical data. The purpose of the class is to understand the basics of these analytical methods and to acquire knowledge that can be applied to the field of resource engineering.

[Course objectives]

Learning the basics of the geological map creation method required for resource evaluation and the spatial distribution estimation method of geological data, the rock geochemical analysis method and mineral analysis method, the time series data analysis method, and the dynamic data analysis method for resource development. Additionally, being able to understand how they can be applied to the field of resource engineering.

[Course schedule and contents]

Geological information analysis (5 times): Lectures will be given on the quality distribution model by geostatistics, the calculation method of ore reserves, the evaluation method of resource existence by data integration using Bayesian statistics, and the geological map creation and interpretation method of geological structure as a basis for resource distribution modeling. In addition, in order to clarify chemical anomalies of rock-forming ore deposits, lectures will be given on the geochemical data analysis method of rocks and Earth crust fluids, the chemical composition analysis method, and the crystal structure of minerals.

Time series data analysis (2 times): Lectures will be given on autoregressive and multivariate regression

Continue to 資源情報解析学(2)↓↓↓

models, which are representative analysis methods, in order to find inherent regularity from time series data and to enable future prediction.

Spatio-temporal data analysis (2 times): Lectures will be given on principal component analysis and independent component analysis as unsupervised classification methods of spatio-temporal data. In addition, lectures will be given on analysis methods of spatio-temporal data using geostatistics, and will deepen understanding of how to model and visualize geological and environmental data that varies according to time and space.

Integrated analytics of mechanical data (3 times): Lectures will be given on mechanical problems related to the development of underground resources and undersea resources, analysis methods of mechanical data and physical property data, the integration method of core data and logging data, the evaluation method of wide stress fields, and a world stress map, to utilize dynamic data to safely and efficiently develop mineral and energy resources. Additionally, many practical examples will be covered.

Application of Artificial Neural Network (ANN) (2 times): Lectures will be given on the fundamentals of Machine Learning including ANN with practical applications to mineral and energy resource assessment and exploration.

Feedback (1 time): Supplementary explanation of the items of insufficient understanding regarding the content of the above lectures

[Course requirements]

It is assumed that students have taken the third year courses of Geological Engineering and Rock Engineering, and the second year course of Basic Mathematics of Geological Engineering

[Evaluation methods and policy]

Class attendance and the results of reports will be evaluated together.

[Textbooks]

Others; prints will be distributed as appropriate.

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Although preparation is not particularly necessary, students should spend enough time preparing the reports as a review and deepening their understanding.

（Other information (office hours, etc.)）

In case of questions, students should come to the office of the professor in charge. After the grade evaluation,

Continue to 資源情報解析学(3)↓↓↓

資源情報解析学(3)

a class for feedback on the content that was insufficiently understood will be conducted.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33190 LJ77　U-ENG23 33190 LJ75		
Course title (and course title in English)	固体の力学物性と破壊 Mechanical Properties of Solids and Fracture Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURATA SUMIHIKO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

For crystalline materials such as rock and metal, macroscopic behaviors of deformation and destruction are explained from the microscopic standpoint of applying fracture mechanics and solid mechanics.

[Course objectives]

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

[Course schedule and contents]

1st: Explanation about the contents, schedule and evaluation, etc.
Introduction: (Mechanical properties of materials; deformation and destruction,
Industry and materials testing, Accident caused by material destruction,
Physics of deformation and destruction,
Materials science for Earth Resources Engineering)
2nd: Stress/strain and elasticity of crystalline material
(Crystal structure and symmetry of crystal)
3rd: Stress/strain and elasticity of crystalline material
(Crystal system and anisotropic elastic constant)
4th: Mechanical properties of atomic bonds and solids
(Bond strength between atoms, Types of atomic bonds,
Ionic crystal and Madelung constant)
5th: Fundamentals of X-ray crystallography
(Reciprocal space, Diffraction condition, Structure factor, Atomic form factor)
6th: Mechanical model of composite material
(Voigt model, Reuss model, Intermediate model of Voigt model and Reuss model,
Eshelby's equivalent inclusion method)
7th: Homozinization method
8th: Intermediate examination and feedback on the first half classes
9th: Brittle fracture and ductile fracture
(Characteristics of brittle fracture and ductile fracture, Griffith's fracture theory for brittle material)
10th: Linear fracture mechanics
(Deformation mode, Stress field, and displacement field in the vicinity of the crack tip,
Stress intensity factor, Strain energy release rate)

Continue to 固体の力学物性と破壊(2)↓↓↓

固体の力学物性と破壊(2)

11th: Nonlinear fracture mechanics
 (J integral, Crack opening displacement)
12th: Fracture toughness and fatigue
 (Fracture toughness value, Fracture toughness test, Mechanism of fatigue, Fatigue life)
13th: Crack and Fracture in mixed mode
 (Crack propagation and destruction criteria in a mixed mode)
14th: Rheology model
 (Macro rheology model, Microrheology model)
15th: Semester examination
16th: Feedback on the second half classes (Review of the whole class and examination)

[Course requirements]

Differential calculus, integral calculus and linear algebra are necessary for this course.

[Evaluation methods and policy]

A quiz or report problem is given in every class. The grade is evaluated by the sum of their scores and the midterm and final exams. The grading weights of them are 30% and 70%, respectively.

[Textbooks]

Not used
Not specified

[References, etc.]

（Reference books）

Keiichiro Togo 『Zairyo Kyodo Kaiseki-gaku』 （ Uchida Rokakuho Publishing Co., Ltd）ISBN: 4753651320（in Japanese）
Naohiro Igata 『Strength of materials』 （Baifukan Co.）ISBN:4563031860（in Japanese）
Charles Kittel 『Kittel's Introduction to Solid State Physics』 （Wiley John + Sons）ISBN:1119454166

（Related URLs）

(This course does not have a web site.)

[Study outside of class (preparation and review)]

Review the lecture materials and note by yourself. In the next lecture, make a qustion about the points that you could not understand well.

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33200 LJ71　U-ENG23 33200 LJ77				
Course title (and course title in English)	弾性体の力学解析 Fundamental Theory of Elasticity and Stress Analysis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURATA SUMIHIKO		
Target year	3rd year students or above	Number of credits	4	Year/semesters	2024/First semester
Days and periods	Mon.1,2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

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 described.

[Course objectives]

This course aims to master the basics to solve the boundary value problems in linear elasticity analytically or numerically and to obtain the basic knowledge of numerical stress analysis methods such as FEM and BEM.

[Course schedule and contents]

1st: Explanation about the contents, schedule, and evaluation, etc.
 Outline of class and explanation of syllabus, History of elasticity, Stress,
 Coordinate transformation of stress, Principal stress
2nd: Maximum shear stress, Mohl’s stress circle, Stress invariant
3rd: Displacement and strain, Coordinate transformation of strain, Strain invariant, Mohl’s strain circle
4th: Relationship between stress and strain, Elastic modulus,
 Basic equations of elasticity in a rectangular coordinate system,
 Elastic basic formula in polar coordinate system
5th: Airy's stress function in a rectangular coordinate system,
 Two-dimensional elastic problem using Airy's stress function
6th: Various Airy’s stress functions in rectangular coordinate system
7th: Airy's stress function in a polar coordinate system,
 Two-dimensional elastic problem using Airy's stress function in the polar coordinate system
8th: Two-dimensional elastic problem using Airy's stress function in the polar coordinate system
9th: Intermediate examination, and feedback of the first half-classes
10th: Introduction of "Mechanical analysis for elastic bodies based on energy principle",
 Basic equations of small displacement problem in elasticity its solution
11th: Energy principle (Principle of virtual work / Complement virtual work, Strain energy function)
12th: Energy principle (Principle of minimum potential energy, Simple example of energy principle)
13th: Approximate solution based on the variational principle(Introduction to finite element method)
 (Approximate solution based on the principle of virtual work and principle of minimum potential energy)
14th: Finite element method for an elastic material
15th:　Semester examination
15th: Feedback of the second half-classes

Continue to 弾性体の力学解析(2)↓↓↓

弾性体の力学解析(2)

[Course requirements]

Differential calculus, integral calculus, and linear algebra are necessary for taking this course.

[Evaluation methods and policy]

Several Exercises are presented in the term. The midterm exam and final exam are also given. The grade is evaluated by the sum of the exercises and the exams with the weight of 30% and 70%, respectively.

[Textbooks]

Not used
Not specified.

[References, etc.]

（Reference books）

Shigeo Takezono et al. 『Introduction of Mechanics of elasticity-from basic theory to numerical analysis-』（Morikita Publishing Co.）ISBN:9784627666412（in Japanese）

（Related URLs）

(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.)

[Study outside of class (preparation and review)]

It is strongly recommended to solve again the example problems explained in the lecture by yourself.

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33210 SJ77 U-ENG23 33210 SJ54				
Course title (and course title in English)	数値計算法及び演習 Numerical Methods for Engineering and Exercises		**Instructor's name, job title, and department of affiliation**	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI	
Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2024/Second semester
Days and periods	Mon.1,2	**Class style**	Seminar (Face-to-face course)	**Language of instruction**	Japanese

[Overview and purpose of the course]

Explaining numerical solution methods, such as simultaneous linear equations, simultaneous nonlinear equations, and partial differential equations, as well as matrix method analysis for truss structures and finite element method analysis for elastic deformation, and performing computer programming exercises.

[Course objectives]

To acquire the knowledge and skills necessary for performing numerical analysis by computer on one's own through lectures and exercises conducted alternately every few weeks.

[Course schedule and contents]

Simultaneous linear and nonlinear equations: 3 classes
Lecture and practice of various direct and iterative methods and their applications for simultaneous linear equations as well as those of Newton-Raphson method for simultaneous nonlinear equations.

Numerical solutions for partial differential equations: 3 classes
Lecture and practice of explicit and implicit-finite difference methods for partial differential equations, such as diffusion equations.

Numerical solutions for ordinary differential equations: 2 classes
Lecture and practice of numerical solutions for initial value problems.

Analysis of truss structures by matrix method: 3 classes
Explanation of stress analysis methods for truss structures, i.e., matrix method, and exercises to write a computer program for a plane truss structure.

Analysis of plane elasticity problems by finite element method: 4 classes
Explanation of how to formulate a plane elasticity problem using finite element method and its computer programming technique. Exercises about writing and running an example program.

Learning attainment will be verified by assigning reports for each item.

Continue to 数値計算法及び演習(2)↓↓↓

数値計算法及び演習(2)

[Course requirements]

Basic mathematical subjects in the Liberal Arts and Sciences Program, Engineering Mathematics, and Mathematics for Global Engineering

[Evaluation methods and policy]

Obtaining credits for this class requires that grades for both lectures and exercises meet the standards. Performance is comprehensively evaluated according to class grades, reports, and quizzes. Prerequisites are having taken "Fundamental Theory of Elasticity and Stress Analysis", "Computer Programming in Global Engineering", and basic mathematics courses. Methods of asking questions and guidelines for learning will be explained in the first class.

[Textbooks]

Additional handouts will be distributed as necessary.

[References, etc.]

（Reference books）

Will be introduced during classes, if necessary.

[Study outside of class (preparation and review)]

Thoroughly review basic mathematical subjects in the Liberal Arts and Sciences Program, Engineering Mathematics, and Mathematics for Global Engineering, etc. In addition, thoroughly review Fortran programming.

In programming, it is necessary to fully understand not only numerical calculation algorithms but also basic solid/fluid mechanics. Therefore, start programming after thoroughly reviewing the relevant mechanics.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33220 EJ77		
Course title (and course title in English)	資源工学基礎実験 Experimental Basics in Earth Resources and Energy Science, Laboratory	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Engineering Senior Lecturer,ISHITSUKA KAZUYA Graduate School of Energy Science Assistant Professor,KUSAKA EISHI Graduate School of Engineering Assistant Professor,XU Shibo Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.3,4,5	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

[Course objectives]

[Course schedule and contents]

,1time,
,2times,
,2times,
,6times,
,1time,

[Course requirements]

None

[Evaluation methods and policy]

[Textbooks]

Continue to 資源工学基礎実験(2)↓↓↓

資源工学基礎実験(2)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 33231 EJ58　U-ENG23 33231 EJ77　U-ENG23 33231 EJ73		
Course title (and course title in English)	資源工学フィールド実習 Geological and Geophysical Survey, Field Excursion	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Associate Professor,KASHIWAYA KOKI Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,Noguchi NaNa Graduate School of Engineering Assistant Professor,KUBO DAIKI Graduate School of Energy Science Assistant Professor,CHIN YUUSEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.3,4,5	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

In the resource engineering, data acquirement and observation in the field are essential skills. For learning these knowledge, two field experiments are conducted; geological and geophysical surveys.

[Course objectives]

Geological Survey
 Students can understand the relationship between the geology and topography by field observations, and also become familiar with the observation of the geological outcrops from the view point of resource geology. In addition, they can explain how the topography and geology are deeply related each other, and obtain the basic geological information, such as strike, dip, rock type (mineral species) in the field observation (measurement).

 Geophysical Survey
 Students carry out the field training and data analysis of seismic refraction survey and electrical resistivity exploration. In the field training, they learn deployment of geophones for land seismic survey, together with arrangement of current/potential electrodes for electrical survey. In addition, they can understand the vibration at seismic source wave and recording method of the seismic wave, together with the transmission of electric current and the measurement of potential. In the data analysis, students can deeply learn the knowledge about the estimated physical quantity from the recorded data, and also understand the imaging method for underground structure.

[Course schedule and contents]

Topographic Analysis (Geology),2times,The topographic analysis method is lectured as a pre-study of geological field trip, then students carry out the analysis by using topographic maps and aerial photos of the excursion destination.
Field Excursion I, II　(Geology),6times,Students observe the outcrops in the field, and compare the real geological structure with the results done as the exercises. Two excursions on the different locations are conducted.
Presentation,2times,Students make presentations what they learned in the excursion and analysis.
Seismic Survey (Geophysics),2.5times,Along the Kamo river side, the seismic refraction survey is conducted.

Continue to 資源工学フィールド実習(2)↓↓↓

資源工学フィールド実習(2)

The data acquired is analyzed using the quotstripping methodquot, and used for estimating the subsurface structure based on the seismic wave velocity.
Electrical Resistivity Survey (Geophysics),2.5times,Along the Kamo river side, the electrical resistivity survey using the Wenner array is conducted. The data acquired is analyzed , then students learn the theoretical basis of this method together with a way for estimation of subsurface resistivity structure.

[Course requirements]

None

[Evaluation methods and policy]

Evaluation based on reports and presentations. Details will be explained at the beginning of class.

[Textbooks]

It will be presented in the lecture.

[References, etc.]

（Reference books）

It will be presented in the lecture.

[Study outside of class (preparation and review)]

It will be shown in the lectures.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33240 LJ73　U-ENG23 33240 LJ58　U-ENG23 33240 LJ77		
Course title (and course title in English)	地質工学 Engineering Geology	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,KASHIWAYA KOKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

For development of mineral, energy, and groundwater resources and construction of social infrastructure such as dam, tunnel, road, bridge, and large building, geological surveys, tests, experiments, and data processing are indispensable to comprehend underground lithofacies and minerals, rock physical properties and chemical composition, mechanical properties, and so forth. Lectures will be given on the fundaments of Engineering Geology for the comprehension and essential geologic phenomena such as weathering that formed physical and chemical properties of rocks and minerals. In addition, data analysis and rock engineering methods necessary for resource mapping and designing and planning of mine development by surface and underground mining and drilling will be covered.

[Course objectives]

Learning the basics of contribution of Engineering Geology to resource development and social infrastructure. Additionally, being able to understand the principles, methods, mapping, and evaluation of geologic and rock survey, experiment, measurement, and data analysis.

[Course schedule and contents]

-Introduction (1 time) about contents and structure of this class and outlines of target problems and technologies of Engineering Geology.
-Fundamental of geologic survey (1 time) about survey methods of geologic properties and structures and rock classification for engineering purposes.
-Geologic mapping (1 time) about drawing of geological maps and cross-sections.
-Geologic data processing (1 time) about fundamentals of geostatistics and spatial modeling of resource grades.
-Geomorphology (1 time) about fundamentals about topographic analysis using aero-photos and interpretations of fault-related topographic features.
-Weathering (1 time) about fundamentals of physical and chemical weathering processes and generation of alteration minerals.
-Rock fracture analysis (2 times) about stereo-nets of directional data of rock fractures, dominant directions, principal stress axes, and fault type.
-Physical properties of rock masses and their measurements (2 times) about mechanical strength, deformability, and permeability of rock masses and their in-situ experiments.
-Analysis stability of slopes and foundation improvement (1 time): Limit equilibrium analysis of slopes for circle slip and surface failure modes; reinforcement of mechanical strength and decrease of permeability of week rock masses.
-Physics of fluid flow in the Earth's crust (1 time) about geology and permeability, governing factors of

Continue to 地質工学(2)↓↓↓

permeability, and modeling method of groundwater flow.
-Hydrogeochemistry (1 time) about water-rock interactions based on equilibrium and kinetics, modeling method of mass transport.
-Resource geology (1 time) about formation processes of oil, natural gas, coal deposits, shale oil and gas, gas hydrates, geological characteristics of their reservoirs, and methods for resource assessment.

-Examination.

-Feedback (1 time): Supplementary explanation of the items of insufficient understanding regarding the content of the above lectures.

[Course requirements]

It is assumed that students have taken the second year course of Fundamental Geological Engineering.

[Evaluation methods and policy]

Grading is based on the following shares: 30% for the attendance, reports, etc., and 70% for the final exam. But this ratio is changeable depending on situations.

[Textbooks]

Class materials will be uploaded on PandA as appropriate.

[References, etc.]

（Reference books）

Introduced during class
Lecturer for each theme may specify supplemental textbooks if necessary.

[Study outside of class (preparation and review)]

Although preparation is not particularly necessary, students should spend enough time preparing the reports as a review and deepening their understanding.

（Other information (office hours, etc.)）

In case of questions, students should come to the office of the professor in charge. After the grade evaluation, a class for feedback on the content that was insufficiently understood will be conducted.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23250 LJ58　U-ENG23 23250 LJ77　U-ENG23 23250 LJ73		
Course title (and course title in English)	資源工学入門 Introduction to Earth Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Engineering Professor,MURATA SUMIHIKO Graduate School of Engineering Associate Professor,KASHIWAYA KOKI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Through the understanding of natural resources that are integral to the development of our human society, a series of lectures is given to bring the fundamental knowledge in earth resources engineering, i.e., a synthetic research area composed of plural scientific fields such as geology, geophysics, civil engineering, environmental sciences, and the other engineering areas of mechanical, electrical, and material sciences.

[Course objectives]

The acquisition of fundamental knowledge on earth resources engineering and its related engineering fields as synthetic research areas being covered in this academic domain.

[Course schedule and contents]

Resource Geology (6 classes) Fundamentals of resource geology about generation mechanism and location of deposits in the earth and accumulation mechanism of useful metals such as metals are accumulated. First topics are fundamentals of geoscience, including the physical and chemical structures of the earth, geologic and tectonic histories, physics, and chemistry of mineralogy and ores. Next, by classifying deposits by origins into igneous (ortho-magmatic and hydrothermal), sedimentary (chemical deposition, weathering, etc.), and metamorphic deposits, characteristics and generation mechanisms of each deposit type are explained, as wells as a brief introduction of hydrocarbon and coal deposits, typical fossil energy resources. To deepen interests, typical ores in Japanese mines are exhibited. Furthermore, as fundamental knowledge of resource use, basics of geochemical exploration, regional exploration technique using remote sensing, and assessment of reserves using geostatistics and the recent global trend of resource exploration are outlined. Exploration geophysics for the development of hydrocarbon, metallic and mineral deposits are also outlined. Fundamentals on exploration seismology, exploration electromagnetics, petrophysics and related fields are covered. [Koike]

Resource Development and Environments (4 classes) Basic information and knowledge necessary to develop various natural resources, such as mining engineering for minerals and petroleum engineering for oil and gas. First, the outline and planning of natural resources development, feasibility study (FS), and reserve evaluation will be explained. Then, an introduction and fundamentals of mining engineering and petroleum engineering will be given. Finally, the environmental measures technologies such as CCS (Carbon Capture and Storage) and CCUS (Carbon Capture Utilization and Storage) for sustainable natural resources development will be explained. [Murata]

Resource Extraction, Recycling, and Material Flow (4 classes) Following lectures on resource extraction processes from ores through dressing and smelting, recycling methods of metals from waste electric appliances, and material flows of resources crucial for industry and society are also explained. [Kashiwaya]

Continue to 資源工学入門(2)↓↓↓

資源工学入門(2)

Confirmation of proficiency level (1 class) The proficiency level throughout the classes is confirmed for students to deepen their understanding. The answers to the questions used to check the proficiency will be provided.

[Course requirements]

No requirement.

[Evaluation methods and policy]

Grading is based on the following shares: 20% for the attendance, reports, etc., and 80% for the final exam. But this ratio is changeable depending on situations.

[Textbooks]

None specified. Class materials will be uploaded on PandA as appropriate.

[References, etc.]

（Reference books）

Lecturer for each theme may specify supplemental textbooks if necessary.

（Related URLs）

(None)

[Study outside of class (preparation and review)]

Lecturer for each theme may specify the title of reports in the lecture.

（Other information (office hours, etc.)）

After the exam, modeled answers will be distributed through KULASIS with the best delay as a feedback material for each student to review the lecture.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course
A lecture derived from the two instructors ’ practical work experiences outside of academia.

(3) Details of practical classes delivered based on instructors ’ practical work experience

Course number	U-ENG23 33260 LJ77		
Course title (and course title in English)	貯留層工学 Reservoir Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURATA SUMIHIKO

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Fluid flow in an oil and gas reservoir and the geothermal reservoir is explained. Then, the reservoir properties relating to the flow, such as porosity, permeability, relative permeability, capillary pressure, and so on, are explained. Reservoir fluids' properties and their phase behavior are also explained. Furthermore, drilling and completion for an oil/gas well, log interpretation method, and well test analysis are presented.

[Course objectives]

The course goals are as follows: 1) to understand the basics of fluid flow in reservoir based on Darcy#039s law, 2) to master the properties of reservoir rock and fluids and their evaluation methods, 3) to obtain basic knowledge about oil/gas well drilling and completion methods, 4) to understand the log interpretation method and well test analysis.

[Course schedule and contents]

1st: Introduction (Explanation about class schedule and grade evaluation), Summary of oil field development, Reserves, and reserve evaluation methods
2nd: Porosity and Compressibility
3rd: Fluid saturation, Darcy's law, and Permeability
4th: Permeability measurement, Gas slippage, and Non-Darcy flow
5th: Exercise for the permeability of reservoir rock
6th: Wettability & Capillary pressure
7th: Effective & Relative permeability
8th: Reservoir fluid properties
9th: Drive mechanism
10th: Material balance equations
11th: Oil well drilling and completion
12th: Well-test analysis
13th: Electrical properties of reservoir rock
14th: Well logging
15th: Semester examination
16th: Feedback (Review of this class and examination)

Continue to 貯留層工学(2)↓↓↓

貯留層工学(2)

[Course requirements]

The knowledge of differential calculus, integral calculus, physical chemistry, and exploration geophysics is necessary for this course.

[Evaluation methods and policy]

The grade will be evaluated by the score of three report works and final examination. Their weight for the grading is 50% each.

[Textbooks]

Not used
Not specified. Materials for the course will be derivered.

[References, etc.]

（Reference books）

L. P. Dake 『Fundamentals of Reservoir Engineering, 19th impression』 （Elsevier）ISBN:9780444418302

（Related URLs）

(Not specified.)

[Study outside of class (preparation and review)]

It is recommended to review the course materials.

（Other information (office hours, etc.)）

Office hour will be set from 13:00 to 15:00 on the same day of this class.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG23 33270 LJ73　U-ENG23 33270 LJ24		
Course title (and course title in English)	社会防災工学 Social Engineering for Disaster Reduction	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,OONISHI MASAMITSU Disaster Prevention Research Institute Professor,TATANO HIROKAZU Disaster Prevention Research Institute Professor,HATAYAMA MICHINORI Disaster Prevention Research Institute Professor,YAMORI KATSUYA Disaster Prevention Research Institute Associate Professor,HIROI KEI Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

This course provides various concepts, scientific methodologies, engineering technologies and plannings related to social policies for reducing the damage due to natural disasters.

[Course objectives]

To understand damages and social impacts caused by various types of natural disaster so that students can propose reasonable policies for disaster risk reduction in reality. To comprehensively understand various concepts, scientific methodologies, engineering technologies and plannings related to social policies for reducing the damage due to natural disasters.

[Course schedule and contents]

(1) Basics and overviews of social engineering for disaster reduction [4 weeks]
Features and variety of natural disasters, damages due to various kinds of disaster, Conceptual framework of disaster risk reduction

(2) Disaster prevention planning [3-4 weeks]
Based on specified hazard events such as earthquake, floods and so on, the process of disaster events and disaster prevention planning regarding engineering and social measures is provided.

(3) Disaster and information [3-4 weeks]
During a disaster event, various emergency measures must be undertaken including evacuation. The role of information in disaster and measures to link the information to action is discussed.

(4) Evaluation of disaster risk [3-4 weeks]

(5) Feedback

Continue to 社会防災工学(2)↓↓↓

社会防災工学(2)

[Course requirements]

None

[Evaluation methods and policy]

The score is based on the evaluation of multiple report works including mini-reports after the classes.

[Textbooks]

Hand-out materials will be distributed.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Homework such as writing essays will be given as needed-basis.

（Other information (office hours, etc.)）

Office hour is not specified, but students may ask lectures questions by email.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

未更新

Course number	U-ENG23 33280 LJ14　U-ENG23 33280 LJ58　U-ENG23 33280 LJ77

Course title (and course title in English)	物理探査学 Exploration Geophysics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Engineering Assistant Professor,XU　Shibo

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester

Days and periods	Tue.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

About various subsurface exploration methods, technologies for investigating subsurface natural resources from the surface of the earth, their exploration principles, as well as data acquisition methods will be introduced.
Along with lectures on basic physicochemical principles of data processing technology and interpretation methods, energy
-The application to the resource field, environment field, disaster prevention field, ground engineering field, and civil engineering field will also be introduced.

[Course objectives]

The goal is to understand geophysical exploration methods from the perspectives of electromagnetics, seismology, geochemistry, and rock physics.

[Course schedule and contents]

Geoelectromagnetism and geophysical exploration, 5 times, outlines the basic theory of exploration technology by geoelectromagnetic methods. Geophysical exploration
Learn the physical basis and measured physical quantities of geoelectromagnetic methods used in the field of
By doing so, the goal is to understand its physical significance.
Seismology and geophysical exploration, 6 times, outline the basic theory of exploration technology by seismological methods. Refraction from the basics of seismology
By learning about measured physical quantities from the physical basis of law and reflection method exploration,
The goal is to understand the scientific significance.
Geochemical exploration and remote sensing, 3 times, chemical properties of rock minerals forming the crust, mantle, and core,
And a geochemical overview of the basics of geochemical measurements used in the exploration of metal deposits and energy resources.
After that, the interaction between electromagnetic waves and substances used in remote sensing technology, optical sensors, and synthetic apertures.
Basics such as data, remote sensing image processing method and topographic analysis, resource exploration, environmental monitoring, etc.
The application to the above will be described.
Confirmation of achievement, 1 time, understanding of lecture contents.

Continue to 物理探査学(2)↓↓↓

物理探査学(2)

[Course requirements]

Preferrable students are those who have taken university-level physics, chemistry, and earth science.

[Evaluation methods and policy]

Basically, a paper-based exam will be conducted, but each professor in charge may explain the method of grade evaluation.

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

N.P.

（Other information (office hours, etc.)）

Anytime.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course
Mikada: Schlumberger 10 yrs, JAMSTEC 5.5 yrs.
Takekawa: Geo-Research Inst. 2.3 yrs.

(3) Details of practical classes delivered based on instructors ’ practical work experience
Lecture on praxis of geophysical exploration used in private sector practice.

Course number	U-ENG23 33290 SJ15　U-ENG23 33290 SJ14

Course title (and course title in English)	環境工学解析演習 Data Analysis in Environmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Agency for Health, Safety and Environment Associate Professor,YANO JUNYA Graduate School of Engineering Senior Lecturer,YAMAMOTO KOUHEI Graduate School of Engineering Assistant Professor,GOMI RYOUTA Graduate School of Global Environmental Studies Assistant Professor,YUTO TADA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester

Days and periods	Fri.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

　環境工学に関連するデータ処理・解析、統計手法等について、手法の基礎の習得、及び実践的なデータを用いた演習を通じて、環境工学の応用について理解を深めるとともに関連する技術を身に着ける。また、演習結果を学生間で発表し、それに関して議論することでデータ解析とそれをもとにした解釈に関する幅広い視点を身に着けることを目的とする。
　授業は前半部と後半部にわかれ、前半部では主として基礎的な手法やソフトウェアの技能の講義及び関連する演習を行う。後半は実際の環境データを用いて前半部で取得した手法を適用し、グループに分かれてそのデータ解析結果をもとに発表討論を行う。

[Course objectives]

環境工学で扱う複雑なデーターセットから、必要な情報を抽出、表現する技術、及びそれを解釈する能力を習得する。具体的には、様々な種類のグラフを用いてデータの本質を表現する方法論、データ間の関係の分析、機械学習による分類などである。

[Course schedule and contents]

第1回イントロ・講義
第2回データ解析演習　Rの基本
第3回データ解析演習　データの可視化（ヒストグラム、ボックスプロット、棒グラフ、折れ線グラフ、散布図）
第4回データ解析演習　データによる母集団の推定（正規分布、ポアソン分布、信頼区間、有意差、検出力、最尤法）
第5回データ解析演習　データ間の関係の分析法（単回帰分析、重回帰分析、一般化線形モデル、分散分析、ロジスティック回帰）
第6回データ解析演習　機械学習（分類問題）クラスター分析、SVM、NN
第7回データ解析演習　画像処理
第8回データ解析演習　因子分析・モンテカルロ法

第9回環境工学データ解析課題１についての講義
第10回環境工学データ解析課題１についての演習
第11回環境工学データ解析課題１についての発表・討論

Continue to 環境工学解析演習(2)↓↓↓

環境工学解析演習(2)

第12回環境工学データ解析課題２についての講義
第13回環境工学データ解析課題２についての演習
第14回環境工学データ解析課題２についての発表・討論
第15回　フィードバック

[Course requirements]

特にないが，確率・統計の基礎，および線形代数の基礎が身についていることが望ましい。

[Evaluation methods and policy]

【評価方法】
　レポートの成績（50%）、発表・討論の成績（20%）、平常点評価（30%）を基本とする。
　平常点評価には、出席状況の他に小テストが課される場合がある。演習科目なので，授業への参加状況を重視する。
　【評価基準】
　到達目標について、各演習の内容を理解する観点から
　　A＋：すべての観点においてきわめて高い水準で目標を達成している。
　　A　：すべての観点において高い水準で目標を達成している。
　　B　：すべての観点において目標を達成している。
　　C　：大半の観点において学修の効果が認められ、目標をある程度達成している。
　　D　：目標をある程度達成しているが、更なる努力が求められる。
　　F　：学修の効果が認められず、目標を達成したとは言い難い。

[Textbooks]

Instructed during class
なお，原則として履修者各自がノートパソコンを各回持参することを想定している。難しい場合は，１回目の講義時に相談すること。

[References, etc.]

（Reference books）
Introduced during class

[Study outside of class (preparation and review)]

配布するプリントの内容を完全に理解するとともに、関連する知識を自分でも得るようにすること。

（Other information (office hours, etc.)）

オフィスアワーは特に設けないが、質問や学修上の相談があればメール等で事前連絡の上，担当教員のオフィスを訪れること。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23291 LJ73

Course title (and course title in English)	Instructor's name, job title, and department of affiliation
水理学I 及び演習 Hydraulics I and Exercises	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,HARADA EIJI Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Engineering Assistant Professor,Takumi Tazaki

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Hydrodynamics corresponding to fundamental design of hydraulic structures is explained systematically in connection with classical fluid dynamics. Specifically, elementary fluid dynamics, dynamics of perfect fluid, viscous flow and turbulence, dimensional analysis, and one-dimensional flow equation and steady flow in pipelines and open channels. Steady flow related to pipe flow and open channel are main topics. Students will deepen their understanding of the basic theory through exercises.

[Course objectives]

Systematic understanding of fundamental hydraulics・fluid mechanics through exercises

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time, Exercises(Ex): 90 minutes: 0.5 times>.
Vector and tensor analysis [Ex:1time]
Elementary Fluid Dynamics [Lec:6times, Ex:1time]: What is a continuum, Eulerian and Lagrangean descriptions, continuity equation, Euler's equation of motion, Bernoulli's theorem, two-dimensional irrotational flow, etc. are explained. In the exercises, one-dimensional analytical methods based on the continuity equation and the equation of motion are considered.
Viscous Flow and Turbulence (Lec:4times): Deformation stress, Navier Stokes equation, velocity distribution and friction loss in laminar flow, laminar and turbulent flow, Reynolds stress and Reynolds equation in turbulent flow, velocity distribution in turbulent flow will be explained.
Intermediate examination and summary: Intermediate examination and summary of the first half are carried out.
One-dimensional flow equations [Lec:2times]: The derivation of energy and momentum equations for one-dimensional
flows from Reynolds equations will be discussed in detail, and resistance laws for turbulent
flows in one-dimensional flows will be described.
Dimensional analysis and similarity law [Ex:0.5times]: Explanation and exercises on hydraulic quantities and dimensional analysis, pi-theorem and similarity law.
Steady flow in pipe [Ex:0.5times]: Simple calculations of siphons and conduits (single, parallel and pipe

Continue to 水理学I 及び演習(2)↓↓↓

networks) are presented.
Steady-state flow in open channels [Lec:4times, Lec:2times]: The derivation of the water-surface equation from the energy and momentum equations for one-dimensional flows is discussed in detail. Specific energy, specific force, expressions for isentropic flow velocity, isentropic and limiting water depths, water surface profile equations for gradual flow and their qualitative solutions (qualitative sketch of water surface profiles) are explained. In the exercises, basic problems of open channel analysis based on one-dimensional flow equations will be dealt with.
Achievement confirmation: Comprehension assessment will be conducted.
Feedback

[Course requirements]

Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A] and [Fundamental Physics B]). Having taken the credits for [Advanced Dynamics] is preferable.

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exams (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

後藤仁志 『流れの方程式』（森北出版）ISBN:978-4-627-67671-8
演習では必要に応じてプリント教材（印刷物）を配布する。

[References, etc.]

（Reference books）
指定しない。

[Study outside of class (preparation and review)]

Review of lecture content and revision of exercises

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33292 LJ73		
Course title (and course title in English)	水理学II Hydraulics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,HARADA EIJI Graduate School of Engineering Professor,SANJIYOU MICHIO Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

As a continuation to Hydraulics I and the Exercises, the essential topics in modern hydraulics and fluid mechanics are covered and discussed in detail. In particular, the mechanics of water surface waves, the shallow water flow equation and its applications, turbulence statistics and the closure problem of Reynolds equation are addressed.

[Course objectives]

To learn and deepen the understanding of essential matters in modern hydraulics・fluid mechanics.

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time>.
Dynamics of water surface waves [Lec:4times]: Governing equations of water surface waves, solutions of small amplitude waves, long and deep water waves, wave groups and group velocities, mechanical energy of water surface waves, surface tension waves, two-dimensional waves.
Shallow water flow equation [Lec:2times]: Depth integration and derivation of shallow water flow equation, shallow water flow equation for rotating systems.
Intermediate examination and summary: Intermediate examination and summary of the first half are carried out.
Equation of coastal current [Lec:2times]: Derivation of the equation of coastal current and explanation of the physical meaning of radiation stress.
Turbulence statistics and Reynolds equation completion problem [Lec:5times]: Turbulence statistics, Kolmogorov's local isotropy theory, derivation of Reynolds stress equation, Boussinesq approximation and one and two equation turbulence models.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

Continue to 水理学II(2)↓↓↓

水理学II(2)

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B], and [Advanced Dynamics]).

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exam (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

後藤仁志 『流れの方程式』（森北出版）ISBN:978-4-627-67671-8

[References, etc.]

（Reference books）
指定しない。

[Study outside of class (preparation and review)]

Review of lecture content

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

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Course number	U-ENG23 33293 LJ73		
Course title (and course title in English)	河川・海岸工学 River/Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,HARADA EIJI Disaster Prevention Research Institute Professor,SUMI TETSUYA Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,KOBAYASHI SOHEI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Fundamental items related to river engineering (i.e. mathematics of flood flow, characteristics of flood disasters, flood control, river basin planning, nature restoration, and sediment transport management) and coastal engineering (i.e., coastal processes, wave shoaling, irregular wave, tsunami, storm surge, tidal wave, wave force) and basics of sediment-transport related to both river/coastal engineering are taught.

[Course objectives]

Our goal is a systematic understanding of fundamental aspects of river/coastal engineering.

[Course schedule and contents]

<Lectures(Lec): 90 minutes >.
Flood Control Planning [Lec:4times]: Rivers and river engineering (why river engineering is important, history of human involvement in rivers, characteristics of recent floods), flood flow hydraulics (building bridge from hydraulics to river engineering), inundation analysis (hazard map), river topography (riverbed morphology) and river channel shape (ruler cross-section, embankment), river law and flood control planning (river maintenance basic policy and river improvement plan), and river structures (dams, weirs, sluices and gates) are outlined.
River Environment Planning [Lec:2times]: Ecosystem services and river ecosystem management, nature oriented river works, environmental improvement below dams, integrated sediment management (erosion control, reservoir sedimentation/sediment removal, river channel management), and integrated basin management (River Basin Disaster Resilience and Sustainability by All, Eco-DRR) are outlined.
Movable bed hydrodynamics [Lec:2times]: Outlines of River bed fluctuation and beach deformation analysis, and basics of bed and suspended load models are outlined.
Wave statistics and wave deformation [Lec:2times]: Mechanism of wave generation and development and engineering treatment of irregular waves are outlined. Transformation mechanisms of ocean waves near the coast due to water depth variation are outlined.
Wave force and wave resistant design [Lec:2times]: The characteristics of waves acting on coastal structures, the formula for calculating the wave force and the stability of rubble mound breakwaters are outlined. An overview of numerical design of wave resistant structures is given, and the latest numerical simulation

Continue to 河川・海岸工学(2)↓↓↓

models are also discussed.
Tsunami and storm surge[Lec:2times]: The characteristics of tsunamis and storm surges are outlined. Evacuation behavior and plans for tsunami evacuation are also outlined.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises] and [Hydraulics II]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B], and [Advanced Dynamics]).

[Evaluation methods and policy]

Grades will be based on an assessment of the final exam.

[Textbooks]

指定しない。

[References, etc.]

（Reference books）
後藤仁志 『数値流砂水理学』（森北出版，2004）ISBN:978-4-627-49561-6
ダム工学会編著 『ダムの科学（改訂版）』（ソフトバンククリエイティブ，2019）ISBN:978-4-7973-9708-6

[Study outside of class (preparation and review)]

Review of lecture content

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lecture is conducted along with exercise. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33294 EJ73		
Course title (and course title in English)	水理実験(R2以降入学者) Experiments on Hydraulics(Enrolled after 2020)	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,HARADA EIJI Disaster Prevention Research Institute Professor,KAWAIKE KENJI Graduate School of Engineering Professor,SANJIYOU MICHIO Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Associate Professor,YOROZU KAZUAKI Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Engineering Assistant Professor,TANAKA TOMOHIRO Graduate School of Engineering Assistant Professor,Takumi Tazaki Disaster Prevention Research Institute Assistant Professor,Takahiro Koshiba Disaster Prevention Research Institute Assistant Professor,MIYASHITA TAKUYA Disaster Prevention Research Institute Assistant Professor,Yamanoi Kazuki Disaster Prevention Research Institute Assistant Professor,YAMADA MASAFUMI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.3,4	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

Continue to 水理実験(R2以降入学者)(2)↓↓↓

水理実験(R2以降入学者)(2)

[Overview and purpose of the course]

The current status of hydraulic experiments, including hydraulic measurement methods and the latest experimental equipments, will be outlined. Experiments on pipe flow and open-channel flow and water surface waves will be conducted for basic phenomena in hydraulics. Programming practice will be conducted for basic problems in the fields of river, coast, and hydrology.

[Course objectives]

Through basic measurement, observation of hydraulic phenomena and computational experience using numerical models for fluid flow, students will obtain a fundamental understanding for investigating physical phenomena of fluids.

[Course schedule and contents]

Introduction to hydraulic experiments [Lec: 1time]: The purpose and contents of hydraulic experiments are outlined and the cases related to the ethics of engineers are explained. Overview of the current status of hydraulic experiments, including measurement devices used in hydraulic experiments and the latest experimental facilities, are outlined.

The following four experiments (A through D) are conducted in small groups on a rotation basis. Students are required to write a report on each experiment and are instructed on the submitted reports.

A) Transition from lamiar to turbulent flows, friction law in pipe flows [1time]: The patterns of laminar and turbulent flows in a pipe are confirmed by the dye injection method. In addition, the Hagen-Poiseuille flow in laminar flow and the Prandtl-Karman flow in turbulent flow are examined in terms of the resistance law.
B) Velocity and free-surface profiles in open-channel flows [1time]: Water surface profile and velocity distribution in open channel flow are measured and compared with theories on the resistance law and velocity distribution in uniform flow. In addition, water surface profile in a channel with varying channel gradient is measured and the theory by one-dimensional analysis method is verified.
C) Hydraulic jump in horizontal bed [1time]: The most basic hydraulic jump on horizontal roadbed is targeted, and the phenomenon itself should be grasped and the experimental values are compared with theoretical ones by one-dimensional analysis.
D) Transmission and deformation behaviors of waves [1time]: Wave profile, celerity, trajectory of water particles, and amplitude of waves propagating in uniform depth are measured. Then, we compare these quantities with the calculated values based on the small amplitude wave theory. In addition, the wave breaking height/depth on the slope are measured and compared with the conventional experimental formula for wave breaking.

For the following four experimental items (1 to 4), the basic properties of the phenomena, mathematical expressions and their discretization are explained. Students are required to create a program, perform the calculations, and write a report. Students are instructed on the submitted reports.
1) Numerical solution of the advection-diffusion equation
2) Tracking of open channel water surface profile
3) Refraction of water surface waves
4) Runoff analysis
Basic properties of phenomena, mathematical expressions and their discretization are explained in the lecture [Lec: 2times].

Achievement confirmation: [1time],
15 lessons (3 lectures, 11 experiments/practices (including report guidance), 1 Achievement confirmation)

Continue to 水理実験(R2以降入学者)(3)↓↓↓

水理実験(R2以降入学者)(3)

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B]).

[Evaluation methods and policy]

Grades will be based on the experiment and programming practice reports (60 points for the four experiment reports and 40 points for the four programming practice reports, for a total of 100 points). Reports submitted without participating in the experiments will not be evaluated.

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

（Reference books）

後藤仁志 『『**流れの方程式**』 (**森北出版**, 2022)』（ISBN:978-4-627-67671-8）

[Study outside of class (preparation and review)]

Students must read carefully the hydraulic experiment instruction manual previous to the experiment and review the related items in the hydraulics and hydraulic-related lectures. Also, when writing the report, review the related items again.

（Other information (office hours, etc.)）

Some experiments are conducted at Katsura campus (Nishikyo-ku, Kyoto City). How to get in touch with instructors is announced during experiment. Information will be announced via PandA or KULASIS, etc.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13295 LJ77　U-ENG23 13295 LJ73		
Course title (and course title in English)	地球工学総論 Introduction to Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,FURUKAWA AIKO

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学総論は，専門教育の最初かつ唯一の必修科目として，全体講義と少人数ゼミにより実施する授業科目である。系統的な講義によって「地球工学という学問とは何か，それが目指すべき方向や貢献すべきことがらが何であるか」について解説するとともに，個別教官によるゼミ形式の指導のもと，地球工学に関連した具体的な課題に自身で取り組むことによって，「 地球工学科に在籍する4年間に何を学修すべきで，また，それにどのように取り組むべきか」について自ら学ぶ機会とする。

[Course objectives]

地球工学科に在籍する4年間に何を学修すべきで，それにどのように取り組むべきかを修得する。

[Course schedule and contents]

ガイダンス：本講義の内容（授業構成，全体講義の内容，少人数ゼミ実施要領等）について説明する。（1回）

安全と工学倫理：地球工学科での学習と研究活動に際して持つべき安全に対する意識と，技術者・研究者として持つ べき工学倫理について解説する。（1回）

全体講義：21世紀の課題と地球工学が果たすべき役割について，土木，環境，資源の各分野の視点から講述する。（5回）

少人数ゼミ：10名程のグループに分かれ，地球工学科に関係している2つの研究室でそれぞれ3回ずつ少人数ゼミ形式の授業を受ける。その中で，各教員に提示された地球工学に関連した特定の課題（調査・実習・実験など）を教員の指導の下で自ら取り組む。（6回）

研究現況の紹介：地球工学科のいくつかの研究室を訪問し，地球工学科では実際にどのような研究活動を行っているのかについて見て，聞くことにより，地球工学の役割や重要性について理解を深める。（2回）

Continue to 地球工学総論(2)↓↓↓

地球工学総論(2)

[Course requirements]

特にありませんが，工学部地球工学科以外の学科および学部所属で受講を希望する学生は，必ず令和6年4月3日（水）までに受講を希望する旨を地球工学科事務室（総合研究9号館1階）まで申し出てください。

[Evaluation methods and policy]

全体講義については平常点とレポート等によって評価する。また，少人数ゼミについては，課題に取り組む姿勢と課題に対するレポートの成績にもとづいて評価する。

[Textbooks]

全体講義では適宜プリントを配布する。

[References, etc.]

（Reference books）
少人数ゼミでは，各自の指導教員から指示される。

[Study outside of class (preparation and review)]

講義中に指示する。

（Other information (office hours, etc.)）

少人数ゼミの指導教員からは，事前に相談しておけば，講義時間に関係なく個別指導を受けることができる。
重要：工学部地球工学科以外の学科および学部所属で受講を希望する学生は，必ず令和6年4月3日（水）までに受講を希望する旨を地球工学科事務室（総合研究9号館1階）まで申し出てください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13296 SJ10		
Course title (and course title in English)	情報処理及び演習(T1) Computer Programming in Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,YOKO SHIMADA Agency for Health, Safety and Environment Associate Professor,YANO JUNYA

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.2	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学におけるコンピュータ利用の現状と必要とされる情報処理技術を解説するとともに，コンピュータを用いた実習によりプログラミング言語を習得させる．この講義を受講することにより，科学技術計算言語であるFortran90の基本文法を修得，Fortran90によるプログラミングと計算を行うことができるようになる．また，地球工学で必要とされる基礎的な情報処理能力を習得することができる．このためには演習課題を独力でこなす努力を必要とする．

[Course objectives]

Fortran90の基本文法とプログラミングに関する知識を身につけ，地球工学で必要とされる基礎的な情報処理能力を習得する．

[Course schedule and contents]

情報処理概説,1回,地球工学におけるコンピュータ利用の現状と，将来必要とされる情報処理技術の概要を説明する．また，実習で用いるプログラミング言語(Fortran90)及び計算機の概要と端末の使用方法について説明する．
入出力と変数,1回,簡単なプログラムを例として，入力，計算処理，出力からなる基本的なプログラムの構成を説明し，組み込み関数，入出力の命令文の使用方法を講義と演習を通じて理解させる．また，データの種類を説明し，宣言文の書き方，計算上の注意点について述べる．
分岐と繰り返し,2回,プログラムの流れを変えるための条件分岐，繰り返しなどの構造を解説するとともに，命令文の使用方法を述べる．また，フローチャートによるプログラム構造の表現について説明し，演習を行う．
配列,2回,実用的計算を行う上で重要な配列の概念を解説し，その宣言，入出力，配列演算，参照の方法を説明する．また，演習により配列を用いたプログラミングを修得させる。
ファイルの入出力,2回,計算結果をファイルに保存する方法，ファイルに保存されているデータを読み込んで計算に用いる方法，書式を指定したデータの入出力方法について講義と演習により修得させる．
サブルーチン,2回,大規模なプログラムを機能ごとに作成する方法を説明し，サブルーチン，関数副プログラムの使用法を講義と演習により理解させる．
応用計算,4回,以上のプログラミングに関する基礎を前提として，地球工学分野における代表的な応用計算の例を示す．統計処理，グラフ作り，乱数の発生，シミュレーション，数値計算法などを取りあげる．アルゴリズムの整理，フローチャートの作成，計算結果のまとめをレポートとして提出させ，プログラムの作成手順を習熟させる．
フィードバック,1回,講義内容の理解度に関して確認を行う．

Continue to 情報処理及び演習(T1)(2)↓↓↓

情報処理及び演習(T1)(2)

[Course requirements]

「情報基礎演習（工学部）」を履修していること.

[Evaluation methods and policy]

Fortran90の文法について理解し，Fortran90を用いた基本的なプログラミングを行うことができるかどうかを、各回に課される演習課題を含む平常点（50%程度)、定期試験あるいはレポート試験(50%程度)により評価する.
詳細は授業時に説明する.

[Textbooks]

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[References, etc.]

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冨田博之ほか 『Fortran90/95プログラミング』（培風館）ISBN:9784563015879

[Study outside of class (preparation and review)]

授業前には、シラバスを確認し、教科書の該当部分を読んで予習しておくこと。授業後は、授業中に行った演習や提出課題を自宅や学内で各自のパソコンからVDIに接続して復習しておくことが望ましい。

（Other information (office hours, etc.)）

T1-T4の４クラスで行う．途中からの出席はできない．オフィスアワーについては，第1回目の講義時に指示を行う．なお，学生本人が所有するノートパソコンを持参するBYOD（Bring Your Own Device）に基づいて講義が行われるので，授業には必ず各自のパソコンを持参すること.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13296 SJ10		
Course title (and course title in English)	情報処理及び演習(T2) Computer Programming in Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Energy Science Assistant Professor,CHIN YUUSEI

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.1	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学におけるコンピュータ利用の現状と必要とされる情報処理技術を解説するとともに，コンピュータを用いた実習によりプログラミング言語を習得させる．この講義を受講することにより，科学技術計算言語であるFortran90の基本文法を修得，Fortran90によるプログラミングと計算を行うことができるようになる．また，地球工学で必要とされる基礎的な情報処理能力を習得することができる．このためには演習課題を独力でこなす努力を必要とする．

[Course objectives]

Fortran90の基本文法とプログラミングに関する知識を身につけ，地球工学で必要とされる基礎的な情報処理能力を習得する．

[Course schedule and contents]

情報処理概説,1回,地球工学におけるコンピュータ利用の現状と，将来必要とされる情報処理技術の概要を説明する．また，実習で用いるプログラミング言語(Fortran90)及び計算機の概要と端末の使用方法について説明する．
入出力と変数,1回,簡単なプログラムを例として，入力，計算処理，出力からなる基本的なプログラムの構成を説明し，組み込み関数，入出力の命令文の使用方法を講義と演習を通じて理解させる．また，データの種類を説明し，宣言文の書き方，計算上の注意点について述べる．
分岐と繰り返し,2回,プログラムの流れを変えるための条件分岐，繰り返しなどの構造を解説するとともに，命令文の使用方法を述べる．また，フローチャートによるプログラム構造の表現について説明し，演習を行う．
配列,2回,実用的計算を行う上で重要な配列の概念を解説し，その宣言，入出力，配列演算，参照の方法を説明する．また，演習により配列を用いたプログラミングを修得させる。
ファイルの入出力,2回,計算結果をファイルに保存する方法，ファイルに保存されているデータを読み込んで計算に用いる方法，書式を指定したデータの入出力方法について講義と演習により修得させる．
サブルーチン,2回,大規模なプログラムを機能ごとに作成する方法を説明し，サブルーチン，関数副プログラムの使用法を講義と演習により理解させる．
応用計算,4回,以上のプログラミングに関する基礎を前提として，地球工学分野における代表的な応用計算の例を示す．統計処理，グラフ作り，乱数の発生，シミュレーション，数値計算法などを取りあげる．アルゴリズムの整理，フローチャートの作成，計算結果のまとめをレポートとして提出させ，プログラムの作成手順を習熟させる．
フィードバック,1回,講義内容の理解度に関して確認を行う．

Continue to 情報処理及び演習(T2)(2)↓↓↓

情報処理及び演習(T2)(2)

[Course requirements]

「情報基礎演習（工学部）」を履修していること.

[Evaluation methods and policy]

Fortran90の文法について理解し，Fortran90を用いた基本的なプログラミングを行うことができるかどうかを、平常点 (20%)・演習課題 (20%)・中間試験 (20%)・最終課題 (20%)・定期試験 (20%) により評価する.
詳細は授業時に説明する.

[Textbooks]

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冨田博之ほか 『Fortran90/95プログラミング』（培風館）ISBN:9784563015879

[Study outside of class (preparation and review)]

授業前には、シラバスを確認し、教科書の該当部分を読んで予習しておくこと。授業後は、授業中に行った演習や提出課題を自宅や学内で各自のパソコンからVDIに接続して復習しておくことが望ましい。

（Other information (office hours, etc.)）

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*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13296 SJ10		
Course title (and course title in English)	情報処理及び演習(T3) Computer Programming in Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Engineering Assistant Professor,GOI YOSHINAO

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学におけるコンピュータ利用の現状と必要とされる情報処理技術を解説するとともに，コンピュータを用いた実習によりプログラミング言語を習得させる．この講義を受講することにより，科学技術計算言語であるFortran90の基本文法を修得，Fortran90によるプログラミングと計算を行うことができるようになる．また，地球工学で必要とされる基礎的な情報処理能力を習得することができる．このためには演習課題を独力でこなす努力を必要とする．

[Course objectives]

Fortran90の基本文法とプログラミングに関する知識を身につけ，地球工学で必要とされる基礎的な情報処理能力を習得する．

[Course schedule and contents]

情報処理概説,1回,地球工学におけるコンピュータ利用の現状と，将来必要とされる情報処理技術の概要を説明する．また，実習で用いるプログラミング言語(Fortran90)及び計算機の概要と端末の使用方法について説明する．
入出力と変数,1回,簡単なプログラムを例として，入力，計算処理，出力からなる基本的なプログラムの構成を説明し，組み込み関数，入出力の命令文の使用方法を講義と演習を通じて理解させる．また，データの種類を説明し，宣言文の書き方，計算上の注意点について述べる．
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配列,2回,実用的計算を行う上で重要な配列の概念を解説し，その宣言，入出力，配列演算，参照の方法を説明する．また，演習により配列を用いたプログラミングを修得させる。
ファイルの入出力,2回,計算結果をファイルに保存する方法，ファイルに保存されているデータを読み込んで計算に用いる方法，書式を指定したデータの入出力方法について講義と演習により修得させる．
サブルーチン,2回,大規模なプログラムを機能ごとに作成する方法を説明し，サブルーチン，関数副プログラムの使用法を講義と演習により理解させる．
応用計算,4回,以上のプログラミングに関する基礎を前提として，地球工学分野における代表的な応用計算の例を示す．統計処理，グラフ作り，乱数の発生，シミュレーション，数値計算法などを取りあげる．アルゴリズムの整理，フローチャートの作成，計算結果のまとめをレポートとして提出させ，プログラムの作成手順を習熟させる．
フィードバック,1回,講義内容の理解度に関して確認を行う．

Continue to 情報処理及び演習(T3)(2)↓↓↓

情報処理及び演習(T3)(2)

[Course requirements]

「情報基礎演習（工学部）」を履修していること．

[Evaluation methods and policy]

Fortran90の文法について理解し，Fortran90を用いた基本的なプログラミングを行うことができるかどうかを、各回に課される演習課題を含む平常点（50%)、定期試験あるいはレポート試験(50%)により評価する.
詳細は授業時に説明する．

[Textbooks]

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[References, etc.]

（Reference books）
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冨田博之 『Fortran 90プログラミング』（培風館）ISBN:9784563014094
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[Study outside of class (preparation and review)]

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（Other information (office hours, etc.)）

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Course number	U-ENG23 13296 SJ10		
Course title (and course title in English)	情報処理及び演習(T4) Computer Programming in Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI Graduate School of Engineering Associate Professor,IKARI HIROYUKI

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.4	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学におけるコンピュータ利用の現状と必要とされる情報処理技術を解説するとともに，コンピュータを用いた実習によりプログラミング言語を習得させる．この講義を受講することにより，科学技術計算言語であるFortran90の基本文法を修得，Fortran90によるプログラミングと計算を行うことができるようになる．また，地球工学で必要とされる基礎的な情報処理能力を習得することができる．このためには演習課題を独力でこなす努力を必要とする．

[Course objectives]

Fortran90の基本文法とプログラミングに関する知識を身につけ，地球工学で必要とされる基礎的な情報処理能力を習得する．

[Course schedule and contents]

情報処理概説，1回，地球工学におけるコンピュータ利用の現状と，将来必要とされる情報処理技術の概要を説明する．また，実習で用いるプログラミング言語(Fortran90)及び計算機の概要と端末の使用方法について説明する．
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フィードバック，1回，講義内容の理解度に関して確認を行う．

Continue to 情報処理及び演習(T4)(2)↓↓↓

情報処理及び演習(T4)(2)

[Course requirements]

「情報基礎演習（工学部）」を履修していること.

[Evaluation methods and policy]

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[Study outside of class (preparation and review)]

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（Other information (office hours, etc.)）

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*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23297 LJ55		
Course title (and course title in English)	地球工学基礎数理（T1） Mathematics for Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の各専門科目に要求される数理解析の基礎的能力を養成することを目的として，常微分方程式・偏微分方程式とその各種解法に関連する事項について解説し，演習を通じてその理解を深める。地球工学に関連する基本的な現象の例についても適宜取り上げ，数理モデルの導出から解の導出に至る過程を具体的に説明する。

[Course objectives]

地球工学科専門科目履修に必要な基礎数理を身につける。

[Course schedule and contents]

常微分方程式とラプラス変換,7回,1階微分方程式，線形微分方程式，高階微分方程式の取り扱いおよび基本的な解法を習得する。特に，常微分方程式の線形性に基づく解法について講述するとともに，力学や振動問題，熱伝導現象などへの適用についても解説する。また，常微分方程式の初期値・境界値問題の解法として，ラプラス変換による解法を説明する。
ベクトル解析,3回,ベクトルの内積，外積，ベクトルの勾配，発散，回転，ベクトルの面積分，線積分（ガウスの発散定理，ストークスの定理）について述べる。これらの概念の連続体力学への応用等にも触れる。
偏微分方程式,4回,偏微分方程式，特に波動方程式やラプラス方程式などに代表される線形2階偏微分方程式に関する解説および演習を行う。初期値・境界値問題の解法として，変数分離法，ラプラス変換，フーリエ級数およびフーリエ変換などによる解法を説明する。波動伝播，流体中の移動・拡散現象，地盤の圧密現象などへの適用についても適宜言及する。
フィードバック,1回,講義内容に関するフィードバックを行う。

[Course requirements]

全学共通科目の微分積分学A，B，線形代数学A，Bの知識を前提とする。

[Evaluation methods and policy]

各クラスごとに、平常点、レポート、学習到達度確認試験，小試験等を総合的に勘案して行う。

Continue to 地球工学基礎数理（T1）(2)↓↓↓

地球工学基礎数理（T1）(2)

[Textbooks]

本講義用に作成された資料を配布

[References, etc.]

（Reference books）
指定しない。

[Study outside of class (preparation and review)]

本講義用に作成された資料に目を通す.

（Other information (office hours, etc.)）

4クラスに分け，クラス毎に定められた教員により同じ時間帯に授業を行う。オフィスアワーは各教員別に設定し，時間，コンタクト方法等は初回講義時に伝える。フィードバック授業の内容は,各クラスの講義時に伝える。
※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23297 LJ55		
Course title (and course title in English)	地球工学基礎数理（T2） Mathematics for Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SAWAMURA YASUO Disaster Prevention Research Institute Associate Professor,FUJIMI TOSHIO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の各専門科目に要求される数理解析の基礎的能力を養成することを目的として，常微分方程式・偏微分方程式とその各種解法に関連する事項について解説し，演習を通じてその理解を深める。地球工学に関連する基本的な現象の例についても適宜取り上げ，数理モデルの導出から解の導出に至る過程を具体的に説明する。

[Course objectives]

地球工学科専門科目履修に必要な基礎数理を身につける。

[Course schedule and contents]

ベクトル解析,3回,ベクトルの内積，外積，ベクトルの勾配，発散，回転，ベクトルの面積分，線積分（ガウスの発散定理，ストークスの定理）について述べる。これらの概念の連続体力学への応用等にも触れる。

常微分方程式,4回, 1階微分方程式，線形微分方程式，高階微分方程式の取り扱いおよび基本的な解法を習得する。特に，常微分方程式の線形性に基づく解法について講述するとともに，力学や振動問題，熱伝導現象などへの適用についても解説する。

ラプラス変換,3回,ラプラス変換とラプラス逆変換の理論と手法について解説する。さらに、ラプラス変換を用いた微分方程式の解法について説明する。

偏微分方程式,4回,偏微分方程式，特に波動方程式やラプラス方程式などに代表される線形2階偏微分方程式に関する解説および演習を行う。初期値・境界値問題の解法として，変数分離法，ラプラス変換，フーリエ級数およびフーリエ変換などによる解法を説明する。波動伝播，流体中の移動・拡散現象，地盤の圧密現象などへの適用についても適宜言及する。

フィードバック,1回,講義内容に関するフィードバックを行う。

[Course requirements]

全学共通科目の微分積分学A，B，線形代数学A，Bの知識を前提とする。

Continue to 地球工学基礎数理（T2）(2)↓↓↓

地球工学基礎数理（T2）(2)

[Evaluation methods and policy]

各クラスごとに、平常点、レポート、学習到達度確認試験，小試験等を総合的に勘案して行う。

[Textbooks]

本講義用に作成された資料を配布

[References, etc.]

（Reference books）

指定しない。

[Study outside of class (preparation and review)]

本講義用に作成された資料に目を通す。

（Other information (office hours, etc.)）

4クラスに分け，クラス毎に定められた教員により同じ時間帯に授業を行う。オフィスアワーは各教員別に設定し，時間，コンタクト方法等は初回講義時に伝える。フィードバック授業の内容は,各クラスの講義時に伝える。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23297 LJ55		
Course title (and course title in English)	地球工学基礎数理（T3） Mathematics for Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Associate Professor,TANAKA SHUHEI Agency for Health, Safety and Environment Professor,HIRAI YASUHIRO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の各専門科目に要求される数理解析の基礎的能力を養成することを目的として，常微分方程式・偏微分方程式とその各種解法に関連する事項について解説し，演習を通じてその理解を深める。地球工学に関連する基本的な現象の例についても適宜取り上げ，数理モデルの導出から解の導出に至る過程を具体的に説明する。

[Course objectives]

地球工学科専門科目履修に必要な基礎数理を身につける。

[Course schedule and contents]

常微分方程式とラプラス変換,7回,1階微分方程式，線形微分方程式，高階微分方程式の取り扱いおよび基本的な解法を習得する。特に，常微分方程式の線形性に基づく解法について講述するとともに，力学や振動問題，熱伝導現象などへの適用についても解説する。また，常微分方程式の初期値・境界値問題の解法として，ラプラス変換による解法を説明する。ベクトル解析,3回,ベクトルの内積，外積，ベクトルの勾配，発散，回転，ベクトルの面積分，線積分（ガウスの発散定理，ストークスの定理）について述べる。これらの概念の連続体力学への応用等にも触れる。
偏微分方程式,4回,偏微分方程式，特に波動方程式やラプラス方程式などに代表される線形2階偏微分方程式に関する解説および演習を行う。初期値・境界値問題の解法として，変数分離法，ラプラス変換，フーリエ級数およびフーリエ変換などによる解法を説明する。波動伝播，流体中の移動・拡散現象，地盤の圧密現象などへの適用についても適宜言及する。
フィードバック,1回,講義内容に関するフィードバックを行う。

[Course requirements]

全学共通科目の微分積分学A，B，線形代数学A，Bの知識を前提とする。

[Evaluation methods and policy]

各クラスごとに、平常点、レポート、学習到達度確認試験，小試験等を総合的に勘案して行う。

Continue to 地球工学基礎数理（T3）(2)↓↓↓

地球工学基礎数理（T3）(2)

[Textbooks]

本講義用に作成された資料を配布

[References, etc.]

（Reference books）

指定しない。

[Study outside of class (preparation and review)]

本講義用に作成された資料に目を通す。

（Other information (office hours, etc.)）

4クラスに分け，クラス毎に定められた教員により同じ時間帯に授業を行う。オフィスアワーは各教員別に設定し，時間，コンタクト方法等は初回講義時に伝える。フィードバック授業の内容は，各クラスの講義時に伝える。

※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23297 LJ55		
Course title (and course title in English)	地球工学基礎数理（T4） Mathematics for Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の各専門科目に要求される数理解析の基礎的能力を養成することを目的として，常微分方程式・偏微分方程式とその各種解法に関連する事項について解説し，演習を通じてその理解を深める。地球工学に関連する基本的な現象の例についても適宜取り上げ，数理モデルの導出から解の導出に至る過程を具体的に説明する。

[Course objectives]

地球工学科専門科目履修に必要な基礎数理を身につける。

[Course schedule and contents]

常微分方程式とラプラス変換,7回,1階微分方程式，線形微分方程式，高階微分方程式の取り扱いおよび基本的な解法を習得する。特に，常微分方程式の線形性に基づく解法について講述するとともに，力学や振動問題，熱伝導現象などへの適用についても解説する。また，常微分方程式の初期値・境界値問題の解法として，ラプラス変換による解法を説明する。

ベクトル解析,3回,ベクトルの内積，外積，ベクトルの勾配，発散，回転，ベクトルの面積分，線積分（ガウスの発散定理，ストークスの定理）について述べる。これらの概念の連続体力学への応用等にも触れる。

偏微分方程式,4回,偏微分方程式，特に波動方程式やラプラス方程式などに代表される線形2階偏微分方程式に関する解説および演習を行う。初期値・境界値問題の解法として，変数分離法，ラプラス変換，フーリエ級数およびフーリエ変換などによる解法を説明する。波動伝播，流体中の移動・拡散現象，地盤の圧密現象などへの適用についても適宜言及する。

フィードバック,1回,講義内容に関するフィードバックを行う。

[Course requirements]

全学共通科目の微分積分学A，B，線形代数学A，Bの知識を前提とする。

Continue to 地球工学基礎数理（T4）(2)↓↓↓

地球工学基礎数理（T4）(2)

[Evaluation methods and policy]

各クラスごとに、平常点、レポート、学習到達度確認試験，小試験等を総合的に勘案して行う。

[Textbooks]

本講義用に作成された資料を配布

[References, etc.]

（Reference books）

指定しない。

[Study outside of class (preparation and review)]

本講義用に作成された資料に目を通す。

（Other information (office hours, etc.)）

4クラスに分け，クラス毎に定められた教員により同じ時間帯に授業を行う。オフィスアワーは各教員別に設定し，時間，コンタクト方法等は初回講義時に伝える。フィードバック授業の内容は，各クラスの講義時に伝える。

※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43305 LJ73

Course title (and course title in English)	地球工学デザインA Design Exercise for Civil, Environmental and Resources Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KAWASAKI MASASHI Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA Part-time Lecturer,NAGAHAMA NOBUTAKA Part-time Lecturer,NIWA NOBUHIRO Part-time Lecturer,YAGI HIROKI

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

「土木工学デザイン」を意味する本授業では、土木設計の工学技術的側面と景観設計的側面を同時に考慮しながらひとつの基盤的空間へと統合するプロセスと方法論について、歩道橋のデザインを例に学習する。本授業では、構造力学、材料学、景観デザインなどが統合的に扱われる。また、前提となる歩行動線や交通量、幅員などの計画的問題にも触れる。受講者は、自ら歩道橋を設計することを通じて、土木デザインの統合性と、土木技術者だからこそ可能な、そして土木技術者にこそ求められるデザイン領域への視座を獲得する。また、後半5回は、社会の第一線で活躍する実務家を招いた特別授業も行う。

[Course objectives]

土木設計の工学技術的側面と景観設計的側面を同時に考慮しながらひとつのデザインへと統合するプロセスと方法論について、歩道橋のデザインを通じて学ぶ。また、実際の土木デザインの最前線にも触れる。最終的には、土木技術者としてのデザインマインドの形成と向上を図る。

[Course schedule and contents]

土木デザイン概論（1回）　土木デザインについて、設計と意匠、設計思想、形と寸法、設計方法などについて概説する。
土木デザイン演習（8回）　現地調査、条件整理、計画、案創出、構造検討、詳細検討、作図、模型制作、発表という一連のプロセスを、演習を通じて経験する。土木工学の基礎的な知識を統合しながら、ひとつの優れたデザインを生み出す。
土木デザインの最前線（5回）　土木デザインの第一線で活躍する３名の実務家を招いての授業。講義だけでなく、それぞれに講師と学生との自由な対話の時間を設ける。
フィードバック（1回）　本講義において示した課題（試験、レポート等）に対するフィードバックを行う。

Continue to 地球工学デザインA(2)↓↓↓

地球工学デザインA(2)

[Course requirements]

必須ではないが、3年次の「都市景観デザイン」を履修しておくことが望ましい。また、構造力学や材料学の基礎知識を有すること。

[Evaluation methods and policy]

平常点（40%）、演習課題の成果（60%）を総合して評価する。平常点評価においては出席を重視する。

[Textbooks]

Instructed during class
課題演習の内容に応じて、必要なプリントを配布する。

[References, etc.]

（Reference books）
土木学会構造工学委員会『歩道橋の設計ガイドライン』(土木学会) ISBN:9784810607147 (2011)
久保田善明『橋のディテール図鑑』(鹿島出版会) ISBN:9784306072831 (2010)
Ursula Baus等[著]（久保田善明[監訳]）,『Footbridges 構造・デザイン・歴史』(鹿島出版会) ISBN: 9784306072848 (2011)
篠原修『土木デザイン論』(東京大学出版会) ISBN:4130611240 (2003)
日本建築学会[編],『コンパクト建築設計資料集成 都市再生』(丸善) ISBN:4621087568 (2014)
中村良夫『研ぎすませ風景感覚１　名都の条件』(技報堂) ISBN:4765516008 (1999)
中村良夫『研ぎすませ風景感覚２　国土の詩学』(技報堂) ISBN:4765516016 (1999)
中村良夫『風景学入門』(中公新書) ISBN:412100650X (1982)
武田史郎ほか『テキスト　ランドスケープデザインの歴史』(学芸出版社) ISBN:9784761531874 (2010)

[Study outside of class (preparation and review)]

課題の進捗状況に応じて、締め切りまでに合わせて各自課題を遂行すること。

（Other information (office hours, etc.)）

オフィスアワーは特に設けない。随時、各教員室（川崎C1棟202号室、高橋C1棟140号、山口C1棟201号室、いずれも桂キャンパスＣクラスター）への訪問、あるいはメールでの質問をすること。
演習課題などは一部変更があり得る。
※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

Continue to 地球工学デザインA(3)↓↓↓

地球工学デザインA(3)

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 43306 LJ77		
Course title (and course title in English)	地球工学デザインB Design Exercise for Civil, Environmental and Resources Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KOIKE KATSUAKI Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Engineering Professor,FUKUYAMA EIICHI Graduate School of Energy Science Professor,FUJIMOTO HITOSHI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Professor,MURATA SUMIHIKO Graduate School of Engineering Professor,HAYASHI TAMETO Graduate School of Engineering Associate Professor,KASHIWAYA KOKI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Engineering Senior Lecturer,ISHITSUKA KAZUYA Graduate School of Engineering Assistant Professor,Noguchi NaNa Graduate School of Engineering Assistant Professor,KUBO DAIKI Graduate School of Energy Science Assistant Professor,KUSAKA EISHI Graduate School of Engineering Assistant Professor,KOBAYASHI KAZUYA Graduate School of Energy Science Assistant Professor,CHIN YUUSEI Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

Continue to 地球工学デザインB(2)↓↓↓

地球工学デザインB(2)

[Overview and purpose of the course]

本年度はaとbの2コースを並列開講する。
aではシミュレーション理論と大規模データ解析法を説明でき，これらによる解析を実施できることを到達目標とし，シミュレーション理論とデータ解析法に関する講義と演習としての解析作業を実施する。
bでは資源・エネルギーにかかわる基礎知識に関する講義と演習を行う。

[Course objectives]

aではシミュレーションと時空間データ解析をツールとして用いた問題解法とそのプレゼンテーション技術のスキルを会得する。
bでは資源・エネルギーにかかわる基礎知識を会得する。

[Course schedule and contents]

a-1 シミュレーション理論とデータ解析法およびこれらに関するテーマ紹介,4回,シミュレーション理論および地球統計学と主成分分析法を解説するとともに、学生が取り組むテーマについて説明する。
a-2 シミュレーションあるいは時空間データ解析演習,5回,各学生が個々のテーマについて自主的にシミュレーション解析（必要に応じ，解析に必要なパラメータの測定を含む）を実施する。
a-3 中間報告,1回,各学生がテーマについて説明し，その解析方法と進捗状況について報告する。
a-4 シミュレーションあるいは時空間データ解析演習,4回,個々のテーマについてシミュレーション解析を継続する。
a-5 解析結果発表会,1回,解析結果をまとめ，発表する。
b-1 金属材料の変形・強度,4～6回,金属材料の変形挙動・強度特性を転位論から説明し、変形におけるマクロ挙動とミクロ因子の関係に関する基礎的知識を習得するとともに，これらに関する基礎的な問題について演習を行う。
b-2 鉱物の組織観察と解析・評価,4～6回,メタンハイドレートの生成・分解実習と偏光顕微鏡を用いた観察・評価を行う。また，造岩鉱物，岩石組織，それらに内在するマイクロクラックの観察を行い，岩石鉱物に関する知識の理解を深める。
b-3 熱移動と流体運動の解析,3～5回,流体力学および熱流体工学で学習した知識をもとに，物質・エネルギー輸送の諸問題を解析する手法を解説し，演習を行う。
b-4 達成度の確認,1回,講義内容の理解度に関して確認を行う。
なお，b-1～b-4に関して，担当者の講義方針と履修者の背景や理解の状況に応じて，それぞれに充てる講義・演習週数を担当者が適切に決め，全15回の講義・演習とする。

[Course requirements]

a. 基礎情報処理演習や情報処理及び演習などの情報系科目を履修しておくことが望ましい。
b. 物理化学，資源工学材料実験，材料と塑性，エネルギー工学入門（旧資源エネルギー論），流体力学，熱流体工学を履修しておくことが望ましい。

[Evaluation methods and policy]

aでは解析結果発表会での審査（５０%）とレポート（５０%）を勘案しておこなう。
bでは平常点とレポートを勘案しておこなう。

Continue to 地球工学デザインB(3)↓↓↓

地球工学デザインB(3)

[Textbooks]

Instructed during class
また，必要に応じてプリントを配布する。

[References, etc.]

（Reference books）

Introduced during class
a. 基礎情報処理演習や情報処理及び演習などの情報系科目を復習しておくことが望ましい。
b. 物理化学，資源工学材料実験，材料と塑性，エネルギー工学入門（旧資源エネルギー論）を復習しておくことが望ましい。

[Study outside of class (preparation and review)]

a. 基礎情報処理演習や情報処理及び演習などの情報系科目を復習しておくことが望ましい。
b. 物理化学，資源工学材料実験，材料と塑性，エネルギー工学入門（旧資源エネルギー論）を復習しておくことが望ましい。また，必要に応じて授業中に指示を行う。

（Other information (office hours, etc.)）

当該年度の授業回数などに応じて一部省略，追加および順序の変更がありうる。注意連絡事項は第１回目の授業で伝える。
※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33307 LJ16　U-ENG23 33307 LJ73		
Course title (and course title in English)	地球工学デザインC Design Exercise for Civil, Environmental and Resources Engineering C	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI Graduate School of Engineering Assistant Professor,NAKANISHI TOMOHIRO Graduate School of Global Environmental Studies Assistant Professor,YUTO TADA

Target year	4th year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Exercises about specific issues related to environmental facilities are conducted based on engineering principles learned until a junior year. Basic planning and design of water supply and sewage treatment facilities are exercised in the first half of the course. In the remaining of the course, basic planning and design of waste management and methodologies of environmental impact assessment using a construction of a waste incineration facility as a subject are learned and estimation about them are exercised.

[Course objectives]

To understand deeply sequence of procedures to gain solutions for substantial problems of environmental facilities through exercises.

[Course schedule and contents]

Planning and design of environmental facility (1 time)
Current status and issues of municipal water supply and wastewater are introduced. Outline of procedures of planning and design of environmental facilities, and their design criteria are stated. Purposes and how to proceed of the exercises in the course are expressed.

Basic design of water supply and sewage treatment (1 time)
A series of steps of design of water supply and sewage treatment systems (e.g., setting of target area, subjects of design based on characteristics and problems of the area, planning of plot and outline of city, design of water supply and sewage treatment facilities (determinations of areas, types of system, capacity, and location etc.)) are explained. Population prediction and estimation of design of water supply and sewage discharge are exercised.

Basic design of water supply (1 time)
Methodologies to determine placement and volume of water supply facilities are expressed. Exercise of a simple case is conducted, and the design of an existing facility is read. An actual water supply facility is also visited.

Continue to 地球工学デザインC(2)↓↓↓

地球工学デザインC(2)

Basic design of sewerage system (2 times)
Update status of design of sewerage system, and methodologies to determine placement and capacity of sewage pipe and treatment facility are explained. Exercises of such determinations using a simple case are conducted.

Exercise of design (5 times)
To conduct planning and design about certain cities selected by students. That is, hydrologic and capacity parameters of water purification and sewage treatment facilities are calculated based on goals and subjects set by the students. Exercises are proceeded with discussion when some problems happen. Drawing and reports of the results of the series of the works are prepared. Some works may be simplified or cut for time.

Exercise of design (5 times)
To conduct planning and design about certain cities selected by students. That is, hydrologic and capacity parameters of water purification and sewage treatment facilities are calculated based on goals and subjects set by the students. Exercises are proceeded with discussion when some problems happen. Drawing and reports of the results of the series of the works are prepared. Some works may be simplified or cut for time.

Prediction of waste emission and its basic design (1 time)
To understand the methodologies of prediction of emissions of industrial waste and estimate values of basic parameters of a certain city targeted.

Basic design of a waste incineration facility (2 times)
To understand heat and mass balances through combustion calculation and calculate a basic design based on certain setting conditions.

Environmental Impact Assessment (1 time)
Environmental impact assessment is introduced using a construction of a waste incineration facility as a subject.

[Course requirements]

It is preferable to have knowledge of related courses because their principles and theories are basics in this course. But, such knowledge is not requirement to attend the class.

[Evaluation methods and policy]

Glade is evaluated by reports and presentation.

[Textbooks]

Not used
Not used
No textbook.
Printed materials are distributed in class

Continue to 地球工学デザインC(3)↓↓↓

地球工学デザインC(3)

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Instruction will be given by the professors.

（Other information (office hours, etc.)）

The number of class hours may be changed.
Information on office hours is provided at fist time of class.

* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23308 LJ28　U-ENG23 23308 LJ77		
Course title (and course title in English)	エネルギー工学入門 Introduction to Energy Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Associate Professor,KASHIWAYA KOKI Graduate School of Energy Science Associate Professor,KUSUDA HIROMU Graduate School of Engineering Associate Professor,TAKEKAWA JUNICHI Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Engineering Assistant Professor,KUBO DAIKI Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.2	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

1)人類が抱える最重要かつ緊急の課題であるエネルギー問題を正しく理解するとともに、多方面から考える意識付けすることを目的とする。
2)地球科学の立場から、エネルギー技術などエネルギー工学の基礎について学ぶとともに、自主的にエネルギー問題について考察する力を養う。

[Course objectives]

講義で得られる知識だけでなく、自ら学び問題を解決していく力を身に付けることを目標とする。

[Course schedule and contents]

＜第1 回＞
ガイダンス

＜第2～4 回＞地球史と化石エネルギー
1)光合成と化石エネルギーの生成：太古の地球環境の変遷と化石エネルギーの成因、産状について述べる。
2)化石エネルギーの大量消費と地球温暖化：産業革命以降の化石エネルギーの大量消費と、それに伴う地球環境の変化、社会情勢との関わりについて述べる。
3)エネルギーの安定供給と自給率の向上：これからの化石エネルギーの位置付けと炭素循環について、シェールオイル、メタンハイドレート、バイオマスなどから考察する。

＜第5～9 回＞輸送機器から見た環境・エネルギー問題とその対策技術
1) 輸送機器から見た環境・エネルギー問題：自動車をはじめとする輸送機器が環境・エネルギー問題へ及ぼす影響と、その対策技術について概説する。またそのなかでも、輸送機器の軽量化に資する材料技術および加工技術などについて説明する。
2) 環境・エネルギー問題に貢献する数値シミュレーション技術：現代のものづくりでは不可欠な数

Continue to エネルギー工学入門(2)↓↓↓

値シミュレーション技術について、その概要や適用事例を概説する。またその問題点と今後の展望についても言及する。
3)演習、探求学習を通し問題を解決していく力を身に付ける。

＜第10～14 回＞省エネルギー・省資源
1)省資源・省エネルギー技術：資源生産性、インバースマニュファクチャリング、３R 技術など省資源、省エネルギー技術について概説する。
2)リサイクル：現行行われているリサイクルについて説明した後、リサイクルの問題点を指摘し、リサイクルに関する理解を深める。
3)演習、探求学習を通し問題を解決していく力を身に付ける。

<<期末試験>>学習到達度の確認,1 回,筆記試験により学習到達度の確認を行う。
フィードバック,＜第15 回＞,講義内容全般を振り返るとともに、筆記試験内容をフィードバックする。

[Course requirements]

None

[Evaluation methods and policy]

期末試験、レポート、探求学習、授業への参加状況等を基に総合的に評価する。

[Textbooks]

講義時に、必要に応じ適宜講義プリントを配布する。

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

授業中に配布するプリントは要点をまとめたものであるので、授業中に説明したことを必ず追記し、復習すること。

（Other information (office hours, etc.)）

オフィスアワーは特に設けない。随時、各教員室を訪ねること。 また、メールによる質問も受け付ける。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33309 EJ77		
Course title (and course title in English)	資源工学材料実験 Material testings for earth resources and energy engineering	Instructor's name, job title, and department of affiliation	Graduate School of Energy Science Professor,HAMA TAKAYUKI Graduate School of Energy Science Professor,MABUCHI MAMORU Graduate School of Engineering Associate Professor,NARA YOSHITAKA Graduate School of Energy Science Associate Professor,HAKAMADA MASATAKA Graduate School of Energy Science Assistant Professor,CHIN YUUSEI Graduate School of Energy Science Assistant Professor,MIYAZAWA NAOKI Graduate School of Engineering Assistant Professor,YOSHIMITSU NANA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.3,4,5	Class style	Experiment (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

岩石および金属材料の機械的特性と微視的特徴を知るための材料実験及び材料の組織観察を実施する。この実験を履修することにより，岩石および金属材料の機械的特性の測定方法，組織観察の方法，測定や観察に係る機器の使用方法を習得する。

[Course objectives]

この実験では，岩石のヤング率，ポアソン比，一軸圧縮強度，引張強度を評価し，岩石の破壊条件を決定できるようになること，顕微鏡を用いて岩石及び金属の組織観察が出来るようになること，金属材料の降伏応力や引張強さ，加工硬化係数といった機械的特性を評価できるようになることを目標とする。

[Course schedule and contents]

全体説明,1回
授業の目的，授業計画，安全のための諸注意，班分けなどの全体説明を行う。

岩石の材料試験と破壊条件，4.5回
岩石材料試験の概要，ヤング率，ポアソン比の求め方，一軸圧縮強度，引張強度の求め方について解説する。また，各班毎に岩石試験片を作成することから始め，岩石の一軸圧縮試験とひずみゲージによるひずみ計測，岩石の引張試験(圧裂試験)，ヤング率とポアソン比の評価，破壊条件の決定を行う。また，乾燥状態と含水飽和状態の岩石の強度を比較し，岩石の強さに及ぼす周辺環境の影響を学ぶ。

金属材料の引張試験と機械的特性，4.5回
金属材料の試験法の概要について解説する。また，鋼材・アルミニウム合金材の一軸引張試験を行い，応力－ひずみ曲線の算出と機械的特性の評価・解析を行う。その後，実験結果と考察について班ごとで資料の整理とプレゼンテーションを行う。また他の班の発表を聞いて質疑を行い、互いの

Continue to 資源工学材料実験(2)↓↓↓

理解を深める。

金属，岩石の組織観察，4.5回
金属および岩石の組織観察についてその手法と使用する顕微鏡の使用法について理解するとともに組織定量化の手法を習得する。
金属組織観察については，班毎に試験片の研磨・腐食を行い結晶粒等の組織観察を行い，得られた組織写真を使って切片法による結晶粒径を定量化する。岩石の組織観察については，偏光顕微鏡の原理・使用方法を習得し，各人が偏光顕微鏡を用いて岩石・鉱物の観察を行うとともに，その観察結果を基に岩石の同定及び成因の考察を行う。

フィードバック，0.5回
実験内容やレポート内容について質問を受け付ける。質問がある場合は担当教員まで連絡する。

[Course requirements]

「資源工学基礎実験」を履修していることが望ましい。また，同時期に開講している資源工学コースの「資源工学フィールド実習」，「岩盤工学（資源工学コース）」，「材料と塑性」を履修することが望ましい。

[Evaluation methods and policy]

実験は，班ごとに行い，各テーマごとに実験レポートを課す。成績評価は，実験に対する取り組み姿勢50%，実験レポート50%を基本として行う。

[Textbooks]

必要に応じてプリントを配布する。

[References, etc.]

（Reference books）
Introduced during class

[Study outside of class (preparation and review)]

毎回出席し，各担当で出される課題に取り組み，レポートを提出することが求められる。

（Other information (office hours, etc.)）

資源工学コースの3年生は全員履修することが望ましい。連絡・注意事項については，第1回目の全体説明の中で行う。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23310 LJ16　U-ENG23 23310 LJ17

Course title (and course title in English)	基礎環境工学A Fundamental Environmental Engineering A	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,Fujiwara Taku Graduate School of Engineering Professor,ITOH SADAHIKO Graduate School of Global Environmental Studies Professor,ECHIGO SHINYA Graduate School of Energy Science Professor,TAKAYUKI KAMEDA Agency for Health, Safety and Environment Professor,MATSUI YASUTO

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester

Days and periods	Fri.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の体系内において、特に環境問題に対処する領域を担当している環境工学について、その概要と基礎的事項を講義する。基礎環境工学A及び基礎環境工学Bで環境工学に関する基礎を網羅する内容となり、具体的には、環境工学の概要、地球環境問題と大気環境の保全、水環境の保全と上下水道システム、廃棄物、環境リスク管理の工学、資源循環型社会の構築と廃棄物管理の技術、環境リスクと放射線リスク、土壌や地下水汚染等に関して、各分野の教員が講述する。また、外部からの講師を呼び、環境工学の実社会における実践例などについて紹介してもらい、環境工学の意義について理解を深め、理論から実践まで幅広く習得する内容である。

その中において基礎環境工学Ａでは、環境工学の中でも特に伝統的に扱われてきた分野、上下水などの水分野、大気、環境衛生について取り上げる。

[Course objectives]

人間活動が環境に与える影響や環境に関する諸問題、とりわけ水分野、大気分野、衛生分野などについて理解すること、ならびに環境工学の基礎を学ぶことを目的とする。

[Course schedule and contents]

(授業計画と内容)
第1回　環境工学の全体像
第2回（上水・水環境）世界の水衛生問題
第3回（上水・水環境）水道システム
第4回（上水・水環境）浄水処理の基礎
第5回（下水・水環境）下水道と各種の汚水処理システム
第6回（下水・水環境）下水処理の基礎
第7回（下水・水環境）水圏生態系と生物多様性
第8回 外部講師
第9回 （大気）　大気汚染の歴史と主要な問題
第10回（大気）　大気汚染物質の発生源と輸送の概要
第11回（大気）　大気汚染物質の化学反応
第12回（環境衛生）　公害と環境基準（環境汚染の歴史と健康影響、法令整備）
第13回（環境衛生）　感覚公害（騒音・振動・悪臭）
第14回（環境衛生）　健康影響と疫学（曝露と影響、疫学の理論と方法）

Continue to 基礎環境工学A(2)↓↓↓

基礎環境工学A(2)

第15回　フィードバック
達成度の確認,1回：講義内容の理解度に関して確認を行う。

[Course requirements]

None

[Evaluation methods and policy]

試験の成績（70%）、平常点評価（30%）
平常点評価には、出席状況の他に小テストが課される場合がある。
【評価基準】
到達目標について、
　A＋：すべての観点においてきわめて高い水準で目標を達成している。
　A　：すべての観点において高い水準で目標を達成している。
　B　：すべての観点において目標を達成している。
　C　：大半の観点において学修の効果が認められ、目標をある程度達成している。
　D　：目標をある程度達成しているが、更なる努力が求められる。
　F　：学修の効果が認められず、目標を達成したとは言い難い。

[Textbooks]

授業中にプリントを配布する。

[References, etc.]

（Reference books）
必要に応じて授業中に指示する。

[Study outside of class (preparation and review)]

配布するプリントの内容を完全に理解するとともに、関連する知識を自分でも得るようにすること。

（Other information (office hours, etc.)）

※オフィスアワーの詳細については、KULASISで確認してください。

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33311 LJ73　U-ENG23 33311 LJ16

Course title (and course title in English)	基礎環境工学B Fundamental Environmental Engineering B	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TAKAOKA MASAKI Graduate School of Engineering Professor,MATSUDA TOMONARI Graduate School of Engineering Professor,FUJIMORI SHINICHIRO Graduate School of Engineering Associate Professor,YOKO SHIMADA

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester

Days and periods	Fri.4	Class style	Lecture (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

地球工学の体系内において、特に環境問題に対処する領域を担当している環境工学について、その概要と基礎的事項を講義する。基礎環境工学A及び基礎環境工学Bで環境工学に関する基礎を網羅する内容となり、具体的には、環境工学の概要、地球環境問題と大気環境の保全、水環境の保全と上下水道システム、廃棄物、環境リスク管理の工学、資源循環型社会の構築と廃棄物管理の技術、環境リスクと放射線リスク、土壌や地下水汚染等に関して、各分野の教員が講述する。また、外部からの講師を呼び、環境工学の実社会における実践例などについて紹介してもらい、環境工学の意義について理解を深め、理論から実践まで幅広く習得する内容である。
　その中において基礎環境工学Ｂでは、環境工学の中でも特に近年注目されている、廃棄物・資源循環、気候変動、環境リスク、土壌汚染等について取り上げる。

[Course objectives]

人間活動が環境に与える影響や環境に関する諸問題、とりわけ廃棄物分野、気候変動分野、リスク分野等について理解すること、ならびに環境工学の基礎を学ぶことができる。

[Course schedule and contents]

第1回（高岡）（廃棄物・資源循環）歴史的経緯、定義、マテリアルフロー
第2回（高岡）（廃棄物・資源循環）リユース、リサイクル、処理・処分技術
第3回（高岡）（廃棄物・資源循環）ライフサイクルアセスメント、循環経済、環境アセスメント
第4回（外部講師）廃棄物関連環境工学の社会での実践
第5回（藤森）（地球環境・気候変動）　地球環境問題と気候変動問題の概要
第6回（藤森）（地球環境・気候変動）　気候変動のメカニズムと影響
第7回（藤森）（地球環境・気候変動）　温室効果ガス削減と環境工学
第8回（外部講師）地球環境関連環境工学の社会での実践（環境政策）
第9回（松田）（放射線・リスク・化学物質）　化学物質の定量的リスク評価手法
第10回(松田）（放射線・リスク・化学物質）　放射線の単位とリスク評価
第11回(島田）（土壌）土壌汚染の歴史と特徴、土壌の特性と支配方程式
第12回(島田）（土壌）土壌中での水分の移動
第13回(島田）（土壌）土壌中での無機物質の動態
第14回(島田）（土壌）土壌中での有機物質の動態
＜定期試験＞
第15回（高岡、松田、藤森、島田）　フィードバック

Continue to 基礎環境工学B(2)↓↓↓

基礎環境工学B(2)

達成度の確認1回：講義内容の理解度に関して確認を行う。

[Course requirements]

None

[Evaluation methods and policy]

試験の成績（70%）**、平常点評価**（30%）
平常点評価には、出席状況の他に小テストが課される場合がある。

[Textbooks]

Instructed during class
授業中にプリントを配布する。

[References, etc.]

（Reference books）

Introduced during class
必要に応じて授業中に指示する。

[Study outside of class (preparation and review)]

配布するプリントの内容を完全に理解するとともに、関連する知識を自分でも得るようにすること。

（Other information (office hours, etc.)）

科目全体に関わること、外部講師の授業内容については、科目担当教員の高岡まで連絡してください。電話は075-383-3335、**メールは**takaoka.masaki.4w@kyoto-u.ac.jp。
各授業の内容に関する質問は各担当教員に連絡をとってください。
オフィスアワーは改めて設定しませんが、メールにて連絡ください。

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13312 LJ90　U-ENG23 13312 LJ15						
Course title (and course title in English)	環境衛生学 Environmental Health			Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUDA TOMONARI Graduate School of Engineering Senior Lecturer,YAMAMOTO KOUHEI Graduate School of Engineering Assistant Professor,HONDA AKIKO		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester		
Days and periods	Thu.1	Class style	(Face-to-face course)	Language of instruction	Japanese		

[Overview and purpose of the course]

衛生学・公衆衛生学は、人の生命と健康を衛るための学問であり、他の多くの学問分野とも関わりを持つ。一方、工学における「モノづくり」は副次的に環境とともに人を含む生物に影響を及ぼす可能性があることを忘れてはならない。本講義では、工学部で学ぶべき衛生学、公衆衛生学の基礎的事項と最近の知見を環境との関わりを中心に講述する。

[Course objectives]

環境衛生学、衛生学、公衆衛生学に関わる基本的な知識を広く習得し、次世代、生命、地球への責任を自覚した社会人、あるいは、関連分野の発展に貢献する高度職業専門人としての基盤とする。

[Course schedule and contents]

健康・疾病、その予防と環境要因,1回：健康と疾病(病気)の概念、および、それらと環境要因との関連について講述し、疾病や健康影響の予防に関する概念についても学ぶ。また、公害問題から地球環境問題までの歴史についても概説する。

環境毒性学,2回：環境要因の健康への影響の基礎的事項を学ぶ。異物（環境汚染物質等）の体内動態、代謝、排泄、毒性エンドポイントと指標、標的分子と毒性発現メカニズム、などについて解説する。

化学物質汚染,1回：環境汚染が懸念される化学物質について概説し、その毒性メカニズム、環境モニタリング（分析）手法、生物濃縮の実態について解説する。

発癌,2回：癌の疫学、発癌メカニズム、発癌要因などについて概説する。

病原性微生物,2回：病原性ウイルス及び細菌の生活環、定量方法、感染経路、予防方法について解説する。

免疫学基礎,2回：生体防御反応である、補体系、自然免疫系、獲得免疫系について概説する。また、アレルギーのメカニズムと環境汚染との関連についても解説する。

疫学・環境疫学,1回：環境汚染物質の健康リスクを評価するためには、ヒト集団を対象とした環境疫学的アプローチが必須である。そのために必要な統計手法、適正な曝露評価、交絡要因等について学ぶ。

感覚公害, 3 回：悪臭、騒音、振動の人体影響や評価方法について講述する。

Continue to 環境衛生学(2)↓↓↓

環境衛生学(2)

学習到達度の確認、フィードバック,1回：講義内容の理解度等に関し確認する。質問等も受け付け、回答する。

[Course requirements]

None

[Evaluation methods and policy]

筆記試験の結果により成績を評価する。
筆記試験では講義した基礎知識が身についているかについて評価を行う。
評点は素点を記載する。

[Textbooks]

講義において随時紹介する。

[References, etc.]

（Reference books）
講義において随時紹介する。

[Study outside of class (preparation and review)]

講義内容の復習のため、原則として毎回簡単なレポート課題を与える。

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

Course number	U-ENG23 13502 SE73		
Course title (and course title in English)	Exercises in Infrastructure Design Exercises in Infrastructure Design	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,AN RIN

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.1,Thu.1	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

The purpose of this course is to understand how Civil Engineering contributes to our society. For this purpose, this course firstly introduces the target area and new topics related to Civil Engineering with some examples from structural engineering, hydraulics, soil mechanics and planning. As part of the exercises, students are asked to survey one or several infrastructures in their countries and make a presentation. In some lectures students are also asked to discuss desirable social infrastructure with group members and make a presentation about the results.

[Course objectives]

To understand how Civil Engineering contributes to our society. Furthermore, throughout the exercises, it is expected to enhance the ability of scientific discussion, engineering problem solving, and scientific presentation.

[Course schedule and contents]

Guidance (1 week)
Introduction to the course

Introduction of Civil Engineering (4 weeks)
Specific areas in civil engineering are introduced with some real-life examples from different subjects.

Group exercise (4 weeks)
Students are divided into several groups and instructed to discuss the given issues related to social infrastructures.

Presentation (4 weeks)
Each group is asked to make a presentation about the issues (problems and solutions) based on their discussions.

Wrap-up discussion (1 week)
Summarizing the lecture contents

Feedback (1 week)

Continue to Exercises in Infrastructure Design(2)↓↓↓

Exercises in Infrastructure Design(2)

[Course requirements]

None

[Evaluation methods and policy]

Grading is based on class participation, presentations, and a final report.

[Textbooks]

Printed handouts will be distributed as appropriate

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Students are advised to review the handouts provided in the class and to work on their assignments.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23504 LE57		
Course title (and course title in English)	Fundamental Mechanics Fundamental Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Kinematics of a single particle in space,2回,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回,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回,the Law of Gravitation center of mass and center of gravity motion through a resisting medium constrained motion
energy conservation,2回,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回,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回,transformation formulae particle dynamics in a non-inertial frame motion relative to the Earth multi-particle system in a non-inertial frame
motion of rigid bodies ,2回,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 inertia and stress tensors
foundation of analytical mechanics,1回,Constraint condition, constraint force,generalized coordinate, generalized force,Lagrange's equations.
confirmation of achievement,1回,The achievement assessment is intended to measure students' knowledge,

Continue to Fundamental Mechanics(2)↓↓↓

Fundamental Mechanics(2)

skill and aptitude on the subject using quiz and viva-voce.

[Course requirements]

calculus A and B, Linear Algebra A and B

[Evaluation methods and policy]

Grade is evaluated based on the final examination, assignment, and class-discussion.

[Textbooks]

Instructed during class
R.DOUGLAS GREGORY: Classical Mechanics, Cambridge University Press, 2006 isbn9780521534093

[References, etc.]

（Reference books）

Introduced during class
Keith R.Symon: Mechanics, Third edition, Addison-Wesley, 1971 isbn0201073927
Ferdinand P. Beer, E. Russell Johnston, etc.: Mechanics for Engineers, Dynamics, McGraw Hill, 2007 isbn9780072464771

[Study outside of class (preparation and review)]

Students must preview and review related contents based on PPT materials downloaded from KULASIS

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23505 LE55				
Course title (and course title in English)	Prob. & Statistical Analysis & Exercises Probabilistic and Statistical Analysis and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KIM SUNMIN		
Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

[Probabilistic Analysis]
1. The Concepts of Probability
2. Conditional probability, Bayes's theorem
3. Random Variables and Probability Distributions
4. Moment Generating Function, Multiple Random Variables
5. Binomial Distribution and Geometric Distribution
6. Poisson Distribution and Exponential Distribution
7. Normal Distribution and Log-Normal Distribution
8. Conversion of Random Variables

[Statistical Analysis]
9. The Concept of Statistical Analysis, Sample and Population
10. Parameter Estimation with Statistics
11. Hypothesis Test with Large Sample
12. Hypothesis Test with Small Sample
13. Regression Analysis
14. Statistical Analysis with R

[Final Exam]

15. Feedback

Continue to Prob. & Statistical Analysis & Exercises(2)↓↓↓

Prob. & Statistical Analysis & Exercises(2)

[Course requirements]

Prerequisite courses are calculus and linear algebra.

[Evaluation methods and policy]

Evaluation (6 levels grade) is based on written tests (final exam: 60%) and assignments (40%).

[Textbooks]

Not specified. Lecture notes will be provided during the class.

[References, etc.]

（Reference books）

A.H.S. Ang and W.H. Tang: Probability Concepts in Engineering (Emphasis on Applications in Civil and Environmental Engineering), ISBN978-0-47-172064-5
William Navidi: Principles of Statistics (for Engineers and Scientists), ISBN978-0-07-016697-4

[Study outside of class (preparation and review)]

Self-review is strongly recommended after each lecture.

（Other information (office hours, etc.)）

No specific office hour. Email communication is preferred through [kim.sunmin.6x@kyoto-u.ac.jp].

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23506 LE73		
Course title (and course title in English)	Design for Infrastructure I Design for Infrastructure I	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,UNO NOBUHIRO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.3	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Civil Engineering provides the essential technology and knowledge to construct and improve the infrastructure for our societies. Various science, technology, and knowledge are required 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 the four main fields of Civil Engineering (Structural Engineering, Hydraulics and Hydrology, Geotechnical Engineering and Planning and Management). Throughout the lectures and exercises including visiting lecturers, the student is expected to learn the essence of Civil Engineering and the ethics of engineering.

[Course objectives]

To understand that Civil Engineering is the organization of the technology and knowledge related to social capital improvement, prevention or mitigation of disasters, and creation of the built environment.

[Course schedule and contents]

Introduction to Civil Engineering (2 weeks)
The content of the course is introduced. Then, the study field of Civil Engineering including the latest topics and the ethic of Civil Engineers throughout the achievement of predecessors is introduced.

Structural Engineering (3 weeks)
Civil Engineering is introduced from the viewpoint of Structural Engineering, which includes natural disasters and structural engineering, the introduction of new technology and research, collaboration with other fields, etc.

Hydraulics and Hydrology (3 weeks)
There will be three lectures corresponding to Hydraulic Engineering.
These three lectures provide the student with basic knowledge of hydraulics from an engineering perspective corresponding to mitigation/prevention of flood induced disasters in river and coastal areas, towards establishment of safe and sustainable water environments.
The fundamentals of hydraulic structure design related to hydrostatic analysis will be explained along with examples related to dams, weirs and floating bodies.

Geotechnical Engineering (3 weeks)

Continue to Design for Infrastructure I(2)↓↓↓

Design for Infrastructure I(2)

Civil Engineering is introduced from the viewpoint of Geotechnical Engineering, which includes soil mechanics, geo-hazard mitigation, geo-environment, international cooperation etc.

Planning and Management (3 weeks)
Civil Engineering is introduced from the viewpoint of designing and managing social Infrastructure, which includes asset management of social infrastructure, soft measures for traffic jams, logistic vehicles in the urban areas, etc.

Feedback (1 week)
Feedback is to confirm the students' understanding on the subject, knowledge, skill, and aptitude on the subject.

[Course requirements]

No specific prior knowledge is required.

[Evaluation methods and policy]

Grade is evaluated comprehensively from reports for each lecture (including attendance) and a final examination. 50 percent of the final score is due to reports, and the other 50 percent from the final examination.

[Textbooks]

Handouts will be distributed as appropriate.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Students are advised to go through the handouts provided in the class and work on their assignments.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23507 LE73		
Course title (and course title in English)	Systems Analysis & Exe. for Plan. & Mng. Systems Analysis and Exercises for Planning and Management	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SCHMOECKER, Jan-Dirk

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 series 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 schedule and contents]

Week 1 and 2: Basic Theory of Civil Engineering Planning (CEP): 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.

Weeks 3 to 7: Linear programming (LP), 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.

Weeks 8-11: Non linear programming (NLP), NLP formulation of problems, global optimality, and description as programming problem. Optimality conditions of nonlinear programming problems (Lagrange function, Kuhn Tucker conditions) are examined.

Weeks 12-14: Dynamic programming (DP), 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.

This is followed by exam and feedback class.

Continue to Systems Analysis & Exe. for Plan. & Mng.(2)↓↓↓

Systems Analysis & Exe. for Plan. & Mng.(2)

[Course requirements]

Students are assumed to have taken the calculus courses.

[Evaluation methods and policy]

Assignments 15%, Midterm Exam 35%; Final Exam 50%

[Textbooks]

Handouts distributed during the lectures

[References, etc.]

（Reference books）

Hillier,F.S. Lieberman,G.J. 『 Introduction to Operations Research 』 ISBN:9781259253188
Iida, Y. 『Civil Engineering Planning System Analysis (Optimization Guide)』 ISBN:4627427204
Iida, Y./ Okada, N. 『Civil Engineering Planning System Analysis (Behaviour Analysis)』 ISBN:4627427301
Fujii, S. 『Infrastructure planning studies』 ISBN:9784761531669

（Related URLs）

(Presented during the first lecture.)

[Study outside of class (preparation and review)]

Handouts should be reviewed by students, homework will be given with exercises reviewing the class content.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23508 LE73		
Course title (and course title in English)	Soil Mechanics I and Exercises Soil Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Engineering Associate Professor,Zhu Fan

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

By the end of the semester, the student is expected to understand the basics of soil formation, classification for engineering purposes, soil compaction, seepage and water flow through soil, consolidation theory, settlement due to consolidation, rate of consolidation, shear strength, and deformation behaviors of different soils.

[Course objectives]

This course aims at providing a fundamental understanding of the mechanical behavior of soils including soil classification, compaction, seepage, permeability, effective stress, consolidation, and shear strength as well as problem-solving skills through exercises in gravimetric-volumetric relationships, Darcy's law, flow nets, consolidation theory, Mohr's stress circle, and failure criteria.

[Course schedule and contents]

Introduction, 0.5 times, Introductory concepts and roles of soil mechanics, engineering aspects of soil behaviors and geotechnical practices dealing with disasters and environments

Soil classification and compaction, 3.5 times, Soil classification and soil formation, basic soil properties and Atterberg ’ s limits, compaction, unsaturated soil and frozen soil

Water flow through soil, 3 times, Fundamentals of water flow through soil, permeability and Darcy's law, quick sand condition, seepage and flow nets

Midterm Exam, 0.5 times,

Consolidation and settlement, 3.5 times, Principle of effective stress and Terzaghi's one dimensional consolidation theory, characteristics and mathematical descriptions of consolidation, prediction of ground settlement due to consolidation

Shear strength of soil, 3 times, Visualization of stress states using Mohr's stress circle, interpretation of shear strength using the Mohr-Coulomb failure criterion, experiments and behaviors of clay and sand under drained and undrained conditions

Class feedback, 1 time, Confirmation of understanding

Continue to Soil Mechanics I and Exercises(2)↓↓↓

Soil Mechanics I and Exercises(2)

[Course requirements]

None

[Evaluation methods and policy]

Grades will be evaluated comprehensively based on Final Exam (approx. 70%), Midterm exam and classworks (approx. 30%).

[Textbooks]

Soil Mechanics I & II Tutorial Exercises and Soil Mechanics Laboratory Manual
Handouts will be distributed

[References, etc.]

（Reference books）

J.A. Knappett and R.F. Craig 『Craig’s Soil Mechanics』ISBN:9780415561266
T. William Lambe and R.V. Whitman 『Soil Mechanics』ISBN:0471022616
Braja M. Das 『Fundamentals of Geotechnical Engineering』ISBN:9781111576752
K. Terzaghi, R. B. Peck, G. Mesri 『Soil Mechanics in Engineering Practice』ISBN:9780471086581
岡二三生著 『土質力学演習』（森北出版）ISBN:4627426607

（Related URLs）

http://geomechanics.kuciv.kyoto-u.ac.jp/lecture/text/kakomon.html

[Study outside of class (preparation and review)]

Practice yourself from Tutorial Exercise

（Other information (office hours, etc.)）

Contact Prof. T. Pipatpongsa (pipatpongsa.thirapong.4s@kyoto-u.ac.jp) and Prof. F. Zhu (zhu.fan.7m@kyoto-u.ac.jp) by email.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 23510 LE55				
Course title (and course title in English)	Engineering Mathematics B1 Engineering Mathematics B1	**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Associate Professor,QURESHI， Ali Gul		
Target year	2nd year students or above	**Number of credits**	2	**Year/semesters**	2024/Second semester
Days and periods	Thu.2	**Class style**	Lecture (Face-to-face course)	**Language of instruction**	English

[Overview and purpose of the course]

The course introduces the theory of complex functions and their applications.

[Course objectives]

To understand the properties of holomorphic or analytic functions. To learn Taylor and Laurent series' expansion. To calculate the residue and to learn the engineering applications of complex function theory.

[Course schedule and contents]

Lecture 1-3: Review (Definition of complex numbers, complex plane and review of vector analysis.)

Lecture 4-12: Basic theory of complex functions (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.)

Lecture 13-14: Application of theory of complex functions (Application of residue theorem to calculate the definite integral.)

Lecture 15: Examination

Lecture 16: Feedback Class

[Course requirements]

Basic Calculus (From the university curriculum: Calculus A and B, Advanced Calculus A)

[Evaluation methods and policy]

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

Continue to Engineering Mathematics B1(2)↓↓↓

Engineering Mathematics B1(2)

[Textbooks]

Materials given during the lecture and some useful books are introduced during the lectures.

[References, etc.]

（Reference books）

Materials given during the lecture.

[Study outside of class (preparation and review)]

Students are advised to do the assigned homework.

（Other information (office hours, etc.)）

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

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23511 LE73		
Course title (and course title in English)	Structural Mechanics I and Exercises Structural Mechanics I and Exercises	Instructor's name, job title, and department of affiliation	Institute for Liberal Arts and Sciences Professor,KIM Chul-Woo Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Associate Professor,Chang, Kai-Chun

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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

[Course objectives]

To grasp the methods of analyzing structures at static equilibrium conditions; to understand stress and strain, and the relationship between them; to understand the buckling phenomenon in columns.

[Course schedule and contents]

#01: Introduction (Load, unit, free body diagram),
#02: Equations of static equilibrium; Classifying structures; Determinacy and Stability of structures; Supports (Boundary condition),
#03: Truss: member forces,
#04: Beams: flexural forces,
#05: Member force diagram of frame and beam structures: normal force diagram (NFD), shear force diagram (SFD and bending moment diagram (BMD),
#06: Influence lines: construction of Influence line; use of Influence line,
#07: Stress and strain (1): Introduction; Hooke's law; stress and stress of composite structure; thermal effect,
#08: Stress and strain (2): normal stress and shear stress in a flexural beam; Sectional properties,
#09: Stress and strain (3): stress state and stress transformation; Mohr ’ s Circle,
#10: Elastic curve and deflection (Theory),
#11: Deformation of beam (utilizing Ordinary Differential Equation),
#12: Deformation of beam (Elastic Beam and Conjugate Beam Methods),
#13: Statically indeterminate structures,
#14: Buckling of column,
Achievement Test (Final Exam),
#15: Feedback session,

[Course requirements]

Classical mechanics

Continue to Structural Mechanics I and Exercises(2)↓↓↓

Structural Mechanics I and Exercises(2)

[Evaluation methods and policy]

Grade is given based on the examination, quiz, assignments and participation.

[Textbooks]

Lecture note will be provided.

[References, etc.]

（Reference books）

References
1.Kenneth M. Leet, et al., FUNDAMENTALS OF STRUCTURAL ANALYSIS, 4th edition, McGraw-Hill, 2011
2. Timothy A. Phiplot, MECHANICS OF MATERIALS, 3rd edition, Wiley, 2012.
3. **基礎土木シリーズ１・崎元達郎著　構造力学［上］森北出版** (in Japanese)

[Study outside of class (preparation and review)]

Students are expected to prepare for the class utilizing the handout uploaded on the PANDA or KULASIS in advance. For the review of the class, students are expected to read the lecture note once again and complete the homework assignment.

（Other information (office hours, etc.)）

Class management policy including contact method to instructor and teaching assistant will be announced in the first class.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33512 LE73		
Course title (and course title in English)	Dynamics of Soil and Structures Dynamics of Soil and Structures	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,IGARASHI AKIRA Disaster Prevention Research Institute Professor,GOTOU HIROYUKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.2	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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

[Course objectives]

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 formulation 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 schedule and contents]

Free and Force vibrations (2 weeks)
Definition of the natural period and damping ratio for single degree-of-freedom systems. Derivation of free vibration response.
Resonance curves and phase response curves for forced harmonic vibration. Frequency response characteristics.

Response to arbitrary input (2 weeks)
Evaluation of dynamic response to arbitrary forcing and earthquake excitation. Response spectra.

Vibration of MDOF systems (4 week)
Solution of equations of motions for 2-degree-of-freedom systems representing free vibration. Concept of normal vibration modes.
Relationship between the natural frequencies, normal vibration modes of multi-degree-of-freedom systems and eigenvalue analysis.
Vibration of multi-degree-of-freedom systems with damping. Analysis of MDOF systems using damping using normal vibration modes.
Modal analysis to evaluate the dyanmic response of multi-degree-of-freedom systems for harmonic and arbitrary excitation.

Vibration of continuum (1 week)
Vibration of shear beams. Flexural vibration. Wave equation. Solution of shear vibration problem.

Nonlinear vibration (1 week)

Continue to Dynamics of Soil and Structures(2)↓↓↓

Dynamics of Soil and Structures(2)

Fundamental properties of nonlinear dynamic response of structures associated with elasto-plastic behavior.

Elastic wave (4 weeks)
The fundamental equation of elastic waves, the wave equation, and the characteristics of dilatational and shear waves are described.
The characteristics of plane waves propagating through elastic bodies and reflection/transmission at layer interfaces are described.
The surface waves and wave dispersion are introduced.

<<Examination>>

Feedback (1 week)
A feedback session on the class material and examination problems.

[Course requirements]

Calculus, Linear algebra, Structural Mechanics I and Exercises

[Evaluation methods and policy]

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

[Textbooks]

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

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

To be notified by instructor during his/her lecture.

（Other information (office hours, etc.)）

Office hours are not specified; Questions to instructors are accepted by appointment.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33513 LE73		
Course title (and course title in English)	Construction Materials Construction Materials	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Mon.1	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Knowledge and techniques to use construction materials, especially on concrete material, are introduced on micro-, meso- until macro-scale.

[Course objectives]

The students are expected to understand the microstructure, properties, production and testing methods of concrete, steel, composite materials etc employed in civil engineering.

[Course schedule and contents]

introduction,1回,Classification of materials, history of construction materials, ethics for civil engineers and current topics
crystal structure,1回,Bond between atoms, ideal strength, dislocation, yield, and mechanical properties are introduced.
Metallic material,1回,Mechanical properties of metals, steel, phase diagrams, Dislocations and metallic new materials
Corrosion & protection,1回,durability, corrosion, deterioration mechanism, carbonation, chloride induced corrosion and corrosion protection
Cement,1回,Types of cements, chemical composition, chemical compound, hydration, hydration heat and blended cement
admixtures,1回,Chemical admixture, water-reducing admixture, air-entraining admixture, mineral admixture, pozzolanic reaction, latent hydraulic property and high-range admixture are introduced.
aggregate,1回,Moisture condition, Chloride ion, Total chloride ion content, alkali-silica reaction and total alkali content
fresh concrete,1回,Workability, rheology, consistency, segregation and mix design
hardened concrete,1回,water cement ratio, compressive strength, flexural strength, tensile strength, durability and testing methods
mechanical properties of concrete,1回,Interfacial transition zone in concrete,strength-porosity relationship, Behavior of concrete under various stress states,Dimensional Stability,
Non-destructive testing method,1回,Surface hardness, ultrasonic pulse, thermography, half cell potential and polarization resistance
Special concrete,1回,Fiber reinforced concrete, flowing concrete, MDF cement and mineral new materials
Polymer material,1回,Resin, rubber, fiber, polymer concrete and organic new materials
review,1回,review mainly on concrete and steel
achievement assesment,1回,The achievement assessment is intended to measure students' knowledge, skill and aptitude on the subject using quiz.

Continue to Construction Materials(2)↓↓↓

Construction Materials(2)

[Course requirements]

Knowledge of structural mechanics is required.

[Evaluation methods and policy]

Reports and Final examination.

[Textbooks]

Instructed during class
P.Kumar Mehta, Paulo J.M.Monteiro:Concrete microstructure, properties and materials, McGraw-Hill,2014 isbn9780071797870
William D. Callister, Jr. David G. Rethwisch:Materials science and engineering an Introduction, John Wiley amp Sons, Inc.,2014 isbn9781118477700

[References, etc.]

（Reference books）

Introduced during class
Students must download related materials from KULASIS

[Study outside of class (preparation and review)]

students are required to make preview and review based on handout and PPT give from KULASIS

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33514 LE73				
Course title (and course title in English)	Structural Mechanics II and Exercises Structural Mechanics II and Exercises		**Instructor's name, job title, and department of affiliation**	Graduate School of Engineering Professor,KITANE YASUO	
Target year	3rd year students or above	**Number of credits**	3	**Year/semesters**	2024/First semester
Days and periods	Mon.4,5	**Class style**	Seminar (Face-to-face course)	**Language of instruction**	English

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

Weak 1: Introduction, Work and energy
Weak 2: Principle of virtual work for rigid bodies
Weak 3: Principle of virtual work for deformable bodies
Weak 4: Principle of complementary virtual work (virtual force) - 1
Weak 5: Principle of complementary virtual work (virtual force) - 2
Weak 6: Castigliano’s theorems
Weak 7: Reciprocal theorems and Influence lines
Weak 8: Learning level check and summary of the first half
Weak 9: Statically indeterminate structures, and Force method by compatibility equations - 1
Weak 10: Force method by compatibility equations - 2
Weak 11: Displacement method (matrix structural analysis): introduction
Weak 12: Displacement method (matrix structural analysis): truss
Weak 13: Displacement method (matrix structural analysis): beam
Weak 14: Stability of rigid body-elastic spring system
<<Final Exam>>
Weak 15: Feedback

Continue to Structural Mechanics II and Exercises(2)↓↓↓

Structural Mechanics II and Exercises(2)

[Course requirements]

Calculus A and B, Linear Algebra A and B, Structure mechanics Ⅰ and Exercises

[Evaluation methods and policy]

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

[Textbooks]

To be informed by the lecturer in charge in his/her first lecture

[References, etc.]

（Reference books）

M. Matsumoto, E. Watanabe, H. Shirato, K. Sugiura, A. Igarashi, T. Utsunomiya, Y. Takahashi: Structure mechanicsⅡ, Maruzen Ltd. isbn{}{4621046403}(in Japanese)

[Study outside of class (preparation and review)]

Study exercise and assignment repeatedly.

（Other information (office hours, etc.)）

Office hour (contact information and consultation hours) of the lecturer(s)will be given in his/her first lecture.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33515 LE73				
Course title (and course title in English)	Continuum Mechanics Continuum Mechanics		Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,Zhu Fan Graduate School of Engineering Associate Professor,IKARI HIROYUKI	
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.5	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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 such as fundamentals of tensor analysis, mathematical formulation of stress, strain, motion and displacement, conservation laws of continuous media (mass, momentum, angular momentum, energy conservation laws), constitutive laws of solids and fluids, principle of virtual work and minimum potential energy based on the calculus of variations and applications in elasticity, stress distribution, wave propagation and fluid dynamics.

[Course objectives]

Based on the clear understanding of the mathematical formulation on deformation, stress and constitutive laws, students are required to understand the derivation of the equation of motion, conservation laws of angular momentum and energy. Principle of energy, variational method and initial-boundary-value problems are appended for enhancing understanding through theoretical applications

[Course schedule and contents]

Elementary knowledge on tensor analysis (1 time): Definition of tensors, Integral theorem, Material derivative over a material volume, Transformation of components of tensors, etc.
Stress, strain and strain rate tensors (1 time): 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 times): Mathematical expression of conservation laws of continuous media (mass, momentum, angular momentum, energy)
Constitutive law of solids and fluids (2 time): Constitutive laws of elastic amp visco-elastic body and Newton fluids
Mid-term confirmation of understanding (1 time)
Principle of energy, variational method and initial-boundary-value problems (2 times): Principle of virtual work and minimum potential energy based on the calculus of variations as well as initial-boundary-value problems
Applications in elasticity and fluid dynamics (5 times): Applications in Elasticity and Fluid Dynamics. Stress distribution and Wave propagation in elastic body, Thermal convection and Lorentz Chaos, etc.
Class feedback (1 time): Achievement confirmation

Continue to Continuum Mechanics(2)↓↓↓

Continuum Mechanics(2)

[Course requirements]

Basic knowledge of calculus and linear algebra studied in 1st-2nd year of study

[Evaluation methods and policy]

Evaluation will be mainly based on written examinations including the mid-term and final examinations. Regular assignments taken during the class will also be considered.

[Textbooks]

Materials on the contents of this subject are uploaded via KULASIS or PandA

[References, etc.]

（Reference books）

P. Chadwick, quotContinuum Mechanics: Concise Theory and Problemsquot, Dover Publications isbn0486401804
A.J.M. Spencer, quotContinuum Mechanicsquot, Dover Publications isbn0486435946
G.E. Mase, quotSchaum#039s Outline of Continuum Mechanicsquot, McGraw-Hill isbn0070406634

[Study outside of class (preparation and review)]

Review of vector and matrix analysis is recommended.

（Other information (office hours, etc.)）

Assoc. Prof. Abbas Khayyer (Department of Civil and Earth Resources Engineering, Katsura C1-585)
khayyer@particle.kuciv.kyoto-u.ac.jp
Assoc. Prof. Hiroyuki Ikari (Department of Civil and Earth Resources Engineering, Katsura C1-101)
ikari@particle.kuciv.kyoto-u.ac.jp
Assoc. Prof. Fan Zhu (Department of Urban Management, Katsura C1-291)
zhu.fan.7m@kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33517 LE73		
Course title (and course title in English)	Fundamentals of Hydrology Fundamentals of Hydrology	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,NAKAKITA EIICHI Disaster Prevention Research Institute Professor,SAYAMA TAKAHIRO Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Associate Professor,YOROZU KAZUAKI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.3	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

The fundamental concept of hydrology is the hydrological cycle, which is various scale physical processes of water movements in the atmosphere, land surfaces, 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 land surfaces, and transport of vapor in the atmosphere. The vapor changes to liquid and fall on the land surfaces as precipitation, then the flow of water on and under the land surfaces are driven by gravity. Hydrology is the study of the movement of water on and under the land surface and its applications to mitigate water-related disasters, develop water resources and preserve the environment. In the class, basic hydrological processes such as solar radiation, precipitation, evapotranspiration, infiltration, surface and subsurface flow, and river flow are described.

[Course objectives]

The aim of the course is to understand the basic hydrological processes to obtain the knowledge for analyzing hydrological phenomenon and the engineering background for water resources development.

[Course schedule and contents]

The hydrologic cycle,1time,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.
Precipitation ,1time,The mechanism of precipitation is described. A numerical rainfall prediction model and the mechanism of radar rainfall observation are described.
Interception and infiltration,1time,The process of precipitation interception by trees is introduced. Then the governing equation of unsaturated flow and the basic equations of potential infiltration are explained.
Groundwater flow,1time,The mechanism of rainfall-runoff in mountainous slope The mechanism of groundwater is explained. The physical equation to represent groundwater flow is derived from the continuity and momentum equations of water flow.
Surface runoff,3times,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.

Continue to Fundamentals of Hydrology(2)↓↓↓

Fundamentals of Hydrology(2)

Solar radiation and energy balance,1time,Energy and water cycle driven by solar radiation is described. Basic mechanism of global warming ant its influence on hydrologic cycle is introduced.
Evaporaion and transpiration,3times,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.
Flood routing,1time,The mechanism of flood routing is explained. Numerical representation method to represent channel network structure is introduced, then typical flow routing methods are described.
Hydrological model,1time,A physically-based hydrological model which consists of various hydrological processes is described. Typical lumped hydrological models are also introduced.
Society and hydrology,1time,How the hydrological sciences are related to the society is described through various examples.
Achievement confirmation,1time,Quiz, report and the final examination is conducted to measure students#039 knowledge, skill and aptitude on the subject.

[Course requirements]

It is desiarable to study Hydraulics (2nd year) and probability and statistical analysis (2nd year).

[Evaluation methods and policy]

The score is evaluated comprehensively with quiz, reports and the final examination.

[Textbooks]

An English text book is provided, which is compiled based of the text books used in Japanese hydrology class.

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Read the handouts to understand contents to be given in lectures and to gain deep understanding of unclear points of the lectures.

（Other information (office hours, etc.)）

Office hours are not provided. Questions from students will be accepted in the lecture room or via email. Contact information will be given at lectures.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33519 LE73		
Course title (and course title in English)	Soil Mechanics II and Exercises Soil Mechanics II and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YASUHARA HIDEAKI Graduate School of Engineering Associate Professor,IWAI HIROMASA Graduate School of Engineering Associate Professor,HASHIMOTO RYOTA Graduate School of Engineering Associate Professor,Zhu Fan

Target year	3rd year students or above	Number of credits	3	Year/semesters	2024/First semester
Days and periods	Wed.1,2	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Students are expected to learn consolidation and stress distribution in soils, shear strength of soils, lateral earth pressures, bearing capacity of shallow and deep foundations, slope stability, and soil dynamics. Fundamental analyses and design criteria of various geotechnical engineering problems are drilled through exercises.

[Course objectives]

The course objective is to provide understanding of key engineering concepts and mechanical behaviors of soil materials including consolidation and soil improvement, load transmission in elastic medium, effect of excessive pore water pressure to shear strength, effective stress paths interpreted from conventional triaxial tests, lateral earth pressure acting on retaining walls, bearing capacity of foundations, stability of slopes and excavations, soil liquefaction, and dynamic characteristics of soils subjected to earthquake.

[Course schedule and contents]

Consolidaton, 2 times, Consolidation equation and its solution, consolidation test, and theory of ground improvement for enhancing consolidation

Stresses in ground, 1 times, Boussinesq's elasticity solution, immediate settlement, and calculation of the settlement

Shear strength, 2 times, Failure criteria, unconfined compressive strength, in-situ tests, triaxial compression tests, stress-strain curve, drainage behaviors, and effective stress paths

Earth pressure, 2 times, Rankine's theory, Coulomb's theory, stability of retaining walls, and earth pressure acting on sheet pile wall

Midterm exam, 0.5 times,

Bearing capacity, 1.5 times, Bearing capacity and design for shallow foundations, bearing capacity and design for pile foundations

Slope stability, 2 times, Stability analysis of infinite slope and slope with a circular slip surface, stability analysis with the slice method, and stability analysis of soft ground

Continue to Soil Mechanics II and Exercises(2)↓↓↓

Soil Mechanics II and Exercises(2)

Soil dynamics and liquefaction, 2 times, Nature of seismic load, soil behavior under earthquake loading, mechanism of liquefaction, and prediction of liquefaction potential

Practice, 1 time, Problem solving in geotechnical engineering

Class feedback, 1 time, Confirmation of understanding

[Course requirements]

A required prerequisite is knowledge of soil mechanics. Soil mechanics I and Exercises (3508000) would be helpful as a prerequisite.

[Evaluation methods and policy]

Grades will be evaluated comprehensively based on Final Exam (approx. 70%), Midterm exam and classworks (approx. 30%).

[Textbooks]

Soil Mechanics I & II Tutorial Exercises
Soil Mechanics Laboratory Manual
Handouts distributed

[References, etc.]

（Reference books）

Braja M. Das, ldquoFundamentals of Geotechnical Engineeringrdquo, Cengage Learning isbn9781111576752
Muni Budhu, ldquoSoil Mechanics and Foundationsrdquo, John Wiley amp Sons, INC. isbn9780470556849
Isao Ishibashi, Hemanta Hazarika, ldquoSoil Mechanics Fundamentalsrdquo, CRC Press isbn9781439846445
岡二三生著：土質力学演習（森北出版）isbn4627426607

（Related URLs）

http://geomechanics.kuciv.kyoto-u.ac.jp/lecture/text/kakomon.html

[Study outside of class (preparation and review)]

Practice yourself from Tutorial Exercise

（Other information (office hours, etc.)）

Announced during classes

*Please visit KULASIS to find out about office hours.

Continue to Soil Mechanics II and Exercises(3)↓↓↓

Soil Mechanics II and Exercises(3)

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33520 EE73		
Course title (and course title in English)	Exp on Soil M & Ex Experiments on Soil Mechanics and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Associate Professor,IWAI HIROMASA Disaster Prevention Research Institute Associate Professor,UEDA KYOHEI Graduate School of Engineering Associate Professor,SAWAMURA YASUO Graduate School of Global Environmental Studies Associate Professor,TAKAI ATSUSHI Graduate School of Engineering Associate Professor,HASHIMOTO RYOTA Graduate School of Global Environmental Studies Assistant Professor,KATO TOMOHIRO Graduate School of Engineering Program-Specific Assistant Professor,MIYOSHI TAKAKO

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.3,4	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

The purpose of this course is to teach students how to conduct laboratory experiments and in-situ tests in order to obtain engineering properties and mechanical parameters of soils which were studied in the soil mechanics courses.

[Course objectives]

To help students deepen their understanding on concepts of soil mechanics and to develop their skills and experiences in fundamental experiments as well as collecting, analyzing and interpreting experimental data.

[Course schedule and contents]

Introduction and orientation, 1 time,

Physical properties of soils, 1 time, Soil structure, engineering classification of soils, consistency Limits, grain size distribution

Compaction test, 1 time, Laboratory compaction tests, factors affecting compaction

Hydraulic conductivity test and particle size distribution test, 2 times, Permeability and seepage, Darcy's law, Hydraulic gradient, determination of hydraulic conductivity, flow net analysis, Sieve analysis for determining the particle size distribution curve

Consolidation test, 1 time, Fundamentals of consolidation, laboratory tests, settlement-time relationship

Continue to Exp on Soil M & Ex(2)↓↓↓

Exp on Soil M & Ex(2)

Uniaxial compression test, 1 time, Stress-strain and strength behavior of clays

Direct shear test, 1 time, Mohr-Coulomb failure criterion, laboratory tests for shear strength determination

Sounding methods, 0.5 time, N-values of standard penetration test and elastic wave exploration

Centrifuge model test, 0.5, Experiments using the similitude law of centrifuge test

Shaking table test, 1 time, Experiments using the shaking table test on dynamic behaviors of soils and foundations

Computer exercise and numerical analysis, 2 times, Fundamentals of math and physics for geotechnical engineering

Special lecture, 1 time, Special lecture on soil mechanics

Exercise, 1 time, Practical applications of laboratory testing data

Class feedback, 1 time, Confirmation of understanding

[Course requirements]

Soil Mechanics I and Exercises (3508000). It is recommended to take Soil Mechanics II and Exercises (3519000) in parallel.

[Evaluation methods and policy]

Students are expected to conduct all experiments. Full attendance to laboratories and submission of all reports are compulsory.

[Textbooks]

Soil Mechanics I & II Tutorial Exercises
Soil Mechanics Laboratory Manual
Handouts distributed

[References, etc.]

（Reference books）

Braja M. Das 『Soil Mechanics Laboratory Manual』（Oxford University Press）ISBN:9780190209667
Dante Fratta et al. 『Introduction to Soil Mechanics Laboratory Testing』（CRC Press）ISBN: 9781420045628
『土質試験 基本と手引き 第三回改訂版』（地盤工学会）ISBN:978-4-88644-127-0
『地盤材料試験の方法と解説（第一回改訂版）』（地盤工学会）ISBN:978-4-88644-121-8
『JAPANESE GEOTECHNICAL SOCIETY STANDARDS Laboratory Testing Standards of Geomaterials (Vol.1)』（Japanese Geotechnical Society）ISBN:4886448200
『JAPANESE GEOTECHNICAL SOCIETY STANDARDS Laboratory Testing Standards of Geomaterials

Continue to Exp on Soil M & Ex(3)↓↓↓

Exp on Soil M & Ex(3)

(Vol.2)』 （Japanese Geotechnical Society）ISBN:4886448224
『JAPANESE GEOTECHNICAL SOCIETY STANDARDS Laboratory Testing Standards of Geomaterials (Vol.3)』 （Japanese Geotechnical Society）ISBN:4886448240

[Study outside of class (preparation and review)]

It is recommended to read and grasp test procedures before each class.

（Other information (office hours, etc.)）

This class is intended mainly for students of the International Course, and will be delivered in English. You cannot join this class from middle of the semester.
Contact: Instructors in charge of this subject will be informed in guidance.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors ’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors ’ practical work experience

Course number	U-ENG23 33521 LE73 U-ENG23 33521 LE24 U-ENG23 33521 LE55

Course title (and course title in English)	Plan & Mng of S Sys Planning and Management of Social Systems	Instructor's name, job title, and department of affiliation	Disaster Prevention Research Institute Professor,Cruz Ana Maria Graduate School of Engineering Associate Professor,QURESHI, Ali Gul Graduate School of Engineering Associate Professor,SCHMOECKER, Jan-Dirk

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Thu.2	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This lecture series explains why and how society can be regarded as a system and described with mathematical tools. Predicting changes in a society and influencing society in a desired direction are closely related to infrastructure planning and management. Basic concepts and frameworks of typical models that are indispensable for the analysis of (social) system states and trends are introduced. Moreover the lectures cover theories in social psychology and discuss how cultural differences impact infrastructure planning.

[Course objectives]

To provide students with a complex system perspective of society and to clarify the role of infrastructure planning and management. Further, to provide understanding of some typical mathematical and psychological models for system analysis.

[Course schedule and contents]

Week 1: Introduction, Problems of infrastructure planning and management, and its methodology. Abstract of systems analysis and "physics of society".

Weeks 2-3: Markov models, Markov process. Transition probability matrix. Steady state.

Weeks 4: Time-series predicting model, Serial correlation. Auto-Regressive model. AutoRegressive-Moving Average model.

Weeks 5-6: Queuing theory, single and multiple queues, examples for different M/D/k queues

Weeks 7-8: Game theory and general social dilemma situations, Strategic interdependency. Nash equilibrium. Typical models. Social dilemma situations and infrastructure planning.

Weeks 9-10: Social psychology and planning, Attitudes, values and their influence on behavior and planning

Weeks 11- 14: Hazard Analysis, Examples of major accident analysis; fault trees and event trees.

This is followed by a final exam and feedback class.

Continue to Plan & Mng of S Sys(2)↓↓↓

Plan & Mng of S Sys(2)

[Course requirements]

None

[Evaluation methods and policy]

Joined judgement of homeworks (45%) and end of term exam (55%).

[Textbooks]

Handouts will be distributed in class as well as links for further reading on specific topics covered in the course.

[References, etc.]

（Reference books）

Hillier, F.S. and Lieberman, G.J. (2015) Introduction to Operations Research. 10th Edition. McGraw Hill. isbn9781259253188

Straffin, P.D. (1993). Game Theory and Strategy. The Mathematical Association of America. New Mathematical Library. isbn0883856379

Further useful textbooks and materials are introduded during the lectures.

[Study outside of class (preparation and review)]

Handouts should be reviewed by students. For each of the three main parts of the course a homework will be given that reviews the class content.

（Other information (office hours, etc.)）

Offices hours of the teachers are notified during the first class.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33522 LE55　U-ENG23 33522 LE73		
Course title (and course title in English)	Engineering Mathematics B2 Engineering Mathematics B2	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SCHMOECKER,　Jan-Dirk

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Fri.1	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This course deals with integral transformation, in particular Fourier analysis. 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 civil engineering applications.

[Course objectives]

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 schedule and contents]

Week 1: Introduction, What is Fourier Analysis? How to apply it? Clarify the necessary background knowledge.

Weeks 2-5: Fourier series, 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.

Weeks 6-10: Fourier transform, Fourier analysis of non-periodic function leads to the Fourier transform. The first class of functions is the actual Fourier integral. The lecture discusses how it represents the non-periodic functions and shows the various properties of the Fourier transform. Students ability to use the Fourier transform is improved through examples. The relationship to the Laplace transform is further discussed.

Week 11-12: Numerical Fourier analysis, Fast Fourier transform (FFT) is a basic Fourier transform algorithm. In this lecture it is explained and a software illustration provided.

Weeks 13-14: Application to Partial Differential Equations. In the last part of this course well known partial differential equations (Laplace equation, wave equation, heat equation, etc.) are discussed. The application of Fourier series and Fourier transform is discussed to obtain specific solutions to boundary value.

The course concludes with a final exam and feedback.

Continue to Engineering Mathematics B2(2)↓↓↓

Engineering Mathematics B2(2)

[Course requirements]

Calculus, Linear Algebra, Engineering Mathematics B1.

[Evaluation methods and policy]

Participation and assignments and midterm (35%) and final exam (65%)

[Textbooks]

Handouts will be given in class. Textbooks and other material are introduced in class.

[References, etc.]

（Reference books）

Pinkus, A. and Zafrany,S.: Fourier Series and Integral Transforms, Cambridge University Press.
isbn0521597714
Further material is introduced during classes.

（Related URLs）

(None)

[Study outside of class (preparation and review)]

Regular homeworks will be given that review the class content.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33524 LE73				
Course title (and course title in English)	Public Economics Public Economics		**Instructor's name, job title, and department of affiliation**	Disaster Prevention Research Institute Professor,TATANO HIROKAZU Graduate School of Engineering Professor,OONISHI MASAMITSU	
Target year	3rd year students or above	**Number of credits**	2	**Year/semesters**	2024/First semester
Days and periods	Thu.1	**Class style**	Lecture (Face-to-face course)	**Language of instruction**	English

[Overview and purpose of the course]

The objective of this course is to acquire the basic concepts and theories of economics, and to understand the business valuation of social infrastructure projects and the supply and procurement mechanisms of public services. For this purpose, lectures will be given on the basic concepts of microeconomics and game theory to understand the concept of economic value of social infrastructures, i.e., infrastructure, and practical considerations on investment decisions in social infrastructures. In addition, students will learn about public procurement systems such as tendering and contracting, as well as economic issues related to the supply of administrative services, with the aim of acquiring the knowledge necessary for the management of public services.

[Course objectives]

Students will acquire basic concepts and theories of economics, and understand the concepts related to project evaluation of social infrastructure projects and the system of supply and procurement of public services.

[Course schedule and contents]

(1) Introduction [1 week]:
    Significance of studying economics in infrastructure planning and management
(2) Theoretical Foundations of Economics [4 weeks]:
    Partial equilibrium analysis, general equilibrium analysis, public goods, externalities, market failure
    Game theory, mechanism design
(3) Cost-benefit analysis [3 weeks]:
    Methodology for evaluating the economic benefits of infrastructure, practical infrastructure investment decisions
(4) Theory of public goods supply [2-3 weeks]:
    Mechanism design with monetary transfers, Lindahl mechanism, VCG mechanism, auction mechanism
    VCG mechanism, auction mechanism, integrated evaluation method*, estimated price system*
(5) Theory of public works contracts [3 weeks]
    Adverse selection, moral hazard, risk sharing, incomplete contracts, specification rules vs. performance rules,
    Boundary between public and private sectors
(6) Provision of evacuation supplies for disaster recovery [1 week]
    Mechanism design without monetary transfers: Non-divisional goods allocation matching and uniform rule, Evacuation goods supply mechanism

Continue to Public Economics(2)↓↓↓

Public Economics(2)

<Final examination>> Feedback [1 time]
Feedback [1 time] Confirmation of the level of achievement regarding the contents of this lecture.

Note that * is an optional list of slightly advanced topics, which may be omitted depending on the student's level of understanding and the progress of the lecture. In addition, an exercise will be given only once to have each student check his/her own level of understanding.

[Course requirements]

It is desirable that students have taken the course of planning system analysis and practice.

[Evaluation methods and policy]

Periodical tests and reports are comprehensively taken into consideration. (Periodic tests: 70 to 80%; reports: 20 to 30%)

[Textbooks]

Not used

[References, etc.]

（Reference books）

Hal R. Varian 『Intermediate Microeconomics : A Modern Approach, ninth Edition』 （W. W. Norton & Company） ISBN:9780393433975
Guillaume Haeringer 『Market Design: Auctions and Matching』 （MIT Press, 2018） ISBN: 9780262037549

[Study outside of class (preparation and review)]

Students are expected to review whether they have understood the contents of the class by working on one or two exercises assigned in each class.

（Other information (office hours, etc.)）

Questions and so forth will be accepted after the class. Questions can also be asked via e-mail to onishi. masamitsu.7e@kyoto-u.ac.jp.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33526 LE73		
Course title (and course title in English)	Urban and Regional Planning Urban and Regional Planning	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,QURESHI， Ali Gul

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.4	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Outlines of the processes of urban planning, planning of urban facilities, land use policies and transportation policy. In addition, the basic theory and models of land use, transportation, environment protection and urban economics will be discussed.

[Course objectives]

To understand the structure of urban problems and to learn the basics of urban planning.

[Course schedule and contents]

Lecture 1:Introduction to Urban and Regional Planning (Concept and problems of urban and regional areas, need and social background of planning. Particularly factors affecting the future of cities such as the internationalization, aging and environmental issues will be described.)

Lecture 2:Histroy of Urban Planning in Japan (Historical background of urban planning in pre-war Japan.)

Lecture 3-5: Land-use Planning and District Planning (Basic concepts of urban planning, domain of urban planning, urbanization, regulations and basic zoning measures. Policies of urban development such as zoning, revamping of the central business district, other district planning methods as well as conservation of natural and historical environment of the city.)

Lecture 6-7: Environmental Issues and Urban Systems (Environmental issues, contemporary challenges and planning requirements of regional and urban environment from the environmental economics point of view.)

Lecture 8:Current Urban Development (Current trends of the urban and regional planning such as eco-towns and smart growth.)

Lecture 9: Basic Theory of Urban Transport Policy (Transport policy framework considering factors such as mobility, environment, landscape, attractiveness and vitality of the city. Classification of transport policy (regulatory policy, economic policy, infrastructure development policy).)

Lecture 10-12:Urban Transport Policy (Urban transport policies will be explained from the perspective of urban development. In particular, the transport policies required to achieve a sustainable city with respect to environment and energy use. Deregulation, basic theory of deregulation, limitations and the effects of deregulation.)

Continue to Urban and Regional Planning(2)↓↓↓

Urban and Regional Planning(2)

Lecture 13-14:Urban Transportation Planning (Basic concepts and models of the four-step transportation model will be discussed.)

Lecture 15:Examination

Lecture 16: Feedback Class

[Course requirements]

None

[Evaluation methods and policy]

Class participation, quiz and end of term examination.

[Textbooks]

Materials will be provided in the class from time to time.

[References, etc.]

（Reference books）

Useful textbooks and material will be introduded during the lectures.

[Study outside of class (preparation and review)]

Students are advised to read the material assigned as pre-read (in almost all lectures) and do the assigned homework.

（Other information (office hours, etc.)）

Office hours will be allocated for students to consult the instructor and ask questions as needed.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33527 LE73				
Course title (and course title in English)	Transportation Management Engineering Transportation Management Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,SCHMOECKER, Jan-Dirk		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Mon.3	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

To provide the student with sufficient knowledge to explain the significance of the various methodologies used for transportation planning, operation and traffic engineering. To enable the student to apply these methods appropriately. The course further aims to provide an overview on new developments in transportation planning and theory, such as micromobility, sharing and autonomous vehicles.

[Course objectives]

To provide the student with sufficient knowledge to explain the significance of the various methodologies used for transportation planning, operation and traffic engineering. To enable the student to apply each method appropriately. To critical discuss the changes new technologies such as autonomous vehicles and shared mobility bring to our urban transportation systems.

[Course schedule and contents]

Weeks 1-2: Introduction. The role of transport in the city and the role of motorisation. Definition of Transportation planning and traffic engineering. Mobility trends related to autonomous vehicles and shared transport modes.

Weeks 3-4: Observing and analysing travel behaviour. Purpose of travel surveys, in particular person trip surveys. How to analyse travel behaviour with these and how to use these data.

Weeks 5-6: Road network survey and analysis. Explaining methods for road traffic flow and travel demand estimation.

Weeks 7-10: Traffic Flow Theory, Mechanisms of congestion, characteristics of traffic flow and traffic flow models, traffic capacity of road.

Weeks 11-12: Traffic operations, Traffic capacity at intersections, traffic signal control methods

Weeks 13-14: Traffic management methods, Introduction to the various traffic management techniques currently being implemented, their benefits and challenges.

This is followed by a final exam and feedback.

Continue to Transportation Management Engineering(2)↓↓↓

Transportation Management Engineering(2)

[Course requirements]

None

[Evaluation methods and policy]

Joined judgement of homeworks (35%) and end term exam (65%).

[Textbooks]

None

[References, etc.]

（Reference books）

Iida, Kitamura 『Traffic Engineering』ISBN:9784274206382（2008）
Roess R.P, Prassas E. S, McShane W.R 『Traffic Engineering』 （Prentice Hall）ISBN:9780136135739（4th Ed (2004)）
Further material will be introduced during the class.

（Related URLs）

(None)

[Study outside of class (preparation and review)]

Handouts should be reviewed by students. Occasionally also homeworks will be given that help reviewing the class content.

（Other information (office hours, etc.)）

It is recommended to take this course jointly with "Urban and Regional Planning " taught by Assoc. Prof. Ali Qureshi as some exercises will be conducted jointly.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33528 LE73		
Course title (and course title in English)	Geoenvironmental Engineering Geoenviornmental Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Global Environmental Studies Professor,KATSUMI TAKESHI Disaster Prevention Research Institute Professor,UZUOKA RYOSUKE

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.1	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This course provides the knowledge on geoenvironmental engineering related to environmental geotechnics, remedial technologies, disaster mitigation and ground improvement/reinforcement.

[Course objectives]

The goal of this course is to understand how geotechnical engineering contributes to disaster prevention and environmental issues.

[Course schedule and contents]

Environmental geotechnics (4-5 classes)
Remediation of contaminated soils and groundwaters, waste containment, and reuse of waste materials in geotechnical applications, are introduced

Ground improvement (4-5 classes)
Principles of ground improvement and foundations are introduced.

Geo-disaster (4-5 classes)
Measures against geo-disasters and remedial technics are introduced.

Class feedback (1 class)
Confirmation of understanding

[Course requirements]

Students are recommended to have taken Soil Mechanics I and Exercises (35080).

[Evaluation methods and policy]

Final exam (80%) and class works (20%)

Continue to Geoenvironmental Engineering(2)↓↓↓

Geoenvironmental Engineering(2)

[Textbooks]

Handouts will be distributed.

[References, etc.]

（Reference books）

Lakshmi N. Reddy, Hilary I. Inyang 『Geoenvironmental Engineering: Principles and Applications』 （Marcel Dekker, Inc.） ISBN:0824700457
Robert W. Sarsby 『Environmental Geotechnics』 （ICE publishing） ISBN:9780727741875

[Study outside of class (preparation and review)]

Introduced at the classes.

（Other information (office hours, etc.)）

No specific office hour is scheduled. Please contact the instructors individually.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course with practical content delivered by instructors with practical work experience

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33529 LE77　U-ENG23 33529 LE73		
Course title (and course title in English)	Rock Engineering Rock Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,KISHIDA KIYOSHI Graduate School of Engineering Professor,YASUHARA HIDEAKI Graduate School of Engineering Associate Professor,Zhu Fan

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Tue.2	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Unlike soil, rock is strong and hard materials consisting of solid aggregates of various minerals. However, rock mass is different from concrete because it is not merely a mixture of materials binding together but it has undergone geological process and formed structural discontinuities. Therefore, strength of rock mass is controlled by planes of weakness and extents of fractures. Moreover, water can have impact on rocks, not by breaking rock into pieces, but rather breaking rock into blocks through permeable discontinuities. Design and construction technology of rock structures (such as tunnel, rock slope, dam), geology, mechanical properties of rock and rock fracture, laboratory tests and field measurements of rock and rock mass are introduced in this lecture.

[Course objectives]

This lecture aims to provide basic understanding of engineering properties of rock and rock masses for applications in both civil engineering works and mining operations. Design exercise of rock structure is also introduced.

[Course schedule and contents]

* Introduction (1 week)
Introduction to rock engineering, geological structure and discontinuities

* Strength characteristics (4 weeks)
Strength of intact rock, fractures in rock mass, discontinuity and surface roughness, Griffith and Hoek-Brown failure criteria

* Stereographic projection (1 week)
Description of discontinuous planes

* Hydraulics in rocks (2 weeks)
Hydro-mechanical behaviors in rock, and groundwater flow in fractured rock

* In-situ investigation (3 weeks)
Geological survey and geophysics, subsurface stresses and measurements, rock classification

* Engineering applications (2 weeks)
Engineering applications to slope and tunneling

Continue to Rock Engineering(2)↓↓↓

Rock Engineering(2)

* Practice (1 week)
Practice of previously studied subjects

* Class feedback (1 week)
Confirmation of understanding

[Course requirements]

None

[Evaluation methods and policy]

Class participation/reports/assignments (25%), Mid-term exam (35%), Final exam (40%).

[Textbooks]

Handouts are distributed via KULASIS or PandA

[References, etc.]

（Reference books）

R.E. Goodman 『Introduction to Rock Mechanics』（John Wiley ）ISBN:0471617180
J.A. Hudson and J.P. Harrison 『Engineering Rock Mechanics』（Pergamon）ISBN:9780080438641
J.C. Jaeger, N.G.W. Cook and R.W. Zimmerman 『Fundamentals of Rock Mechanics』（Blackwell Publishing ）ISBN:9780632057597
日本材料学会編 『ロックメカニクス』（技報堂出版）ISBN:4765516288
Soil mechanics sign convention (compression is taken as positive) is used throughout this course. Please be careful if you refer to the knowledge sources using Continuum mechanics sign convention (tension is taken as positive).

（Related URLs）

https://www.isrm.net/(International Society for Rock Mechanics and Rock Engineering)

[Study outside of class (preparation and review)]

Quizzes are regularly taken in the course.

（Other information (office hours, etc.)）

1) Prof. Kiyoshi KISHIDA
Office: Department of Urban Management, C1-2-335
E-mail: kishida.kiyoshi.3r@kyoto-u.ac.jp
2) Prof. Hideaki YASUHARA
Office: Department of Urban Management, C1-2-212
E-mail: yasuhara.hideaki.7p@kyoto-u.ac.jp
3) Assoc. Prof. Fan ZHU
Office: Department of Urban Management, C1-4-291
E-mail: zhu.fan.7m@kyoto-u.ac.jp

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33530 LE73						
Course title (and course title in English)	Design for Infrastructure II Design for Infrastructure II			Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester		
Days and periods	Tue.4	Class style	Lecture (Face-to-face course)	Language of instruction	English		

[Overview and purpose of the course]

Civil Engineering widely contributes to our society. This course explains Civil Engineering from the viewpoint how technology and knowledge is applied and integrated for a safe, comfortable and sustainable society. This class consists of lectures from not only academic staffs but also guest lecturers and it comprehensively discusses what Civil Engineering is, including the expected roles and ethics for civil engineers.

[Course objectives]

To understand how technology and knowledge cultivated in Civil Engineering contributes to the promotion of social infrastructure, prevention or diminishment of disasters, and creation of environment. Furthermore, by overviewing the current research trend, it is expected to comprehend the challenges and future directions of Civil Engineering.

[Course schedule and contents]

- Expected role for Civil Engineers, 3 times
Firstly, the outline of this course is explained. Then, reflecting the current examples, the role and the field related to civil engineers are explained. Finally, the ethics for Civil Engineers are explained.

- Application of Civil Engineering to the society, 8 times
It is explained how technology and knowledge cultivated in Civil Engineering contributes to the promotion of social infrastructure, prevention or diminishing of disasters, and creation of environment. Concretely, the relationship between the academic studies and the application to practice, and the real image of Civil Engineering are explained from the viewpoint of major fields where many Civil Engineers work.

- Understanding the current research directions in Civil Engineering, 3 times
Firstly, the research trend in Civil Engineering, which aims to realize safe, comfortable and sustainable society, is explained. Then, each student selects specific research field based on his/her interests and investigates their research topics and future directions.

- Achievement assessment, 1 time
The achievement of the lecture is assessed.

Continue to Design for Infrastructure II(2)↓↓↓

Design for Infrastructure II(2)

[Course requirements]

None

[Evaluation methods and policy]

The grade is evaluated based on the record of attendance and reports assigned by lecturers.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Recommend to survey related information of each topic introduced in the class

（Other information (office hours, etc.)）

Lecture handouts and assignment submissions are handled by PandA. Due to COVID-19, the form of lecture delivery will be updated later.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
An omnibus course delivered by invited lecturers and guest speakers from different companies, etc.

(2) Details of instructors' practical work experience related to the course

(3) Details of practical classes delivered based on instructors' practical work experience

Course number	U-ENG23 33531 LE73				
Course title (and course title in English)	Water Resources Engineering Water Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,TACHIKAWA YASUTO Disaster Prevention Research Institute Professor,HORI TOMOHARU Graduate School of Engineering Associate Professor,KIM SUNMIN		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.1	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

The 1st Class: Water resources systems planning
Target of water resources engineering. Temporal and spatial distribution of water resources on the earth.

The 2nd - 3rd Classes: Development of water resources
Concept and measures of water resources develeopment. Efficiency and limit of water resources development.

The 4th Class: Design of water resources systems,
Estimation of water demand and design of water resources systems.

The 5th - 6th Class: Operation and management of water resources systems
Planning and management, off-line and real time operation, optimization of reservoir control.

The 7th Class: Social and legislation system for water resources
Social and legislation system for water resources, water right, public and private water, management and defect.

The 8th Class: Hydrologic predictions
Hydrologic predictions play an important role for water resources evaluation. The basic role of hydrologic predictions for a river planning and river management are explained.

The 9th - 12th Class: Hydrologic frequency analysis
The basis of the hydrologic frequency analysis is explained. Hydrologic variables used for the river planning and water resources planning are introduces as probabilistic variables; the concept of non-exceedance and

Continue to Water Resources Engineering(2)↓↓↓

exceedance probability and T-year probabilistic hydrologic variables are explained. Then, the procedure of hydrologic frequency analysis, distribution functions used for the frequency analysis, and estimation methods of parameters of a distribution function is described.

The 13th - 14th Class: Real-time hydrologic forecasting
Methods for real-time rainfall forecasting and river discharge forecasting are focused.

<<Semester final examination>>

The 15th Class: Feedback
Achievement assement is intended to measure students' knowledge, skill and aptitude on the subject.

[Course requirements]

It is desirable that students have already learned fundamental hydrology and systems analysis for planning and management.

[Evaluation methods and policy]

Grading is done based on the mark on regular examination. Performance in the assignment and quiz in the classes is also taken into account. Minimum passing grade is sixty percent.

[Textbooks]

Not used

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Explained in the classes.

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33534 PE73		
Course title (and course title in English)	International Internship International Internship	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,MATSUNAKA RYOUJI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Intensive, Second semester
Days and periods	Intensive	Class style	Practical training (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This program aims to train basic concept and application of global engineeringrsquos methodology (ldquostructural engineeringrdquo, ldquohydraulicsrdquo, ldquogeomechanicsrdquo, ldquoinfrastructure planning and managementrdquo, etc) on real society.
 This internship will not only provide practical opportunity to train at formal institution or enterprise in Japan but also train at foreign university or international institution or NGO.

[Course objectives]

To understand relationship between basic concept and application of global engineeringrsquos methodology in real society, and to induce high motivation of technical capacity improvement through practical experience of business.

[Course schedule and contents]

Week 1, Guidance
Week 2, Preparation on Internship
Week 3-13, Implementation of Internship
Week 14-15, Report meeting
Each students should present output of internship in this meeting.

[Course requirements]

Students should attend to orientation meeting for 3rd year student in April.

[Evaluation methods and policy]

Final presentation: 40-50%, Reports (Daily work report, summary report) : 50-60%

[Textbooks]

None

Continue to International Internship(2)↓↓↓

International Internship(2)

[References, etc.]

（Reference books）

None

[Study outside of class (preparation and review)]

None

（Other information (office hours, etc.)）

Priority is given to the international course student when the applicants for employing institute of internship program are a large number.

*Please visit KULASIS to find out about office hours.

[Courses delivered by instructors with practical work experience]

(1) Category
A course that includes off-campus training classes.

(2) Details of instructors’ practical work experience related to the course

(3) Details of practical classes delivered based on instructors’ practical work experience

Course number	U-ENG23 33535 LE73		
Course title (and course title in English)	E & WR of S, & RSDP Earthquake and Wind Resistance of Structures, and Related Structural Design Principles	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,SUGIURA KUNITOMO Graduate School of Engineering Professor,TAKAHASHI YOSHIKAZU Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI Graduate School of Engineering Assistant Professor,MATSUMOTO RISA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.3	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

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.

[Course objectives]

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 schedule and contents]

(1) Design: Structural planning of civil infrastructure
(2) Design: Design theory of civil infrastructure
(3) Design: Actions
(4) Wind Resistance: Aerodynamics of structure
(5) Wind Resistance: Wind-induced vibration
(6) Wind Resistance: Wind resistant design
(7) Earthquake Resistance: Earthquake source
(8) Earthquake Resistance: Earthquake ground motion
(9) Earthquake Resistance: Dynamic analysis
(10) Earthquake Resistance: Seismic design
(11) Design: Limit state of structure
(12) Design: Design format
(13) Design: Reliability design
(14) Design: Optimal design

Continue to E & WR of S, & RSDP(2)↓↓↓

<Final Examination>
(15) Feedback

[Course requirements]

Probabilistic and Statistical Analysis and Exercises(35050), Dynamics of Soil and Structures(35120), Structural Mechanics I and Exercises(35110), Structural Mechanics II and Exercises(35140), and Fluid Mechanics

[Evaluation methods and policy]

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

[Textbooks]

Hand-outs are distributed when necessary.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

Require to review probabilistic and statistical analysis, dynamics of soil and structures, structural mechanics, and fluid mechanics.

（Other information (office hours, etc.)）

Office hour (contact information and consultation hours) of the lecturer(s) will be given in his/her first lecture.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33536 LE73				
Course title (and course title in English)	Concrete Engineering Concrete Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,AN RIN		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.5	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

The basic analysis theory and the design technique of reinforced concrete (RC) and prestressed concrete (PC) structure are explained.

[Course objectives]

Students are expected to understand the mechanical behaviors of RC and PC structures members such as beams and collumns, based on the fundamentals learned in this course.

[Course schedule and contents]

Introduction,1回,Introduction of concrete structures (RC&PC)
Fundamental of design,2回,Design code and specifications
Materials,1回,The mechanical behaviors of concrete, reinforcing steel and others are explained.
Bonding behavior,2回,The mechanism of bonding between concrete and steel.
Flexural behavior,2回,The mechanical behavior and the capacity of RC section subjected to the flexural moment and/or the uniaxial force are explained.
Shear behavior,2回,The mechanical behavior and the capacity of RC section subjected to the shear are explained.
Crack and deflection,2回,Cracking mechanism and evaluation of deflection of RC member are explained.
Prestressed concrete I,1回,Effects of Prestressing　Prestressing steel　concrete for prestressed construction
Prestressed concrete II,1回,Elastic flexural analysis　Flexural strength
Confirmation of understanding of lecture,1回,A confirmation of understanding of lecture is examined.

[Course requirements]

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

[Evaluation methods and policy]

Grading is based on the result of final examination and reports.

Continue to Concrete Engineering(2)↓↓↓

Concrete Engineering(2)

[Textbooks]

Arthur H.Nilson, David Darwin and Charles W.Dolan 『Design of Concrete Structures』 （Mc Graw Hill） ISBN:0073293490（2010）

[References, etc.]

（Reference books）

K. Kobayashi 『Concrete Engineering』 （Morikita Publishing Co. Ltd.）ISBN:9784627425651（3,240JPY）

James K.Wight, James G.MacGregor 『Reinforced Concrete Mechanics & Design』 （Pearson）ISBN: 9780132176521（2010）

[Study outside of class (preparation and review)]

students are required to make preview and review based on handouts and PPT give by KULASIS

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33537 EE73		
Course title (and course title in English)	CP & Exp on Struct M Computer Programming and Experiment on Structural Mechanics	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,YAGI TOMOMI Disaster Prevention Research Institute Professor,IGARASHI AKIRA Graduate School of Engineering Professor,KITANE YASUO Disaster Prevention Research Institute Professor,GOTOU HIROYUKI Graduate School of Engineering Associate Professor,AN RIN Graduate School of Engineering Associate Professor,SAITOU JIYUN Graduate School of Engineering Associate Professor,FURUKAWA AIKO Graduate School of Engineering Associate Professor,MATSUMIYA HISATO Graduate School of Engineering Associate Professor,Chang, Kai-Chun Graduate School of Engineering Assistant Professor,UEMURA KEITA Graduate School of Engineering Assistant Professor,NOGUCHI KYOHEI Graduate School of Engineering Assistant Professor,MATSUMOTO RISA

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Fri.4,5	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Practical understanding and application of the theory that have been learned in “Structure mechanicsIand Exercises ”and “Structure mechanicsIIand Exercises”.
To learn the measurement 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 the mechanical properties of member and/or structure.

[Course objectives]

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 schedule and contents]

Introduction, 1 time
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

Continue to CP & Exp on Struct M(2)↓↓↓

CP & Exp on Struct M(2)

practical failure structures

Structural Experiment, 7 times (lecture 1, experiment 5, Feedback and report guidance 1)
Introducing fundamentals of experiment method and measurement technique for structure model, 5 experiments (cantilver, frame, metal, vibraition test, concrete)

Computer Analysis, 7 times (lecture 1, programming 5, Feedback and report guidance 1)
Computation of the global stiffness matrix, boundary condition, solution procedure, calculation of strain, Visualization, Numerical analysis of a simple beam, Numerical analysis of the test cases (flexural deflection of and a frame)

Feeback lecture, 1 times
Review structural experiments and computer analysis. Confirm the attainment level of learning

[Course requirements]

Computer Programming in Global Engineering, Structure mechanics Ⅰ and Exercises, Structure mechanicsⅡ and Exercises.

[Evaluation methods and policy]

Grade is given based on attendance and reports.
Experiment: 50 points (each experiments 10 points), Computer programming:50 points
Evaluation of experiment and computer programming must be over 30 points.

[Textbooks]

Instructed during class
To be distributed in lectures

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Students will review frame analysis.

（Other information (office hours, etc.)）

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

It is desirable to bring your own laptop.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43538 GE73　U-ENG23 43538 GE14				
Course title (and course title in English)	Graduation Research Graduation Research		Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA	
Target year	4th year students or above	Number of credits	5	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

To acquire the skills of grasping the trends of research related to the educational administration and policy, and basic skills of the master ’ s thesis writing along with the improvement of writing skills. At the same time, students will learn writing strategies for submitting their papers to an academic journal.

[Course objectives]

・To be able to grab the trends of research and read previous studies thoroughly and critically.
・To acquire the ability of pursuing the originality and learn ethics, structures, and writing styles that are required to write the thesis to carry out their research.

[Course schedule and contents]

We will provide tutorials according to the progress of individual students ’ graduation thesis regarding “ Decide on the theme of thesis ” , “ Collecting previous studies, and critical considerations, Examination of research methods ” , “ Investigation of materials ” , “ Reading materials ” , “ Consideration of writing thesis ” , etc. It will be conducted based on their theme of studies.

The indication of course goals is as shown as below(half of a year).
Week1, 2: Decide the theme of thesis
Week3-5: Collecting previous studies and critical considerations,
Examination of research methods
Week6-9: Investigation of materials
Week10-12: Reading materials
Week13-15: Consideration of writing thesis

[Course requirements]

Satisfying the graduation requirement and conditions for starting graduation research

[Evaluation methods and policy]

Based on thesis and presentation and review results

[Textbooks]

consult with supervisor

Continue to Graduation Research(2)↓↓↓

Graduation Research(2)

[References, etc.]

（Reference books）

consult with supervisor

[Study outside of class (preparation and review)]

consult with supervisor

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 23540 LE73		
Course title (and course title in English)	Hydraulics I and Exercises Hydraulics I and Exercises	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Associate Professor,KHAYYER ABBAS Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA

Target year	2nd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.3,4	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Hydrodynamics corresponding to fundamental design of hydraulic structures is explained systematically in connection with classical fluid dynamics. Specifically, elementary fluid dynamics, dynamics of perfect fluid, viscous flow and turbulence, dimensional analysis, and one-dimensional flow equation and steady flow in pipelines and open channels. Steady flow related to pipe flow and open channel are main topics. Students will deepen their understanding of the basic theory through exercises.

[Course objectives]

Systematic understanding of fundamental hydraulics・fluid mechanics through exercises

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time, Exercises(Ex): 90 minutes: 0.5 times>.
Vector and tensor analysis [Ex:1time]
Elementary Fluid Dynamics [Lec:6times, Ex:1time]: What is a continuum, Eulerian and Lagrangean descriptions, continuity equation, Euler's equation of motion, Bernoulli's theorem, two-dimensional irrotational flow, etc. are explained. In the exercises, one-dimensional analytical methods based on the continuity equation and the equation of motion are considered.
Viscous Flow and Turbulence (Lec:4times): Deformation stress, Navier Stokes equation, velocity distribution and friction loss in laminar flow, laminar and turbulent flow, Reynolds stress and Reynolds equation in turbulent flow, velocity distribution in turbulent flow will be explained.
Intermediate examination and summary: Intermediate examination and summary of the first half are carried out.
One-dimensional flow equations [Lec:2times]: The derivation of energy and momentum equations for one-dimensional
flows from Reynolds equations will be discussed in detail, and resistance laws for turbulent
flows in one-dimensional flows will be described.
Dimensional analysis and similarity law [Ex:0.5times]: Explanation and exercises on hydraulic quantities and dimensional analysis, pi-theorem and similarity law.
Steady flow in pipe [Ex:0.5times]: Simple calculations of siphons and conduits (single, parallel and pipe networks) are presented.
Steady-state flow in open channels [Lec:4times, Ex:2times]: The derivation of the water-surface equation from the energy and momentum equations for one-dimensional flows is discussed in detail. Specific energy, specific force, expressions for isentropic flow velocity, isentropic and limiting water depths, water surface profile equations for gradual flow and their qualitative solutions (qualitative sketch of water surface profiles) are explained. In the exercises, basic problems of open channel analysis based on one-dimensional flow

Continue to Hydraulics I and Exercises(2)↓↓↓

equations will be dealt with.
Achievement confirmation: Comprehension assessment will be conducted.
Feedback

[Course requirements]

Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A] and [Fundamental Physics B]). Having taken the credits for [Advanced Dynamics] is preferable.

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exams (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

Printed materials will be distributed as necessary for the exercises.

[References, etc.]

（Reference books）

non

[Study outside of class (preparation and review)]

Review of lecture content and revision of exercises

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33541 LE73				
Course title (and course title in English)	Hydraulics II Hydraulics II	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,HARADA EIJI Graduate School of Engineering Associate Professor,KHAYYER ABBAS Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU		
Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Tue.4	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

As a continuation to Hydraulics I and the Exercises, the essential topics in modern hydraulics and fluid mechanics are covered and discussed in detail. In particular, the mechanics of water surface waves, the shallow water flow equation and its applications, turbulence statistics and the closure problem of Reynolds equation are addressed.

[Course objectives]

To learn and deepen the understanding of essential matters in modern hydraulics・fluid mechanics.

[Course schedule and contents]

<Lectures(Lec): 90 minutes: 1 time>.
Dynamics of water surface waves [Lec:4times]: Governing equations of water surface waves, solutions of small amplitude waves, long and deep water waves, wave groups and group velocities, mechanical energy of water surface waves, surface tension waves, two-dimensional waves.
Shallow water flow equation [Lec:2times]: Depth integration and derivation of shallow water flow equation, shallow water flow equation for rotating systems.
Intermediate examination and summary: Intermediate examination and summary of the first half are carried out.
Equation of coastal current [Lec:2times]: Derivation of the equation of coastal current and explanation of the physical meaning of radiation stress.
Turbulence statistics and Reynolds equation completion problem [Lec:5times]: Turbulence statistics, Kolmogorov's local isotropy theory, derivation of Reynolds stress equation, Boussinesq approximation and one and two equation turbulence models.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

Continue to Hydraulics II(2)↓↓↓

Hydraulics II(2)

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B], and [Advanced Dynamics]).

[Evaluation methods and policy]

Grades will be based on a comprehensive assessment by the final exam and the intermediate exam (50 marks for the intermediate exam and 50 marks for the final exam, for a total of 100 marks).

[Textbooks]

non

[References, etc.]

（Reference books）

non

[Study outside of class (preparation and review)]

Review of lecture content

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lectures are conducted along with exercises. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33542 LE73		
Course title (and course title in English)	River/Coastal Engineering River/Coastal Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,GOTOH HITOSHI Disaster Prevention Research Institute Professor,SUMI TETSUYA Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Graduate School of Engineering Associate Professor,KHAYYER ABBAS Disaster Prevention Research Institute Associate Professor,KOBAYASHI SOHEI Graduate School of Engineering Assistant Professor,Yuma Shimizu

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Wed.2	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

Fundamental items related to river engineering (i.e. mathematics of flood flow, characteristics of flood disasters, flood control, river basin planning, nature restoration, and sediment transport management) and coastal engineering (i.e., coastal processes, wave shoaling, irregular wave, tsunami, storm surge, tidal wave, wave force) and basics of sediment-transport related to both river/coastal engineering are taught.

[Course objectives]

Our goal is a systematic understanding of fundamental aspects of river/coastal engineering.

[Course schedule and contents]

<Lectures(Lec): 90 minutes >.
Flood Control Planning [Lec:4times]: Rivers and river engineering (why river engineering is important, history of human involvement in rivers, characteristics of recent floods), flood flow hydraulics (building bridge from hydraulics to river engineering), inundation analysis (hazard map), river topography (riverbed morphology) and river channel shape (ruler cross-section, embankment), river law and flood control planning (river maintenance basic policy and river improvement plan), and river structures (dams, weirs, sluices and gates) are outlined.
River Environment Planning [Lec:2times]: Ecosystem services and river ecosystem management, nature oriented river works, environmental improvement below dams, integrated sediment management (erosion control, reservoir sedimentation/sediment removal, river channel management), and integrated basin management (River Basin Disaster Resilience and Sustainability by All, Eco-DRR) are outlined.
Movable bed hydrodynamics [Lec:2times]: Outlines of River bed fluctuation and beach deformation analysis, and basics of bed and suspended load models are outlined.
Wave statistics and wave deformation [Lec:2times]: Mechanism of wave generation and development and engineering treatment of irregular waves are outlined. Transformation mechanisms of ocean waves near the coast due to water depth variation are outlined.
Wave force and wave resistant design [Lec:2times]: The characteristics of waves acting on coastal structures, the formula for calculating the wave force and the stability of rubble mound breakwaters are outlined. An overview of numerical design of wave resistant structures is given, and the latest numerical simulation

Continue to River/Coastal Engineering(2)↓↓↓

models are also discussed.
Tsunami and storm surge[Lec:2times]: The characteristics of tsunamis and storm surges are outlined. Evacuation behavior and plans for tsunami evacuation are also outlined.
Achievement confirmation: Comprehensive assessment will be conducted.
Feedback

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises] and [Hydraulics II]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B], and [Advanced Dynamics]).

[Evaluation methods and policy]

Grades will be based on an assessment of the final exam.

[Textbooks]

non

[References, etc.]

（Reference books）

non

[Study outside of class (preparation and review)]

Review of lecture content

（Other information (office hours, etc.)）

Supplementary examination and reexamination will not be conducted. However, this excludes reasons such as unprecedented infectious diseases that the university requires that attendance be prohibited.
Lecture is conducted along with exercise. How to get in touch with instructors is announced during lecture and exercise. Information will be announced via PandA or KULASIS, etc.
* Please visit KULASIS to find out about office hours.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 33543 EE73		
Course title (and course title in English)	Experiments on Hydraulics(Enrolled after 2020) Experiments on Hydraulics(Enrolled after 2020)	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,ICHIKAWA YUTAKA Graduate School of Engineering Professor,GOTOH HITOSHI Graduate School of Engineering Professor,TACHIKAWA YASUTO Graduate School of Engineering Professor,HARADA EIJI Disaster Prevention Research Institute Professor,KAWAIKE KENJI Graduate School of Engineering Professor,SANJIYOU MICHIO Disaster Prevention Research Institute Professor,MORI NOBUHITO Graduate School of Engineering Associate Professor,IKARI HIROYUKI Graduate School of Engineering Associate Professor,ONDA SHINICHIROU Disaster Prevention Research Institute Associate Professor,SHIMURA TOMOYA Disaster Prevention Research Institute Associate Professor,YAMAGUCHI KOSEI Graduate School of Engineering Associate Professor,YOROZU KAZUAKI Graduate School of Engineering Assistant Professor,Yuma Shimizu Graduate School of Engineering Assistant Professor,TANAKA TOMOHIRO Graduate School of Engineering Assistant Professor,Takumi Tazaki Disaster Prevention Research Institute Assistant Professor,Takahiro Koshiba Disaster Prevention Research Institute Assistant Professor,MIYASHITA TAKUYA Disaster Prevention Research Institute Assistant Professor,Yamanoi Kazuki Disaster Prevention Research Institute Assistant Professor,YAMADA MASAFUMI

Target year	3rd year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.3,4	Class style	Experiment (Face-to-face course)	Language of instruction	English

Continue to Experiments on Hydraulics(Enrolled after 2020)(2)↓↓↓

Experiments on Hydraulics(Enrolled after 2020)(2)

[Overview and purpose of the course]

The current status of hydraulic experiments, including hydraulic measurement methods and the latest experimental equipments, will be outlined. Experiments on pipe flow and open-channel flow and water surface waves will be conducted for basic phenomena in hydraulics. Programming practice will be conducted for basic problems in the fields of river, coast, and hydrology.

[Course objectives]

Through basic measurement, observation of hydraulic phenomena and computational experience using numerical models for fluid flow, students will obtain a fundamental understanding for investigating physical phenomena of fluids.

[Course schedule and contents]

Introduction to hydraulic experiments [Lec: 1time]: The purpose and contents of hydraulic experiments are outlined and the cases related to the ethics of engineers are explained. Overview of the current status of hydraulic experiments, including measurement devices used in hydraulic experiments and the latest experimental facilities, are outlined.

The following four experiments (A through D) are conducted in small groups on a rotation basis. Students are required to write a report on each experiment and are instructed on the submitted reports.

A) Transition from lamiar to turbulent flows, friction law in pipe flows [1time]: The patterns of laminar and turbulent flows in a pipe are confirmed by the dye injection method. In addition, the Hagen-Poiseuille flow in laminar flow and the Prandtl-Karman flow in turbulent flow are examined in terms of the resistance law.
B) Velocity and free-surface profiles in open-channel flows [1time]: Water surface profile and velocity distribution in open channel flow are measured and compared with theories on the resistance law and velocity distribution in uniform flow. In addition, water surface profile in a channel with varying channel gradient is measured and the theory by one-dimensional analysis method is verified.
C) Hydraulic jump in horizontal bed [1time]: The most basic hydraulic jump on horizontal roadbed is targeted, and the phenomenon itself should be grasped and the experimental values are compared with theoretical ones by one-dimensional analysis.
D) Transmission and deformation behaviors of waves [1time]: Wave profile, celerity, trajectory of water particles, and amplitude of waves propagating in uniform depth are measured. Then, we compare these quantities with the calculated values based on the small amplitude wave theory. In addition, the wave breaking height/depth on the slope are measured and compared with the conventional experimental formula for wave breaking.

For the following four experimental items (1 to 4), the basic properties of the phenomena, mathematical expressions and their discretization are explained. Students are required to create a program, perform the calculations, and write a report. Students are instructed on the submitted reports.
1) Numerical solution of the advection-diffusion equation
2) Tracking of open channel water surface profile
3) Refraction of water surface waves
4) Runoff analysis
Basic properties of phenomena, mathematical expressions and their discretization are explained in the lecture [Lec: 2times].

Achievement confirmation: [1time],
15 lessons (3 lectures, 11 experiments/practices (including report guidance), 1 Achievement confirmation)

Continue to Experiments on Hydraulics(Enrolled after 2020)(3)↓↓↓

Experiments on Hydraulics(Enrolled after 2020)(3)

[Course requirements]

Having taken the credits for [Hydraulics I and Exercises]. Having taken the credits for standard liberal arts mathematics, including calculus and basic linear algebra, and standard liberal arts physics, including mechanics and basic electromagnetism ([Fundamental Physics A], [Fundamental Physics B]).

[Evaluation methods and policy]

Grades will be based on the experiment and programming practice reports (60 points for the four experiment reports and 40 points for the four programming practice reports, for a total of 100 points). Reports submitted without participating in the experiments will not be evaluated.

[Textbooks]

Hydraulic experiment instruction manual (distributed on KULASIS)

[References, etc.]

（Reference books）

non

[Study outside of class (preparation and review)]

Students must read carefully the hydraulic experiment instruction manual previous to the experiment and review the related items in the hydraulics and hydraulic-related lectures. Also, when writing the report, review the related items again.

（Other information (office hours, etc.)）

Some experiments are conducted at Katsura campus (Nishikyo-ku, Kyoto City). How to get in touch with instructors is announced during experiment. Information will be announced via PandA or KULASIS, etc.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13544 LE14　U-ENG23 13544 LE73				
Course title (and course title in English)	Introduction to Civil, Environmental and Resources Eng Introduction to Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering KANKEI KYOIN Graduate School of Engineering Associate Professor,AN RIN		
Target year	1st year students or above	Number of credits	2	Year/semesters	2024/First semester
Days and periods	Wed.4	Class style	Lecture (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This class is a mandatory class for first year students. It includes guidance, small group seminars and a visit to the civil engineering facilities in Katsura campus

[Course objectives]

To help students understand what it means to study at university.
To familiarize students with the topics covered in civil engineering.
To introduce the research covered in several research laboratories.
To help students get to know other students and academics and to learn to discuss in small groups.

[Course schedule and contents]

Weeks 1-6; Small group seminars by different professos
Weeks 7-8; Individual guidance from faculty members
Week 9-13; Exercises, group homeworks
Week 14-15; Visit to Katsura campus, review of engineering facilities.

[Course requirements]

None

[Evaluation methods and policy]

Based on homeworks and participation

[Textbooks]

Instructed during class

[References, etc.]

（Reference books）

Introduced during class

[Study outside of class (preparation and review)]

Instructions will be given in class.

（Other information (office hours, etc.)）

Information will be given as part of the student guidance.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 13545 SE73		
Course title (and course title in English)	Computer Prg in Civil, Environmental and Resources Eng Computer Programming in Civil, Environmental and Resources Engineering	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Associate Professor,Zhu Fan

Target year	1st year students or above	Number of credits	2	Year/semesters	2024/Second semester
Days and periods	Thu.5	Class style	Seminar (Face-to-face course)	Language of instruction	English

[Overview and purpose of the course]

This course aims to introduce the basic computational tools needed in the fields of civil, environmental and resources engineering. Students will learn and practice a computer programming language Fortran 90. This course focuses not only on the fundamentals of the Fortran language, but also numerical algorithms that are actually applied in researches and applications, such as root finding, numerical differentiation and integration methods, and matrix operation.

[Course objectives]

The students will learn basic programming skills with Fortran 90 language and be able to solve simple mathematical and engineering problems numerically.

[Course schedule and contents]

This course consists of 15 classes including one feedback class. The main contents of this lecture are:

1. Overview, basic program and data types
(Overview on using computer terminals and description of programming language Fortran 90. Main parts of a basic program and data types)

2. Branches and loops
(Conditional branching to change the flow of a program and create repetition is explained)

3. Characters and format
(Use of character string in program, specification of input/output format)

4-5. Functions and numerical analysis
(Function subprogram and application in numerical analysis such as differentiation and integration)

6-7. Review, exercise, and confirmation of understanding

8. Arrays and vector
(Declaration and operation of one-dimensional arrays, vector calculations)

9. Multi-dimensional array and matrix
(Use of multi-dimensional array, matrix operation)

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10-11. Subroutine and file operation
(Matrix calculations, read/write data with files, use of subroutine for large/complex problems)

12-14. Numerical analysis
(Solving basic mathematical and engineering problems numerically, including solving ordinary and partial differential equations)

<Final Examination>

15. Feedback

[Course requirements]

You will need to bring your own notebook computer to work on programming exercises.

[Evaluation methods and policy]

Grading will be based on weekly assignments (30%), a mid-term exam (30%), and a final exam (40%).
Students will be assessed for their understanding of the programming syntax, logics, and the ability to write programs for mathematical and engineering problems.

[Textbooks]

Exercise book and class materials will be provided thru KULASIS/PandA.

[References, etc.]

（Reference books）

Stephen J. Chapman 『Fortran for Scientists and Engineers』 （McGraw-Hill Education, 2018）ISBN: 9780073385891
Brian Hahn 『Fortran 90 for Scientists and Engineers』 （Oxford : Elsevier , 2004）ISBN:9780340600344

[Study outside of class (preparation and review)]

Students will be requested to work on an assignment after each class and submit it thru PandA.

（Other information (office hours, etc.)）

Office hours and contact of instructors will be announced in the first class.

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43999 GJ73　U-ENG23 43999 GJ14　U-ENG23 43999 GJ77		
Course title (and course title in English)	特別研究(土木工学コース) Graduation Thesis	Instructor's name, job title, and department of affiliation	Graduate School of Management Professor,YAMAMOTO TAKASHI Graduate School of Global Environmental Studies Associate Professor,YAMAGUCHI KEITA

Target year	4th year students or above	Number of credits	5	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

To acquire the skills of grasping the trends of research related to the educational administration and policy, and basic skills of the master ’ s thesis writing along with the improvement of writing skills. At the same time, students will learn writing strategies for submitting their papers to an academic journal.

[Course objectives]

・To be able to grab the trends of research and read previous studies thoroughly and critically.
・To acquire the ability of pursuing the originality and learn ethics, structures, and writing styles that are required to write the thesis to carry out their research.

[Course schedule and contents]

We will provide tutorials according to the progress of individual students ’ graduation thesis regarding “ Decide on the theme of thesis ” , “ Collecting previous studies, and critical considerations, Examination of research methods ” , “ Investigation of materials ” , “ Reading materials ” , “ Consideration of writing thesis ” , etc. It will be conducted based on their theme of studies.

The indication of course goals is as shown as below(a half year).
Week1, 2: Decide the theme of thesis
Week3-5: Collecting previous studies and critical considerations, Examination of research methods
Week6-9: Investigation of materials
Week10-12: Reading materials
Week13-15: Consideration of writing thesis

[Course requirements]

Satisfying the graduation and conditions for starting graduation research.

[Evaluation methods and policy]

Based on thesis, presentation and review results.

[Textbooks]

consult with your supervisor

Continue to 特別研究(土木工学コース)(2)↓↓↓

特別研究(土木工学コース)(2)

[References, etc.]

（Reference books）

consult with your supervisor

[Study outside of class (preparation and review)]

consult with your supervisor

（Other information (office hours, etc.)）

*Please visit KULASIS to find out about office hours.

Course number	U-ENG23 43999 GJ73　U-ENG23 43999 GJ14　U-ENG23 43999 GJ77		
Course title (and course title in English)	特別研究(資源工学コース) Graduation Thesis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MURATA SUMIHIKO Graduate School of Engineering Associate Professor,NARA YOSHITAKA

Target year	4th year students or above	Number of credits	5	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

資源工学コース所属の教員の指導のもとにテーマを決め研究を遂行し、研究計画、データ取得、論議の進め方などを修得するとともに、得られた研究成果を「特別研究論文」としてまとめる。
年度後半に開催される特別研究発表会にて研究発表を行い、研究内容を分かりやすく発表し、質問に適切に答えるスキルを身につける。

[Course objectives]

研究計画、データ取得、論議の進め方、研究成果のまとめ方、発表のスキル等、研究を遂行する上で必要な能力を養う。

[Course schedule and contents]

集中講義・演習形式のため進捗に応じて変動はあるが、大きく分けて下記の通りである。

第１回
　資源工学コース所属の教員の指導のもと、具体的な研究テーマの検討と決定を行う。また、論議の進め方や研究に際して安全衛生上の留意点を講述する。

第2回～第74回
　各自の研究テーマに応じて、研究計画の設定（2～10回）、先行研究の調査と検討（11～20回）、研究方法の吟味（20～30回）、データ収集（31～55回）、得られた結果の考察（56～65回）などを行う。また適宜、研究発表を通した論議、論文執筆の検討を実施する。毎回の予定は進捗に応じてその都度調整する。

第66回～第75回
　研究・調査の成果と残された課題を特別研究論文としてまとめる。また第75回に、特別研究発表を実施する。

Continue to 特別研究(資源工学コース)(2)↓↓↓

特別研究(資源工学コース)(2)

[Course requirements]

資源工学コースの研究室に配属されることが必須となる。

[Evaluation methods and policy]

教員の指導のもとに「特別研究論文」を作成・提出すること、さらに特別研究発表会で研究発表を行うことにより評価する。

[Textbooks]

Not used

[References, etc.]

（Reference books）

指導教員の指導によるものとする。

[Study outside of class (preparation and review)]

教員の指導のもとにテーマを決め研究を遂行するとともに、先行研究や関連する研究の論文や専門書を自主的に勉強することが望まれる。

（Other information (office hours, etc.)）

教員の指導のもとに研究を遂行してください。

*Please visit KULASIS to find out about office hours.

未更新

Course number	U-ENG23 43999 GJ73 U-ENG23 43999 GJ14 U-ENG23 43999 GJ77		
Course title (and course title in English)	特別研究(環境工学コース) Graduation Thesis	Instructor's name, job title, and department of affiliation	Graduate School of Engineering Professor,MATSUDA TOMONARI Graduate School of Engineering Associate Professor,OOSHITA KAZUYUKI

Target year	4th year students or above	Number of credits	5	Year/semesters	2024/Intensive, year-round
Days and periods	Intensive	Class style	Seminar (Face-to-face course)	Language of instruction	Japanese

[Overview and purpose of the course]

Acquisition of ability to solve problems through taking an initiative to carry out a research subject of environment-related issues under the supervision of staffs of Environmental Engineering Course. To write the thesis of graduation study based on the research results and give a presentation.

[Course objectives]

To understand and acquire research activities involving a subject set, development of a research plan, research implementation, writing a thesis, and making a presentation.

[Course schedule and contents]

(1) A research subject set (3 times):
To set a research subject under supervision of staffs.

(2) Review of previous researches and investigation of research procedures (3 times):
To collect and critically review literature of previous researches, and to investigate the research procedures.

(3) Development of a research plan (3 times):
To develop a research plan under supervision of staffs.

(4) Experiments, survey and data analysis (15 times):
To carry out experiments, survey, data analysis and so on under supervision of staffs.

(5) Thesis writing (5 times):
To write a thesis of graduation study based on the research results.

(6) Presentation (1 time):
To deliver presentation of the graduation study and discuss with examiners and audiences.

[Course requirements]

To meet the requirement for starting graduation research described in the Guidance of Global Engineering about requirements for graduation and starting graduation research.

Continue to 特別研究(環境工学コース)(2)↓↓↓

特別研究(環境工学コース)(2)

[Evaluation methods and policy]

Grade is evaluated by graduation research thesis which must follow the guideline for authors and its presentation.

[Textbooks]

To follow supervision of the staffs.

[References, etc.]

（Reference books）

[Study outside of class (preparation and review)]

To follow supervision of the staffs.

（Other information (office hours, etc.)）

To follow supervision of the staffs.

*Please visit KULASIS to find out about office hours.